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International Handbook of
**Research and Development of
Giftedness and Talent**

Edited by

KURT A. HELLER
University of Munich, Germany

FRANZ J. MÖNKS
University of Nijmegen, The Netherlands

A. HARRY PASSOW
Teachers College, Columbia University, U.S.A.



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Foreword

HOWARD GARDNER

Harvard Project Zero, Cambridge, Massachusetts, U.S.A.

Next to its close relative *intelligence*, no topic in psychology or education has been as salient and controversial for so long a time as that of *giftedness*. Interest in human gifts—broadly defined—has been perennial in diverse societies, as those believed to have special powers have been variously honored or damned. This interest in human beings who display unusual capacities is hardly surprising, given the desirability of harnessing these gifts to the public good and the fear of what might happen if such extraordinary gifts were turned against those in power. Once systematic investigations of individual differences began, about a century ago, lay concerns about human talent were joined to scientific curiosity and to policy decisions, thus ensuring heated discussions which continue unabated to this day.

From early on, discussions about giftedness among both theorists and practitioners have been framed by competing positions. The most fundamental arena of dispute has concerned the origins of gifts. While the majority of researchers have assumed that gifts are largely inborn, a cohort has insisted on the contribution of family and other environmental factors to the development of talent. A topic arousing equal controversy has been the singularity of giftedness. Many of the pioneering researchers believed it was most parsimonious to assert the existence of general giftedness (sometimes parading under the name “g”), but a contrary position has posited the existence of a multiplicity of gifts.

On the more practical side, an analogous set of contrasts has arisen. When it comes to the identification of the gifted individuals in a society, many practitioners seek to rely on the simplest, least ambiguous form of evidence—usually the score on an objective instrument such as an intelligence test. Other practitioners, however, are reluctant to place faith in such measures, preferring to look directly at evidence of high-level performance in the scholastic or other areas. Once gifted individuals have been identified by whatever means, controversy surrounds the question of how best to nurture talent. A clear majority of workers in the gifted area favor forms of tracking, organized either around general giftedness or along the lines of specific talents. However, especially in recent years, the costs of tracking have frequently been noted—costs not only at the expense of competing values such as equity, but even in terms of the alleged costs of such isolation for the gifted individual herself.

In some areas of research, controversy proceeds but without notable progress. Indeed, after some brilliant initial flourishes in the early part of the century, investigations of giftedness languished until the 1970s. In the last two decades, however, the area of research on giftedness and related topics has come alive again. There is an ever-expanding set of journals, books, conferences, special interest groups, and encyclopedic handbooks. Issues of giftedness have become of interest not only to researchers with a long-time declared interest in the area but also to other accomplished scientists who find that their investigative curiosity draws them to individuals or groups of exceptional promise and/or exceptional achievement.

The handsome volume that you hold in your hands is eloquent testimony to the progress of the field in the last few decades. Following Abraham Tannenbaum’s magisterial review of the history of interest in the field of giftedness, one encounters important essays on many topics that could

hardly have been imagined earlier in the century. Of special note are new theories of giftedness, put forth by scholars like François Gagné, David Feldman, Franz Mönks, and Robert Sternberg; biologically-oriented accounts offered by Robert Plomin, Hans Eysenck and their colleagues; studies of giftedness in particular domains, ranging from music and art to leadership and mathematics; a plethora of essays on practices for the gifted across the age range and from a large number of countries; as well as treatments of a number of special topics, ranging from after-school programs to underachieving gifted students to gifted handicapped individuals. Nearly every major worker in the field is represented in this compendium; the selection is even-handed as well as comprehensive. Themes recur in various articles, often with a somewhat different slant, conferring a beguiling contrapuntal quality on the book. Anyone who takes the time to sample across the *Handbook* will be exceedingly well informed about the work of today and in a privileged position to speculate about, and perhaps contribute to, the prospects for tomorrow.

Given the relatively long history of the study of giftedness, one might ask what would most astonish such pioneers as Francis Galton and Alfred Binet, Lewis Terman and Walter Lippman, Leta Hollingsworth, and Catherine Cox, were they to display an unanticipated talent of returning to the earthly scene today. In my own view, they would be surprised to see the extent to which the evidence has accrued in support of both hereditarian *and* environmental accounts of giftedness. On the one hand, powerful neurophysiological evidence has accrued to demonstrate the “physical reality” of “g” and other symptoms of general intelligence. Yet, on the other hand, evidence from a variety of quarters points to the important, indeed indispensable role played by family support, cultural values, and vast amounts of practice in the realization of any and all gifts.

Along a parallel line, I think that these early students of giftedness would be surprised to find the continuing hegemony of the notion of a single intelligence, in the face of persistent attempts to develop a more capacious notion of intellectual competence. Joseph Renzulli’s three-ring approach to giftedness, Sidney Marland’s six forms of giftedness, Robert Sternberg’s triarchic conception of intellect, and my own theory of multiple intelligences represent but the tip of an ever-expanding iceberg of efforts to go beyond a singular view of giftedness. Our predecessors would note, properly, that those of a psychometric bend tend to favor a single view of intellectual power, while those who attend to cultural, social, and environmental factors are more comfortable with a more expansive (or looser) conception of giftedness.

Whatever their theoretical bent, these visitors from our history would be fascinated by a concern with many issues that had scarcely arisen in their day. A preoccupation with gifted young girls, with gifted minority youngsters, with gifted handicapped children, and with individuals gifted in a plethora of domains and crafts would seem astonishing to those raised at a time when a young white male scholar was the prototype of the gifted child. Even as they would be amazed by the attention now paid to the occasional young Hungarian chess player, Oxford schoolgirl, or Chinese painting prodigy, they would probably be intrigued by the ever stronger uneasiness found among educators and the general public concerning any effort to single out for special attention those individuals who appear to have special promise. And although they might take comfort in the fact that most gifted programs still admit youngsters on the basis of test scores, their attention would be caught by those innovative programs which allow self-nomination, parental nomination, or admission by a panel of peers and experts.

Some issues from days past continue to cry out for explanation. We still do not understand why some gifted youngsters go on to enormous adult accomplishment, while others essentially drop out; nor why otherwise unremarkable normal youngsters occasionally surpass the performances of even the most promising of their peers. We still are uncertain about the relative contributions of intellectual, social, affective, motivational, and sheer energetic and temperamental factors to unusual promise and startling achievement. Much work remains to be done before we can understand the relationship among intelligence, giftedness, creativity, precocity, prodigiousness, and ultimate achievement, however defined and however exhibited. Yet, if there is far to go, the distance traversed in the past quarter

century is impressive indeed. The progress has been brought into a state of high readiness by the hardworking and shrewd editors of this volume. Professors Heller, Mönks, and Passow deserve our congratulations—and our thanks.

Harvard University
Cambridge, Massachusetts
May, 1993

Preface

In his presentation at an international meeting on “Research Problems in Developing Giftedness” at the University of Munich in May 1988, A. Harry Passow, then President of the World Council on Gifted and Talented Children, Inc. (WCGTC), observed that the time had come for the development of a handbook on research on giftedness. Such a handbook, he argued, would provide researchers, theorists, practitioners and program planners with an understanding of what the knowledge base was and what lacunae existed regarding the identification and nurturing of the gifted and it would help in the framing of questions and the designing of studies which would enhance our understanding of the complex phenomenon of giftedness.

Serious research on the gifted began at the turn of the century and has intensified in the past two decades or so. As early as 1916 the German psychologist William Stern wrote already an article about the identification, the needed provisions for the gifted student and he described giftedness as a multifactorial concept. About 40 years later Terman came to the conclusion that Intelligence is a necessary but not sufficient condition for giftedness. Stern concluded almost the same in his 1916 article.

Hundreds of studies are done each year dealing with every conceivable aspect of giftedness. These studies range from sophisticated research to both well- and poorly-designed master theses and doctoral dissertations and include quantitative and qualitative designs, experiments, surveys, case studies, descriptions of school programs, and classroom practices, etc. Some are replications of previous studies, intended to extend and deepen insights. Many add to the knowledge base concerning the identification and development of potential or the achievements of the gifted.

Until relatively recently, publication of research findings and other material concerning the gifted was thought by many to be a “peculiarly American phenomenon”. While it is true that more publications emanate from the United States sources in the form of books, journals, reports, dissertations and other materials than from any other nation, the improvement in international communication has made it clear that the U.S.A. has no monopoly in this field.

The increase in international and regional meetings and the exchange of various kinds of publications has had two consequences: (a) it has enhanced the flow of information cross-nationally and (b) it has made clear the need for taking stock of the knowledge base if the field of the gifted is to move ahead.

The published proceedings of the biennial World Conferences on Gifted and Talented Children include contributors from many nations but, since these are conference presentations, they tend to be primarily nondata based reports and program or practice descriptions. Numerous books are published each year dealing with some aspect of giftedness, but these tend to be topic-specific. In the U.S.A., a monthly publication titled *Resources in Education* (issued by the ERIC system which includes one center responsible for materials on the gifted and talented) disseminates abstracts primarily of unpublished reports and papers. International exchanges are somewhat sparse—there are few international journals. Most publications cover only local, national or regional projects. The expanding cross-national communication between individuals and groups has done much to sensitize many persons in the field to the growing body of information about the gifted and talented.

Thus, it seemed to the editors that the field of gifted education could profit from a comprehensive handbook designed to provide a synthesis and critical review of the significant theory and research dealing with all aspects of giftedness, one which included contributors from the many nations where such research and program development was occurring. We viewed the undertaking with 80 contributors from 18 countries on six continents as a kind of international stock-taking. While the contributors provide a broad base for an international information exchange, they also provide insights into research deficits and research needs.

Since the majority of studies of giftedness over the last two decades and even earlier has been carried out in North America, there is a danger that one will take a noncritical perception of the material from the perspective of their origin—e.g., conceptions of giftedness and appropriate educational and nurturing strategies. However, we have long known from cross-cultural socialization research that the assumption of universal validity of many educational and psychological theories of human behavior—e.g., learning and thinking—has become obsolete. Moreover, many recent

studies, as well as programs and practices outside the English-speaking regions, particularly in Europe, Africa, Asia, and South America, are not known among specialists in the field. Progress in research and practice regarding the identification and nurturance of talent potential to talent performance is dependent on the broad cross-national exchange of information. A major purpose of this handbook is to document the state of the art of research and development on giftedness from an international perspective.

The process of turning an idea into a product is often a long and time-consuming process, as the editors rediscovered. However, the editors were provided with a great deal of stimulation and support from many colleagues around the world for which they are grateful.

Kurt A. Heller was awarded an Academy Scholarship from the Volkswagen Foundation (Grant No. II/64 911) for the academic year 1989-90, and grants from the German Research Society (DFG 477/24/90-20 and 477/832/92) and the UNESCO (ROK/87/009-No. 116.040.2), which enabled him to make extensive trips to Western and Eastern European countries, Israel, the Far East (China, Taiwan, Hong Kong, Korea, Japan and Thailand) as well as the U.S.A. and Canada, visiting more than 60 research institutions, universities, special schools, and extracurricular programs in those countries, and conducting many discussions with colleagues about the concept of the handbook. The other editors, Franz J. Mönks and A. Harry Passow, participated in numerous international and regional conferences and consulted in a variety of countries during the period that the handbook was being prepared. Several meetings of the three editors took place at international and regional conferences.

The proposal for the handbook, together with drafts of chapter contents, was reviewed by an international panel whose suggestions and comments were incorporated in revised outlines. Possible contributing authors with expertise in particular areas were identified, keeping in mind that representation from as many nations as possible was being sought. Over 90% of the individuals asked to contribute accepted our invitations. Some could not accept because of our deadlines. With very few exceptions, the manuscripts were submitted on time and we are grateful for both the quality and the promptness of the contributions. The timing was especially critical since the editors and the publisher aimed for publication by July 1993 so that it would be available at the Tenth World Conference on Gifted and Talented Children in Toronto.

Our instructions to the contributors emphasized that each article should reflect the state-of-the-art from an international perspective, should offer a comprehensive review and should include contents that comprised the forefront of knowledge and thought about the gifted. All contributors responded to that request—some more than others with the sparsity or unevenness of available knowledge often determining the author's response.

The contributors and the editors have tried to provide this comprehensive review of research and practice on giftedness and talent in a form which will be useful to a variety of readers—researchers, practitioners, program planners, and policy makers, among others. If the handbook reaches politicians concerned with education and advocates of gifted education—lay or professional—then an important goal will have been attained. University and college students and teachers will find this handbook useful as a comprehensive source of information regarding the gifted and the talented. Anyone concerned with identification and nurturing of the gifted and the talented will find the handbook a rich resource.

The 53 chapters are divided into seven sections as follows:

Part I: Historical perspective and perennial issues.

Part II: Conceptions and development of giftedness and talent.

Part III: Identification of giftedness and talent.

Part IV: Programs and practices for nurturing the gifted and the talented.

Part V: Other components of nurturing giftedness and talent.

Part VI: Examples of country efforts, policies, programs and issues.

Part VII: Present and future of education of the gifted and talented.

Finally, we want to thank the editors of Pergamon Press—Barbara Barrett, Michele Wheaton, and Lesley Williams and their colleagues in the production department—for their very professional handling of this publication. We would also like to thank Dr Michael Katzko who did indepth English editing of some of the contributions and Dr Rebecca Geiger for her assistance in editing the final chapter.

Kurt A. Heller
Franz J. Mönks
A. Harry Passow

PART I

**Historical Perspectives and Perennial Issues Related to
Giftedness and Talent**

History of Giftedness and “Gifted Education” in World Perspective*

ABRAHAM J. TANNENBAUM

Teachers College, Columbia University, New York, U.S.A.

Introduction

Does genius make history, or does history make the genius? A seemingly intriguing question for school children and scholars alike. But a deceptive one nonetheless, since the choice is not “either–or”. Actually, neither individual geniuses nor historical forces predominate, the real relationship being interactive and interdependent. Great ideas by highly creative individuals often carry enough power to influence the course of history; conversely, the *Zeitgeist* (spirit of the times) exercises an enormous influence on great minds and on the domains of excellence in which their precious ideas are generated.

Western Perspectives on Domains of Excellence

Although the precise manner in which geniuses and their eras inter-relate will always be a mystery, one impression seems clear: the work of seminal thinkers throughout the ages and societies is so important that unless we learn to appreciate it we cannot hope to learn how the human family *makes* history. Indeed, there are historians whose theories are bound up with the nature and impact of creative accomplishments in every historical period.

Spengler (1918), who compared the development of a society to that of a human organism, each with its own life cycle and distinctive personality, believed that every stage of growth is *defined* by the style and substance of great creative works produced at that time. Medieval Europe is characterized by the Gothic cathedral in architecture, the Gregorian Chant in music, and “Everyman” in drama, all treasures of creative thinking and fitted perfectly to Church–State political leadership. In the Romantic Period, sumptuous government buildings and

elegant homes for the bourgeoisie are the representative architecture of flourishing democracies; Beethoven’s music and Shelley’s poetry bespeak the idealization of the human collective spirit as it replaces the earlier authority of monarchy and aristocracy and the still earlier power of the Supernatural. It would therefore be anachronistic for a late twentieth-century composer to create music in the style of Mozart’s *Divertimenti* or for an artist to produce a Gainsborough-type “Blue Boy” in the 1990s. The voices of present-day genius are not only different from those of previous times—they also codify current history as both reflectors and shapers of the society in which *they* live, just as their predecessors did in their own idiomatic, but era-inspired, ways when Western society was younger.

In an essentially different approach to history, Toynbee (1967) emphasizes society’s need to respond successfully to periodic challenges as a condition of survival. Today, the most obvious obstacles facing the world include threats to the environment, huge regional pockets of overpopulation and hunger, the dread of nuclear warfare, urban decay and violence, inter-ethnic and inter-class tensions, and a host of diseases that resist cure thus far. Whatever progress is made in confronting these problems will be spear-headed by some of the most advanced thinkers of our times. Toynbee is explicit in estimating the importance of creativity in guaranteeing the survival of Western civilization when he writes:

To give a fair chance to potential creativity is a matter of life and death for any society. This is all-important, because the outstanding creative ability of a fairly small percentage of the population is mankind’s ultimate capital asset, the only one in which Man has been endowed (p. 24, italics in the original).

*Since the terms “giftedness”, “talent”, “creativity”, and “genius” appear in this chapter, a brief note is in order concerning their intended meanings. “Giftedness” and “talent” are used synonymously to encompass publicly valued abilities possessed by no more than one to two percent of people at each developmental stage. “Creativity” is regarded here as representing one of two aspects of “giftedness” (or

“talent”), namely, innovation or invention that deserves critical acclaim, in contrast to the other aspect of “giftedness” (or “talent”) which refers to highly developed proficiency in highly demanding tasks. “Genius” is the most advanced extension of “giftedness” (or “talent”) or “creativity”, denoting Olympian-level accomplishments by the rarest of adults.

In essence, then, there is not only a history of giftedness, but also history *and* giftedness. It makes little sense to recount the life of a people without taking special note of at least some of its best minds. These leading figures produce immortal artifacts that symbolize the distinctive nature of culture and civilization as they are preserved and changed in the course of time (according to Spengler). Viewed differently, the nature and degree of creative thinking are critical in determining whether a culture can survive and continue to grow or become truncated relics of an unrecoverable past (according to Toynbee).

Historical Drives

The human psyche seems to have a phenomenal potential for achievement. There are no known limits to the *kinds* of talents it can demonstrate and to the heights to which it can climb in any talent domain. But the mind is not motivated to achieve every possible form of excellence. The cultural milieu makes that decision in the broadest possible sense. Spengler suggested that the predominant characteristic of Western society is "Faustian", a term based on the medieval legendary character, Faust, who is depicted in masterpieces by Marlowe, Goethe, Gounod, Boito, and Thomas Mann. In its reified form, this governing power is said to produce an insatiable urge in individuals to explore the unknown and even the unknowable, to reach the unreachable, to grasp at the fringes of eternity, as it were, no matter what sacrifices are necessary to solve the mysteries of the universe and to serve the cause of aesthetics. Spengler offers no clue as to why the West adopted Faust as its inspiration to thrust ever upward with the Gothic arch in the Middle Ages and into outer space and the firmament in our own time. But according to him, the high-intensity drive has always been there; penetration of the heavens with cathedral architecture in one period of history and with jet propulsion in another era represent similar Faustian impulses emanating from different world views. Both also represent accomplishments of some of the best minds of their respective generations. Thus, the history of a people comes to life and takes on meaning through feats of supreme intellect and artistry in every generation.

In the course of Western history, considerable consensus has evolved concerning domains of excellence that have come to receive highest valuation and emphasis. Phenix (1964) describes these domains from the perspective of a philosopher-educator, as follows:

(1) *Symbolics*, including basic forms of communication through ordinary language, mathematics, and such nondiscursive symbolic forms as gestures, rituals, and rhythmic patterns. These systems are structured according to socially accepted rules of formation and transformation and, as carriers of messages between human beings, they are the most basic of all realms of

meaning since they have to be used to express ideas in each of the other realms.

(2) *Empirics*, comprising the sciences of the physical and living world. Their content includes factual descriptions, generalizations, and theoretical formulations based on objective evidence in a world of matter, life, mind, and society. Hypotheses introduced into these realms are tested according to specified rules of evidence and verification before acceptable truths can emerge.

(3) *Aesthetics*, including the various arts, such as music, painting, sculpting, theater, and literary creation. "Meanings in this realm are concerned with the contemplative perception of particular significant things as unique objectifications of ideated subjectivities" (pp. 6,7).

(4) *Synnoetics*, derived from the Greek word *Synnoesis*, meaning "meditative thought", or more specifically, a combination of *syn*, meaning "with" or "together", and *noesis*, meaning "cognition". Synnoetics therefore signifies insightful relationships between people or psychological understandings about people. It applies to other persons or to oneself in the sphere of *knowing*, just as sympathy relates to individuals in the sphere of *feeling*.

(5) *Ethics*, which emphasizes moral meanings that are concerned with *obligation* instead of fact, what ought to be rather than what was, is, or will be. "In contrast to the sciences, which are concerned with abstract cognitive understanding, to the arts, which express idealized aesthetic perceptions, and to personal knowledge which reflects intersubjective understanding, morality has to do with personal conduct that is based on free, responsible, deliberate decision" (p. 7).

(6) *Synoptics*, which embraces meanings that integrate history, religion, and philosophy comprehensively. The tools for building such meanings are empirical, aesthetic, and synnoetic, and the outcomes are new insights that amount to more than the sum of the parts from which they are derived.

Psychologists observing the trained and habituated skills in modern Western society classify human aptitude structures in fairly much the same way as Phenix does, albeit from a different vantage point. For example, DeHaan and Havighurst (1957) list the following domains of excellence:

(1) *Intellectual ability*, which is related most directly to success in school subjects, encompasses the verbal, number, spatial, memory, and reasoning factors of the primary mental abilities. Combinations of these aptitudes are regarded as basic to other talents, such as fine arts, social leadership, science, and mechanics.

(2) *Creative thinking*, which is revealed through some complex mental powers, such as the ability to recognize problems, to be flexible in thinking, to originate ideas or products, or to find new uses for old objects and materials.

(3) *Scientific ability*, including skills in the use of numbers and algebraic symbols, arithmetic reasoning, curiosity about the natural world, and facility with the scientific method.

(4) *Social leadership*, specifically the ability to help a group reach its goals and to improve human relationships within a group. Such skills are necessary for those who will eventually assume leadership positions in business and industry, labor unions, professional organizations, community groups, government, and international agencies.

(5) *Mechanical skills*, otherwise known as "craft skills" and closely related to talents in the fine arts and in science and engineering. Success in this category depends on manipulative facility, spatial ability, and perception of visual patterns, details, similarities, and differences.

(6) *Talents in the fine arts*, which are required of artists, writers, musicians, actors, and dancers.

In a similar vein, Gardner (1983) lists seven human intelligences: (1) linguistic, (2) musical, (3) mathematical, (4) visual-spatial, (5) bodily kinesthetic, (6) social-interpersonal, and (7) intrapersonal. What is noteworthy about Gardner's theory is that it derives partly from his observations of individuals who had sustained injuries in different parts of the brain. This source of data is a far cry from the primarily cultural and historic corpus of material from which Phenix (1964) drew his observations. Yet, the overlap in their domain listings is extensive enough to give a clear picture of what is generally recognized as the major types of excellence treasured in modern Western civilization, in contrast to earlier times in the West and to present-day life in some Western subcultures and in parts of the world that remain relatively untouched by Western influence.

Among the talent domains that define the West's particular brands of Faustian strivings, there seems to be something of a prestige hierarchy which has remained fairly stable over the years. Highest in valuation are the *scarcity talents*, so called because they are always in short supply. Medieval society could never get its fill of leadership and inspiration from the clergy who created an orderly, protective environment and provided its constituents with keys to personal redemption from sin and from the threat of divine retribution. In our modern world there is also an insatiable need for people inventive enough to make life easier, safer, healthier, and more intelligible. But hopes for survival are no longer vested primarily in special talents possessed by leaders of the clergy. Instead, the creative scientist and social leader are seen as most indispensable, and therefore the demand for them cannot be satiated as long as life itself is vulnerable to extinction or dysfunction.

Although it takes only a single Jonas Salk to achieve the breakthrough in conquering polio, there can never be enough talent like his for the great leaps forward that still need to be made in medical science. The same can be said for an Abraham Lincoln in political leadership, a Martin Luther King Jr. in race relations, a Winston Churchill in defense of human freedom, and a Sigmund Freud in mental health. Society will always venerate such talents as they appear, while thirsting for more and more since the shortage can never be filled, principally

because the public's motives are more self-preserving than self-serving. It makes sense, therefore, to consider these special abilities as symbols of excellence in greatest demand.

Ranking second are the *surplus talents*, so named because their cumulative accomplishments over the years are so abundant, rich, and varied that they exceed the capacity of individuals to sample and derive benefit from all of them. For example, it is said that multitudes acknowledge the greatness of Dante for his *Inferno*, but hardly anyone ever reads it even once in a lifetime. For the non readers, such a masterpiece is considered "surplus" in the sense that it is underutilized as literary fare, although it could never be considered "superfluous" inasmuch as some people, albeit a handful, do read and adore it.

Those who possess surplus talents have the rare ability to elevate people's sensibilities and sensitivities to new heights through the production of great art, literature, music, and philosophy. Few individuals can excel in this category, and some who do achieve celebrity status, which means that they are the most widely recognizable people in the eyes of the general public. But despite the fame and fortune of a Picasso and a Beethoven, they are treated as "divine luxuries" capable of beautifying the world without guaranteeing its continued existence. Of course, a Michelangelo and a Bach are always welcome as cultural assets; still, the need for such talents represents a *craving* for ways in which to enhance the quality of life rather than a *demand* for finding means of preserving life itself. People are more likely to suppress their cravings than their demands, as evidenced by the vast treasures of art, literature, and music that are widely unappreciated.

The terms *scarcity talents* and *surplus talents* are not intended to express value judgements, as if one were superior to the other. They are simply different in the *kinds* of admiration they elicit from society and in the popular hierarchy of importance if a choice between them had to be made. Scarcity talents are treated as if they were vital human resources that will always be in short supply as long as utopia is yet to be attained. Their primary preoccupation is with fathoming the unknown and even the unknowable, and modern Western society has committed itself to investing all it can to further such an enterprise. The physical survival of individuals depends on the existence of scarcity talents, whereas the cultural survival of the civilization depends on surplus-type talents. Therefore, it is no surprise that many schools and their supporting communities are more eager to cultivate scarcity talents in order to keep body and soul together rather than to nurture surplus talents for the sake of keeping the human spirit alive.

Third in rank are the *quota talents*, which include specialized, high-level skills needed to provide goods and services for which the market is limited. The job to be done is fairly clear; there are no creative breakthroughs expected and no way of knowing precisely how long the opportunities for such work will

last. Job openings for the relatively few who qualify depend on supply and demand, which can be irregular and geographically bound. Thus, a person with aptitudes for local political leadership has a chance of becoming elected only on special days designated for voting in a democracy, provided that an appropriate vacancy in public office exists at that time. Physicians, teachers, engineers, lawyers, commercial artists, and business executives are but a few of the kinds of highly skilled people whose work is valuable. But they are sought after only in response to market demand and opportunity. Sometimes there are low supplies of such talents, as in the case of physicians needed in poverty-stricken areas of the world; occasionally there are surpluses, such as liberal arts PhDs who are working at unskilled jobs because they cannot find professional employment for which they are trained, even though some positions are filled by less capable people hired ahead of them and protected by tenure policies.

Like scarcity and surplus talents, quota talents emerge in response to popular demand, but only up to the point where the public feels that its needs for such productivity are being met. For example, major symphony orchestras are kept alive by appreciative audiences that support first-rate performances by first-rate musicians. Sometimes there are vacancies to be filled in orchestral sections, and the search is on for candidates who qualify. But the number of such positions is necessarily limited by the number of orchestras the public is willing to sponsor. Hence, there is a quota system against which to measure shortage and surplus.

Schools have historically been most responsive to the public's needs for quota talents. These types of advanced skills are appreciated for the specialized services and goods they supply and for their market value. Schools can therefore be alerted to areas of expertise where there are many openings and the pay is good for those who are bright and trained enough to qualify. In many schools, the advanced training programs designed to fill quotas in various professions have traditionally constituted the total effort at differentiating education for the gifted.

Ranking last in the hierarchy are *anomalous talents*, including those which are either unappreciated or disdained. Yet, they reflect how far the powers of the human mind and body can be stretched and still not be recognized for excellence. Included among them are many prodigious feats, some having practical meaning, others being appreciated for the amusement they provide, and still others that strike fear and awe in people. Speed reading, mastery of mountains of trivia, gourmet cooking, trapeze artistry, performance of complex mathematical calculations faster than a computer, and even the numbers of sexual seductions boasted by a Don Juan are just a few examples of such talents. In this category there are also "extinct" abilities such as oratory and various types of manual craftsmanship that belonged among the scarcity, surplus, or quota talents in another era, but can now be considered anomalous because they have become anachronisms.

The condemned talents include the demagoguery and craftiness of a Hitler or a Stalin, which may require as much ingenuity as do extraordinary leadership skills for constructive purposes, except that they are threats rather than boons to humanity.

Schools have habitually emphasized the development of harmless anomalous talents, especially those that attract crowds and build morale, such as sports, glee clubs, and marching bands. The popularity of such activities among students and alumni, especially in the United States, is communicated to faculties who respond by mounting elaborate talent hunts and devoting considerable effort to sharpening these talents.

Thus we see that scarcity, surplus, quota, and anomalous types of giftedness have always been valued differently by patrons of excellence. The four categories may encompass all forms of giftedness, but the differential categorization helps describe, if not fully explain, their differential acceptance.

Historical Constraints

In his psychoeconomic approach to the study of creativity, Rubenson (1992) weighs the intrinsic and extrinsic costs as well as benefits of innovation in different historical periods. The intrinsic costs refer to the pressures on creative minds who, by virtue of their inventions and discoveries, render obsolete at least some cherished wisdom that had also been innovative at one time and had also upset established dogma before gaining acceptance. Indeed, iconoclasm and revisionist thinking is likely to meet resistance which can exercise restraint on the impulse to create, or even demoralize it. But the countervailing, if not overpowering, drive is toward newness, which is seen as progress in some domains of excellence and venturesomeness in others. Among the sciences, changes in theory often meet the stiffest objections from those who have mastered and adopted older concepts, but eventually the change is accepted as progressive. For example, Galileo's proposition that the sun is immovable in the center of the universe and that the earth has a diurnal motion of rotation has long been seen as a major breakthrough in astronomy. Yet, Galileo languished in what amounted to house arrest for the last eight years of his life because his theories were considered heretical.

It is awesome to contemplate how much richer and more abundant the West's cultural treasures would be if countless potential geniuses had not elected to suppress or abort their creative impulses because they feared ostracism or even reprisal if they would dare revolutionize style and substance in the world of ideas.

Unlike intrinsic costs, which relate to the creative person's courage (or lack of it) to render received wisdom obsolete, extrinsic costs focus on societal influences that stimulate (or inhibit) creative activity. Obviously, freedom of expression encourages daring, avant-garde thought and productivity. Coupled with liberty is the

impact of opportunity and access to audiences, clients, and customers. Rubenson (1992) cites evidence to show a relationship between the number of journals in an academic domain and research output by discoverers in that discipline. He also refers to patent data to measure how changes in demand can affect the frequency of invention. It is not just demand that makes a difference; patronage and sponsorship do also. And the effect is not only on quantity, but also on fashion and content of creative products. Simonton (1990a, b), for example, lists many instances where ingredients of musical and literary products relate directly to variations in external demand. How else to explain the special Russian thematic material—and indeed the very existence—of Beethoven's Rasumovsky Quartets without reference to their being subsidized by the person to whom these works are dedicated, and to his native origin?

The combination of personal freedom and encouragement would seem to create historical imperatives for the production of excellence. That is, times and places which provided these conditions should have been rewarded with a flowering of genius, whereas under oppressive and restrictive conditions the landscape of creativity would be expected to remain barren. However, here is an instance where logic and reality are not always compatible. Somehow, the human spirit that is strong enough to overcome internal restraints is sometimes able to survive and even create under brutal political regimes.

True, a Werner Von Braun could develop his considerable talents even in a police state under Hitler because his own Nazi convictions may have given him access to opportunities for cultivating and dedicating desperately needed talents in rocketry to help the German war effort. The same may apply to the multi-talented Albert Speer, whose superior abilities together with his deep loyalty to Hitler enabled him to design an enormously productive slave labor operation, as well as a vision of a Third Reich capable of maintaining its hegemony for a thousand years. But how to explain the genius of an Osip Mandelstam, who wrote great poetry while declaring his enmity toward Stalin, which eventually led to his death by order of that tyrant? How did he, and his wife Nadezhda too, manage to achieve immortality for their literary works while suffering so much oppression and humiliation in their native country? Perhaps Amabile (1983) and Hennessey and Amabile (1988) are on target when they reveal the enormous power of intrinsic motivation in creative work. Indeed, it may even be strong enough in some cases to overcome the pain of extreme adversity.

The emphasis has to be on "some cases", to point up the fact that wide generalizations cannot be drawn from them in any view of history. More typical are the consequences of changes in political leadership in late fourteenth- and early fifteenth-century China. As Mokyr (1990) points out, before the fourteenth century, Chinese technology was clearly superior to that of the West in textile production, ship building, the measurement

of time, movable type printing, the invention of the wheelbarrow, and the development of chemicals for explosives, pharmaceuticals, and insecticides. In fact, it would take the West several centuries to catch up with some of these technological feats. Artistic technique and imagination were similarly encouraged to flourish as China was approaching the fourteenth century. Grousset (1959) attributes this outpouring of creative productivity to the climate of cultural freedom, and probably public appreciation as well.

But as the Ming Dynasty came into power in the late fourteenth century, support by the ruling elite shifted away from technological and artistic creation to more immediate economic needs. Instead of emphasizing innovation, the regime urged imitation of the past. It also blocked the development of letter alphabets, preferring instead to stay with the old ideograms, which fostered artistic activity through calligraphy but stifled literary excellence for many years. Thus it appears that a relaxation of political policing of cultural life, together with a powerful popular thirst for excellence, helps account for periodic outbursts of greatness in different localities. These conditions were surely prominent in the early sixteenth-century Florence of Leonardo Da Vinci and Michelangelo, the late sixteenth and early seventeenth-century London of Shakespeare, Milton, Bacon, Jonson and Donne, the nineteenth-century Vienna of Beethoven, Schubert, and Mahler, the late nineteenth- and early twentieth-century Paris of Cezanne, Matisse, Monet, and Picasso, and the nineteen-twenties' Weimar Republic of Wedekind, Reinhardt, Thomas Mann, and the Bauhaus.

In a grotesque expression of political and public frenzy to generate progress, especially in science, nations at war can be "credited" with "inspiring" breakthroughs meant for human destruction but turned into major blessings for people at peace. Examples abound in the wake of World War II, but two obvious ones come to mind immediately. The first, of course, is the Manhattan Project, which brought together some of the world's greatest scientific minds to create an atomic bomb, and that in turn ushered in forever the real and potential peaceful benefits of nuclear energy. The other is experimentation with jet propulsion of bombs over Britain by Germany's scientists at Peenemünde, which paved the way to today's jet travel and space exploration. And who can gainsay the countless benefits to modern medicine of treatment drugs, devices, and methods developed originally for use on the wounded in battle? On the other hand, wars have destroyed, crippled, exiled, demoralized, and misdirected so many creative spirits that the discoveries and innovations gained in wartime, dramatic as they may be, cannot possibly make up for the real and potential talent lost in the upheavals of conflict.

Disastrous living conditions around the world have also brought scientific breakthroughs in recent decades. Witness, for example, the so-called "green revolution", with its outcropping of agricultural abundance, thanks

to new methods of selecting, planting, and fertilizing crops to produce enough surplus edibles to feed famine stricken areas of the world. But unfortunately, the magnitude and effects of famine clearly overwhelm the benefits of a green revolution in making enough of a difference worldwide. There are now some three billion people who have no easy access to fresh water, and millions of them live in arid climates, mostly in the southern hemisphere where the once fertile land is already, or is becoming, desert-like in its failure to yield any crops to sustain human life. Aside from the unspeakable misery that exists in that part of the world, there is the added tragedy of a scarcity of talent, brought on by the need to alleviate suffering which saps all energies, physical and mental.

Until the late eighteenth-century, starvation also threatened the lives of many settlers in the North American continent, and artistic life had to be compromised accordingly. But the settlers had brought with them from Europe a social legacy which eventually evolved to what Laski (1948) calls "the quintessence of a secularized puritanism" (p. 42). Its origins are in the familiar Protestant ethic (Weber, 1948), but is applied singularly to the North American condition. It extols effort and the belief that success is its inevitable consequence. In a pioneering society, it is praiseworthy to take risks, show courage, innovate and adapt, and even engage in "rugged individualism" to build and maintain a modern society. It takes so much ingenuity and hard work to get the job done that there is hardly much time to cultivate the arts. Indeed, artistic life is a luxury that few can afford when so many shoulders have to be put to the wheel.

Only later, when the pioneering days in America were over and political, social, and economic institutions were established, could increasing numbers of people allow themselves to turn to the life of the mind. Great political theory and science flourished earliest in the post-pioneer years because they were rooted in the necessities of the pioneer period; great drama and music began to appear much later, also as symbols of hard work and self-perfection in conformance with the Protestant ethic. However, in too many parts of the southern hemisphere, where survival is constantly under threat, and living conditions are indescribably brutal, any confidence people may have had in their ability to overcome adversity has been buried beneath layers upon layers of tragedy accumulated over generations. If they ever inherited a belief in achieving excellence through hard work, their histories of abject misery *despite* hard work could only have had a demoralizing effect on them. And yet, faith in oneself and in the perfectibility of the world are prerequisite to creative activity that is of great value. Sadly, there are too many people today, especially in the southern hemisphere, whose life circumstances deprive them of such basics and deny them access to membership in a global circle of immortals.

Ancient Origins of Interest in the Gifted

Western society has generally looked to Ancient Greek (i.e., Athenian) and Judaeo-Christian traditions for sources of its own cultural identity. In following this practice, a reviewer of history of/and the gifted must beware not to view these forebears as child-like in their mental powers compared to the mature moderns simply because the age of the human species is older now and therefore presumably wiser. True, today's storehouse of music, art, literature, and scientific knowledge is much greater than ever before, a fact that makes contemporary Western society culturally richer than that of Ancient Athens, Judea, or Babylon. But for sheer intellectual power, and the ability to achieve immortality in creative production, the ancients could easily match the moderns in domains of excellence that were characteristic of their societies.

The Legacy of Athens

In the case of Athenian culture, the talent domains were fairly much the same as those which would eventually be valued in the West. They include intellectual ability, often expressed in philosophic speculation, moral excellence, political insight, literary, musical, oratorical, and artistic talents, as well as physical strength for beauty's sake. Hellenism also spread its influence to Ancient Rome and, indeed, to much of the Middle East long before it took hold in Western countries.

There was no state-sponsored education at any level in Athens, even though Plato advocated its establishment. Instead, private citizens opened schools for boys, ages 6 to 14, or to later ages for those who could afford it. (Girls studied at home where their mothers or nurses taught them how to weave, spin, embroider, sing, dance, and play an instrument.) The boys' course of study was divided into three parts: writing (including arithmetic and reading), music, and gymnastics. In Aristotle's time, drawing and painting were added. Everyone learned to play the lyre, and much of the instruction emphasized creating music and poetry. Although no time was spent on acquiring foreign languages, great care was taken in learning the correct usage of the mother tongue. Gymnastics were major features of the curriculum, especially wrestling, swimming, and the use of bow and sling. By age 16, the boys were well trained to run, leap, wrestle, hunt, drive chariots, and hurl the javelin, skills needed for military service. When they became soldier youths at age 18 they learned and practiced the skills of democratic governance and engaged in intensive studies of literature, music, geometry, and rhetoric before being sent off as 19-year-olds for a two-year assignment to a frontier garrison to protect the city.

For advanced study, Aristotle, who was recognized in his time as a philosopher, scientist, and statesman, established the Lyceum, a major learning center rivaling the Academy and the School of Isocrates. All three

became severe competitors until they began to emphasize different courses of study. The School of Isocrates concentrated on rhetoric, the Lyceum on natural science, and the Academy on mathematics, metaphysics, and politics. At the Lyceum, Aristotle assigned his students to gather and coordinate knowledge in many fields: the customs of barbarians, the constitutions of the Greek cities, the chronology of victories in the Pithian Games and in the Athenian Dionysia, the organs and habits of animals, the character and distribution of plants, and the history of science and philosophy.

Athenian citizens, mainly the well-to-do aristocrats, could thus provide their sons with an education that came reasonably close to Plato's version of special enriched schooling for so-called Guardians, or men of silver, whose performance in advanced studies would determine who qualifies as a man of gold, or philosopher king. Plato believed that citizens in his republic should be trained to maximize their potentialities. He insisted that young men who possessed unusual mental ability, based on evidence derived from various tests, be separated from those of average intelligence and given a specialized type of education. The program would require mastery of science, philosophy, and metaphysics. Those who excelled in the program would form a pool out of which future leaders of the state could be drawn. Plato was convinced that Athenian democracy could sustain its greatness only as long as it provided the best educational opportunities for selected young people who would then become its future leaders.

The Classical idea of a ruling elite based on wealth and merit is anathema to modern Western democracies and has been effectively satirized by Young (1959) as a portent of social upheaval and possible disaster. However, Athenian tradition highlights the need to nurture human excellence for its own sake and for the betterment of life in society, an ideal which should be made attainable without sacrifice of egalitarian principles. Classical society also calls attention to domains of excellence which came alive during the Renaissance period in Europe and which are so very much alive today in the entire Western world.

Judaic Influences

The Jewish people have often been called "children of the book", with a tradition of studying, creating, interpreting, teaching, and disseminating ideas wherever they have lived in Western countries. This intense devotion to learning, which has spread its influence to the larger Western community, can be found in several biblical sources, of which the medieval Jewish philosopher, Maimonides, in Chapter 2 of *Laws of the Study of Torah (Mishna Torah)* singles out one: "The Torah which Moses commanded us is a legacy for the congregation of Jacob (i.e., the Jewish people)!" (Deuteronomy, 33:4). *Torah* encompasses a vast literature, including the Old Testament, Mishna and Talmud

(i.e., codifications of centuries of Rabbinic exegeses of scriptural law, lore, and philosophy), along with the wisdom and scholarship of *Gaonim*, *Rishonim*, and *Acharonim*, leading exegetists of post-Talmudic times to the present day.

Maimonides' extolling the centrality of *Torah* learning in traditional Jewish life deserves some explication because it reflects the pronouncements of generations of scholars before him, and his influence has remained powerful, even in large segments of today's Jewish world. Here are just a few examples of his thoughts on *Torah* studies:

(1) There is no biblical positive commandment that outweighs the study of *Torah*.

(2) *Torah* should be studied for its own sake (i.e., self-betterment and enlightenment), not for the sake of material reward.

(3) Even if economic circumstances reduce persons to sustain themselves on bread and salt and on severely limited measures of water, and they are forced to sleep on the ground, they may not renounce immersion in *Torah*.

Religious Jews throughout their history have devotedly adhered to the sentiments expressed by Maimonides. To achieve the status of a *Talmid Chacham* (literally a student-scholar)—everybody a student, including the scholar—was an incomparable accomplishment in early Jewish history and remains so to this day. Not even material wealth could gain so much public veneration for its possessor. Indeed, the rich have often sought the brightest, most scholarly young bachelors for possible marriage to their daughters, and the promise of a substantial dowry could enable the groom to spend a lifetime in *Torah* study free from want, even while building a family. There is never any thought of using the money to enter the business or professional world, or even to support a luxurious lifestyle. Young women had no such educational opportunities until the early twentieth-century when seminaries were opened for them in various Western countries and have multiplied ever since, rapidly in recent years.

Usually, the male's advanced academic work is conducted at a *Yeshiva* (*Torah* Academy) where partners or small groups of three or four adolescents or adults study together for up to ten hours a day and attend regular lectures by leading student-scholars. Since there is no end to the breadth or depth of study, there is no completion of coursework and therefore no diplomas or any other material awards granted, or even sought, except for the few—not necessarily the brightest—who are ordained as Rabbis after some years of prescribed study, and they serve in pulpits, or in Jewish education, or in community leadership positions. This kind of intensive learning that begins soon after the cradle and extends to the grave has permeated large pockets of *Torah*-loyal Jewish life in every Western country where Jews have settled, since the destruction of the Temple in Jerusalem in A.D. 70.

When the male child enters the *Cheder* (i.e., a Jewish school containing one or more classrooms),

with much joy and celebration, often as early as age 3, he quickly develops literacy in the Hebrew language and then spends most of the time, until the pre-adolescent years, mastering the scriptures and the accompanying commentaries. Thereafter, for the rest of his student years at Yeshiva, including the many informal learning periods outside of school hours and beyond the school years, most of the concentration, by far, is on the Talmud and its vast collection of related literature. His deep penetration into Judaic jurisprudence and codes of behavior requires a most sophisticated level of logical insight simply to understand the text, let alone to draw brilliant inferences from it. The highest honor bestowed by learned peers and even by the uneducated public is upon the rare student who can gain intimate familiarity with Talmudic thought in all its depth and breadth and can also create original interpretations that illuminate it as perhaps never before. This gifted individual thus qualifies as a student-scholar, the person for whom the Yeshiva is primarily meant to exist. In short, it is an educational system that fosters a kind of intellectual elitism in which the Talmudist *par excellence* reigns supreme.

Since Jews lived for many centuries as second class citizens in Western society, their Gentile neighbors were rarely inspired by the Jewish love for learning. In fact, some of the richest, most intensive scholarly activity took place in ghetto-like settings, small town (*Shtetl*) communities where religious oppression and separatism was greatest, and there was little desire or even opportunity for Gentile to emulate the often-hated Jew. It was not until the emancipation proclamations all across Europe and in the United States, mostly in the late eighteenth and early nineteenth centuries, that ghetto life began to crumble as Jews were given freedom to prosper in financial centers and to participate in Western cultural life. From that time on, a huge majority of "children of the book" (i.e., *Torah*) became children of *all* books. The devotion with which Talmudic study was pursued shifted, for a vast majority of Jews, to secular learning, with far-reaching consequences for the Jewish *Shtetl* and for Western society in general.

The *Shtetl* lamented the hemorrhaging of religious commitment and Torah learning among its youth, while Western society gained a talent pool that enriched cultural life immeasurably and permanently in virtually every domain of advanced-level activity. Unreconstructed anti-semites have derided highly motivated, high achieving Jewish students as grindingly overambitious as they scramble and compete to get ahead. So conspicuous have these students been in their self-sacrifice for mastery, that the American novelist, Thomas Wolfe, whose university classes contained large Jewish enrollments, once described them as "burning in the night" with a seemingly endless fire of enthusiasm for matters cerebral and secular.

For sheer volume of great Western achievements in the arts and sciences over the past two centuries, Jews have contributed far out of proportion to their

numbers within the general population. Such immortals as Freud, Einstein, Kafka and von Neumann, among others, even succeeded in revolutionizing whole domains of productive activity far beyond their lifetimes, possibly for all time. Others, though lesser lights, have enriched cultural life in the West not only as creative contributors but also as patrons, mentors, and role models by enabling others to achieve renown while remaining virtually unknown themselves. The magnitude of Jewish constructive involvement in Western arts and sciences can only be a matter of conjecture, the few hints coming out of facts concerning pre- and post-Holocaust Europe. Engelmann's (1984) powerful treatise on Germany without Jews reports on their critical role in German medicine, politics, higher education, artistic, literary, theatrical, and musical life, and even in that country's record in winning Nobel prizes. The precipitous drop in quality and abundance of German talent since the liquidation of almost all Jewry in that country illustrates how a life of the mind among ancient Jews, passed on from generation to generation, plays a vital role in the recent history of giftedness in Western society.

Christian Influences

To the extent that Christianity is rooted in Judaic sources, it has also extolled studiousness and achievement, concentrating in its early history on the scriptures, including the New Testament. When it was at its peak of power during the Middle Ages, it created an everlasting learning tradition without causing Europe to be "blissfully ignorant of the 'spell of the classics' and interested only in theological speculation" (Lamonte, 1949, p. 553). Great ideas in science, law, literature, philosophy, and art were, in fact, studied and propounded vigorously at that time. Yet, to the modern Westerner, Medieval Europe appears as a tradition-oriented society in which high-level talent was devoted primarily to the preservation, understanding, and enhancement of Church ideals.

Among the most significant developments in creative thinking by the end of the fifteenth-century, besides ideological treatises, were those associated with early technology and the renaissance. Advances in the chemistry of ink, skills in paper making, and metallurgy enabled Gutenberg to invent movable type sometime around the mid-fifteenth-century, and this new device almost immediately facilitated the wide dissemination of ideas, some of them highly critical of the Church. Among the most powerful polemics were Martin Luther's ninety-five theses which he nailed on the door of the Castle Church at Wittenberg, Germany, in 1517, a document that received wide circulation with the help of movable type. The theses bitterly attacked the Pope's practice of selling indulgences, whereby sinners were promised forgiveness if they sent substantial sums of money to the papal treasury. Luther was branded a heretic, but the authority of the Vatican was shaken, not only in his

native Germany, but also in France and Switzerland, where John Calvin led the struggle for Church liberalization soon afterwards. These three countries were already leaning toward reformation, so they provided fertile ground for the sowing of new ideas by Luther and Calvin.

With the advent of the Protestant Reformation came the movement toward widespread growth of literacy. Protestants suggested that the masses can serve their religion directly without relying heavily on Church intermediaries. But in order to do so, everybody had to be able to read and understand the scriptures. True, it requires hard work, but the rewards are substantial, since human beings are considered perfectible through their own efforts, according to Protestant tradition.

The growth of the Protestant spirit and ethic over the past five centuries, and the conversion of the Western world from an agrarian to a highly commercial and industrial society have exerted deep influences upon present-day concerns about the development of talent. In the Protestant urban centers the individual quickly learned that the highest rewards in life could be attained through self-enlightenment and self-betterment in some culturally approved area of activity. This orientation to life's opportunities brought with it the seeds of universal education, scientific and technological development, and an intense intellectual restlessness that conforms with the Faustian nature of Western society.

Reinforcing the spirit of reformation and humanism was the contemporaneous renaissance movement which vitalized creative behavior through new freedom of style and substance. Although the Church and its sages retained their prominence in the art of Titian, Tintoretto, Michelangelo, and El Greco, among many others, these masterpieces reflected an inspiration to idealize the human form and to place the human being at center stage as divinely conceived and precious beyond measure. The powers of reason and the senses gained new respect as they brought back to life the Greek and Roman Classics. The scope of the new enthusiasm for learning widened rapidly, incorporating in it a need to advance the sciences for a better understanding of the laws of nature, of the structure of the planet, and the place of the planet in the wider universe. It was a break from the past in which intellectually gifted behavior was dominated by logicians trained in scholastic disputation and in speculating mostly about the human soul that was often shrouded in mysticism. The Renaissance replaced mysticism with humanism and its belief in the goodness and dignity of the human species, as well as its great powers of thought and imagination, as evidenced by the wealth of ideas inherited from the ancient Greeks and Romans.

The Modern Scene

The Reformation and the Renaissance eventually led to the industrial revolution which further reinforced belief

in human potential for fashioning a new world with better-than-ever standards of living and qualities of life. Understandably, the public bestowed renown—sometimes fortune, too—upon those who excelled as conquerors of nature through science, producers of masterpieces, and masterful performance on the stage and in various professions. The names associated with these great achievements took on an importance of their own, sometimes exaggeratedly so, when the so-called “Matthew Effect” drew critical accolades for inferior work simply because the high reputation of its creator had been earned through earlier success. Fame, or at least recognition among peers, became a powerful spur to self-fulfillment and self-advancement and remains to this day a prime incentive for potentially gifted people to fulfill their promise.

As popular belief in the powers of the individual and in opportunities for individualism grew over the past two centuries in Western countries, so did democracy as a preferred social system and form of government. Egalitarianism and excellence emerged as ideals to be preserved, even though they have always been counterpoised and resistant to reconciliation. Among the democracies there are constant changes and variations in emphases on people's rights to social, political, economic, and educational entitlements, especially those individuals who are poor in status and in finances. A democracy that leans far in the direction of egalitarianism seems to weaken its commitment to excellence and is therefore in danger of losing honor in the family of nations—a threat from without. On the other hand, a strong commitment to excellence can compromise equality of status and opportunity within a democracy and arouse serious civil unrest—a threat from within.

Examples of both kinds of threat seem to surface from time to time in modern Western history. Conscious efforts to foster excellence could be seen under the benevolent monarchy of late nineteenth-century Austria, which was determined to maintain its status as one of Europe's premier cultural centers. At that time, secondary education was of a kind that some of today's educators would consider elitist. The famous literary figure, Stefan Zweig, was then a student at a Viennese *Gymnasium*, along with others from bourgeois families, who could afford the tuition and who were bright enough to qualify for pre-university studies. In his autobiography (1943), Zweig described his *Gymnasium* as an eight-year program, following five years of elementary school, and requiring French, English, and Italian (the “living” languages) along with Greek and Latin (“dead” languages) plus geometry and physics, among other subjects. In more egalitarian democracies, the Viennese program would perhaps qualify as differentiated education for the gifted, since the mainstream curriculum is geared to accommodate students who are closer to average in ability, many of whom have no plans to enter college.

In a fairly unusual situation where commitment to excellence is a national priority, one may consider the

relatively short history of education for the gifted in Singapore. A city-state established in 1965 as an independent, Western-oriented democracy, it has adopted English as its official language and geared its educational system as a means of finding a place in the economic and cultural atmosphere of the much larger, more established Western nations. Law and order are strictly enforced, efficiency and proficiency are emphasized, and there are relatively few special educational provisions for handicapped learners. However, the academically gifted are placed in special programs which provide advanced-level studies in English language and literature, the maths and sciences, foreign languages, history, geography, social studies, moral education, and computer appreciation. Australia's commitment to the gifted, on the other hand, varies according to the social ideologies of its states. In Victoria, where there is a relatively strong emphasis on egalitarianism, political office holders tend to resist singling out the gifted for special enrichment experiences. They would rather "cut down tall poppies" to equalize educational opportunity than adjust curricula to accommodate individual differences at the upper ability levels. As a result, proponents of special enrichment for the gifted have had to struggle hard, with only occasional success, in influencing public policy. Not so in New South Wales, where egalitarianism seems to be a less sensitive issue and where there is more eagerness to single out the gifted for special studies.

It should be emphasized that modern Western democracies have always paid attention to the needs of the gifted, albeit with various degrees of intensity. From 1917 until Hitler came to power, Germany made some efforts on behalf of precocious children. Special schools and classes with enriched curricula were formed on the basis of psychological tests. France, Great Britain, Belgium, and Switzerland also have a modern tradition of identifying and training gifted children, or at least providing support for their continued advancement up the educational ladder. However, none of the democracies invested as heavily as did the dictatorships, which considered the gifted as vital human resources for furthering the power of the state. In its early period, the Soviet Union's overall curriculum emphasized heavy indoctrination in communism but only incidental coverage of the physical sciences, mathematics, and languages. In later years, government leaders recognized that physics, chemistry, and mathematics are essential to national aspirations, culturally and militarily. Schools intensified requirements to the point where relatively few could manage to graduate from high school since requirements included five years of physics, biology, and foreign language, four years of chemistry, one year of astronomy, and as many as ten years of mathematics (*Soviet Commitment to Education*, 1959).

The United States has lived with the conflict between egalitarianism and excellence throughout its history, but it took on new meaning in 1918, when the Commission on Reorganization of Secondary Education issued its *Cardinal Principles of Secondary Education* (1918) which

took careful note of human differences and characterized the function of the high school program as open to all young people but differentiated according to their abilities and aspirations. For some students, high school education remained preparatory to college studies, but for others it served as terminal schooling. Inasmuch as democracy is sweeping through the Western world and beyond, the American post-war history of balancing egalitarianism and excellence, and its effect on the gifted, is instructive to more and more societies in present times.

The American Experience: Pre-Sputnik

Since World War II, the greatest swings between devotion to excellence and to egalitarianism have occurred between the late nineteen-fifties and the early nineteen-seventies. Because of these changes, the five years following the launching of *Sputnik* in 1957 and the last half-decade of the 1970s may be viewed as twin peak periods of interest in gifted children. Separating the peaks was a deep valley of neglect in which the public fixed its attention more eagerly on the low functioning, poorly motivated, and socially handicapped at school. In the late 1960s, there was a revival of earlier sensitivities to the needs of the gifted. These fluctuations in national temperament seem to indicate that the country had not succeeded in paying equal attention *simultaneously* to its most and its least successful achievers at school.

Unlocking the secrets of the atom during World War II to produce the bomb represented a scientific as well as a military breakthrough that increased the dependency of armed power on the innovativeness of the scientist. Since the bomb was produced on American soil, its citizens had grown confident that America's leadership in science and technology was unchallengeable. The nation expected itself always to be the first in creating new gadgetry to make life and death easier, be it through sophisticated home appliances, computer systems, communications equipment, or explosives with the power of megatons of TNT. It is easy to imagine, therefore, the shock when this illusion was shattered with the orbiting of *Sputnik* by none other than America's arch enemy in the midst of a Cold War that at any moment could turn hotter than any conflict in history. *Sputnik* was not just a demoralizing technological feat; it had potential military applications, too. Suddenly, the prestige and survival of a nation were jeopardized because some of the enemy's greatest minds of the day had taken the lead in achievement, and the Soviets capitalized on this coup by broadcasting to every nation on earth its success in reducing America to a second-class power at long last.

As might be expected, the targets of criticism for the national humiliation were elementary and secondary schools. But it was by no means the first time that American education had been put on the defensive in those years. Four years before *Sputnik*, a sensational indictment of public education had been published

(Bestor, 1953), which accused the schools of practicing what the author considered their special brand of fraudulence on America's children. The main charge was that schools were not governed by learned educators but rather by know-nothing "educationists", a term the author used in referring to teachers, administrators, and those responsible for training them on college campuses. To his way of thinking, it was tragically ironic that "educationists" should exert nearly total influence on the content of curricula while caring so little about the world of ideas. How could anyone presume to dictate what should be taught at school if he/she is not immersed personally in any scholarly discipline or artistic pursuit? Because of what he regarded as a misplacement of power in the hands of "educationists", Bestor was convinced that schools provided meager intellectual nourishment or inspiration, especially for the gifted, who often marked time in their studies until graduation released them from boredom.

An even more prominent critic was Admiral Hyman Rickover, famous as the "father" of the atomic submarine and long an advocate of programs that would identify and educate an intellectual elite for leadership in the United States. Rickover saw a deadly link between scientific advancement and military strength and warned that the Soviets were moving ahead menacingly on both fronts. Ennobling excellence was no longer just a means of improving the quality of life in a free society; it had also become a key to the survival of the free world.

Beyond the military advantages of producing knowledge and technology, there was also the matter of national prestige that Rickover saw clearly. He warned that the Soviets were in a do-or-die race with the democratic West to produce excellence in every arena that the world respected. Even the number of gold medals it accumulated at the quadrennial Olympics was counted as a badge of honor. Rickover warned that, in order to compete on an equal footing, America had to overcome its traditional guilt about singling out the gifted for special opportunities at school. Even after *Sputnik* was launched, he observed that "anti-intellectualism has long been our besetting sin. With us, hostility to superior intelligence masquerades as belief in the equality of man and puts forth the false claim that it is undemocratic to recognize and nurture superior intelligence" (Rickover, 1960, p. 30). In other words, America could not afford to indulge in a complacent sense of egalitarianism which granted compensatory education for those who needed it while denying enriched education for others who deserved it.

Since Rickover was not an educationist, his "outsider" status prevented him from influencing school policy. However, the pre-*Sputnik* evidence that America was neglecting its gifted could hardly be ignored much longer. In a lengthy report prepared by the director of the Commission on Human Resources and Advanced Training (Wolfe, 1954), it was asserted that the United States failed to prepare enough men and women in the natural sciences, health fields, teaching,

and engineering. Only six of ten in the top five percent and only half of the top twenty-five percent of high school graduates went on to earn college diplomas. At the more advanced levels, a mere three percent of those capable of earning doctorates actually did so.

What made matters worse were expectations that the shortages would soon become even more acute in the late nineteen-fifties unless the schools succeeded in encouraging gifted students to continue on to advanced studies. These concerns were later echoed by the chairman of the U.S. Atomic Energy Commission when he warned the nation that its public schools were not maintaining educational standards, especially for gifted students, thereby causing dangerous shortages of scientists and engineers and other technically trained individuals (*New York Times*, November 27, 1955). An earlier *New York Times* report (May 1, 1955) estimated that, in 1954, American industry needed thirty thousand engineers but that colleges and universities had graduated only eighteen thousand. A mere two hundred physicists earned diplomas that year, and half chose not to enter the field of physics. Serious shortages existed also in industry, medicine, nursing, pharmacology, clinical psychology, and social work, among other important fields. The alarm spread to the National Education Association's Ninety-third Annual Convention in 1955. A committee report pointed out that each year two hundred thousand outstanding high school graduates did not enroll in a college and that an equal number dropped out of college before graduation. The report went on to warn that an annual loss of 400,000 highly trained men and women could force the United States to lose its superiority to the Soviet Union in the realm of technology.

And yet, pre-*Sputnik* America of the 1950s was not entirely unmindful of the nature and nurture of its gifted. In addition to conducting basic research that generated new hypotheses about intellectual functioning and preserving long-standing special school programs in a few scattered cities, behavioral scientists and educators were already demonstrating how university resources could reach out to schools and to school systems in order to further the cause of special education for the ablest. Pioneering such efforts on a nationwide scale was the Talented Youth Project under the direction of A. Harry Passow, at Teachers College, Columbia University. Initiated in 1954, three years before *Sputnik*, the project assisted school administrators and their staffs in different parts of the country to develop, implement, and evaluate their own programs for the gifted. This outreach service was in the tradition of the 1930s activities of Leta Stetter Hollingworth and her staff, also of Teachers College, who experimented with curriculum enrichment and conducted research on behalf of gifted children, albeit only in New York City's public schools rather than nationwide.

The Talented Youth Project existed for twelve years, during which time it provided technical assistance to

many practitioners at their own sites and at various professional conferences concerned with the needs of the gifted. The Project staff also conducted some large-scale studies on ability grouping (Goldberg et al., 1966), underachievement (Raph et al., 1966), the comparative effectiveness of several special programs for the mathematically gifted (Goldberg et al., 1966), and the attitudes of high school students toward academic brilliance (Tannenbaum, 1962). At the outset of its service and research activities, Passow and his associates wrote a problems-and-issues monograph (Passow et al., 1955) that turned out to be not only timely for its day but surprisingly timeless, or at least as applicable nearly forty years after its publication as it was then.

The American Experience: Post-Sputnik

When the American educational community finally took action on behalf of the gifted, it did so with alacrity. Enormous public and private funds became available to assist in the pursuit of excellence, primarily in the fields of science and technology. Academic course work was telescoped and stiffened to test the brainpower of the gifted. Courses that had been offered only at the college level began to find their way into special enrichment programs in high school and eventually in elementary school.

Rickover's alarms concerning Soviet advancement in technology were finally taken seriously, especially since they were expressed by a man whose own career symbolized the marriage between science and the military. His criticisms of public schools were basically motivated by concerns about national security. This coupling of education and defense became public policy through a significantly titled piece of legislation, the National Defense Education Act of 1958, which revealed a new and far more critical role for the schools than they had ever played before. While remaining obliged to produce an enlightened people capable of living together happily, responsibly, and productively in a democratic system of government, schools are also in the business of protecting its citizens from being buried ideologically, and perhaps militarily too, by a fearsome foreign power. The Act provided funds to strengthen six components of American education, one of which was the identification of gifted children. In addition, it set aside money to help schools mount programs in science, mathematics, and foreign languages, which showed where the emphasis in high-level education was to be placed.

Another influential figure in promoting excellence in American schools was James B. Conant, a renowned chemist and public servant and a president of Harvard University. In his report, titled *The American High School Today* (1959), he addressed the concerns of the post-Sputnik 1950s by offering a broad twenty-one step plan for changing secondary education with special emphasis on core courses that were challenging in content and required of all students regardless of their

career plans. His proposal also took special note of the academically gifted (defined as the upper fifteen percent) and the highly gifted (defined as the upper three percent), and schools took serious note of his recommendations. Perhaps the combination of the report's timeliness and Conant's personal credibility in the public schools enabled his message to get through and retain its influence for a long time, while the earlier critics' ideas, which were fairly similar to his, were taken less seriously.

In addition to the outpouring of special enrichment activities initiated in the schools during the late nineteen-fifties and early nineteen-sixties, there was a good deal of research activity dealing with the characteristics and education of gifted children. Lewis M. Terman's studies of high-IQ children, which began in the early nineteen-twenties, had produced several landmark results that cleared the way for efforts on behalf of the gifted. One important outcome of his research was that precocious children are not mutants who possess some kinds of freakish powers bestowed upon them by biological accident. Instead, they differ from lesser abled peers in degree rather than in kind. Those who find themselves in the upper extreme of the ability continuum merely have more powerful versions of the same attributes possessed by those who are closer to average in ability.

A second enduring outcome of Terman's work was his finding that potential giftedness reveals itself even in childhood. "Early ripe, early rot" is a once-popular platitude that he helped turn into a canard by his studies of high-IQ children growing up. Despite the many cases of aborted genius, his data provided some assurance that children with high potentialities and reasonably stable personalities stood a better-than-average chance to excel eventually in their careers, provided they were given the right opportunities at home and at school. Because of his finding that greatness does not materialize suddenly and unaccountably in adulthood, but instead has its roots in the early years of growth, professional education was convinced of its key position in helping bright children fulfill their promise. In other words, Terman confirmed the need for special educational programs for the gifted, an idea that would be irrelevant if there were no developmental connection between early promise and later fulfillment.

In claiming to reach beyond the IQ, Guilford's Presidential address at the American Psychological Association in 1950 introduced creativity as an unsung dimension of precocious development. The need to measure creativity encouraged psychometrists to abandon the assumption that tests of general intelligence, such as those developed in the early part of the century by Terman and his associates, could be used to locate the entire pool of children out of which virtually all the gifted would probably emerge. This led to a highly influential paper by Getzels and Jackson (1958) which reported a comparison of "high-creative, low-IQ" and "high-IQ, low-creative" students at the University of

Chicago Campus High School. This study had a stunning influence on educational researchers because it announced a breakthrough in the use of so-called "creativity" measures to identify a talent resource that was allegedly overlooked by IQ tests.

Other investigations in vogue in the immediate post-*Sputnik* period focused on the relative effectiveness of different administrative designs, such as ability grouping, enrichment in regular classes, and acceleration; the social status of the gifted at school and its effect on their motivation to learn; the causes and treatment of scholastic underachievement among children with high potential; achievement motivation and other non-intellective factors in high-level learning; and the psychosocial correlates of divergent thinking processes. Professional journals in America were deluged with research reports and with exhortations to do something special for the gifted. So rapid was the build-up of literature in the field that one writer (French, 1959) claimed there were more articles published in the three-year period from 1956 to 1959 than in the previous thirty years.

Perhaps the most vivid recollection of the post-*Sputnik* years is that of the Great Talent Hunt. It was a time when every possible effort was exerted at federal, state, and local levels to identify gifted children and to educate them to the limits of their potential. So intense was the search for young brains, their nurture, and utilization that a parallel can be drawn between the way in which America dealt with high-level *human* resources in the 1950s and its approach to precious *natural* resources during the energy shortages of the late nineteen-seventies. Just as the nation grasped at new energy sources out of fear that it could not continue to function without them, so did the post-*Sputnik* leadership cast about frantically for signs of giftedness in the schools. And just as natural resources were dealt with in an objective, efficient manner, so did the talent hunt show signs of detachment and impersonality, as if gifted people's usefulness to society mattered more than their individualities and sensibilities as human beings.

High scholastic standards and standing, academic advancement, studiousness, and career mindedness were conspicuous themes in America's schools when the bandwagon for the gifted was rolling in reaction to the Soviet *Sputnik* threat. It became virtually unthinkable for a gifted child to bypass the more difficult courses in favor of the less demanding ones. It certainly was no time for young people to be free spirited or to enjoy the privilege of doing nothing. Instead they were brought up in a period of total talent mobilization, requiring the most able-minded to fulfill their potentials and to submit their developed abilities for service to the nation.

The American Experience: The 1960s Decade of Turmoil

The 1960s opened with John F. Kennedy's election to the Presidency amid promises and dreams of a modern

utopia. There was excitement in the air as the nation prepared itself to sweep away the stodginess of the 1950s and to create a new age of excellence. Kennedy was particularly attractive to young people who saw in him (and his family) a refreshing blend of youthfulness, vitality, intelligence, idealism, and beauty. His earliest messages as President of the United States made it clear that brains and loyalty to the flag were among the nation's most precious assets. He announced boldly his intention to put a man on the moon by 1970, a clear sign that he was accepting the Soviet challenge for supremacy in space exploration and that the most brilliant scientists would be called upon to make such a feat feasible. This meant encouraging the largest possible number of able students to enroll in science programs that offered them the best possible specialized education. For who else but the gifted could yield forth from their ranks a team of scientists qualified to honor the President's commitment?

There were other hints of meritocracy in the air. Kennedy gathered around him some of the most precocious men (though few women) of his generation to advise him on governmental matters. Known then as the "Whiz Kids", some had earned their reputations as scholars at leading universities and others as promising ideas men in industry. All of them projected an image of braininess with a zest for unraveling the Chief Executive's knottiest problems. They were gifted children grown up and enjoying the glamor of fame and power rather than living in relative obscurity as so many other gifted people have to do even in their most productive years. At last, able children had their own celebrity role models to emulate, much as budding athletes and entertainers have theirs. The nation's leaders were demonstrating by their own example that it pays to be smart at school if you want to get ahead in life. It certainly made good economic sense because the best paying jobs were going to the best educated.

It would, of course, be naïve to suggest that America had reached a time in history when brilliant students were taking their place alongside the sports stars as heroes on campus. Far from it. Research by Coleman (1962) and Tannenbaum (1962) demonstrated that acclaim among peers was achieved far more easily on the athletic field than on the honor roll. Still, the Kennedy years were making good on promises of social and economic rewards for those willing to cultivate their superior scholastic abilities despite the lack of enthusiastic cheering from schoolmates.

The bids were high for brains in the early 1960s, but there was a string attached. President Kennedy expressed it best in his immortal admonition to his countrymen: "Ask not what your country can do for you—ask what you can do for your country." It was a call for unselfish accomplishment, to dedicate the work of America's citizens to the greater glory of the nation. Those with higher abilities had more to contribute and were therefore under pressure not to bury their talents or even to indulge in creative productivity that was

impractical. The feeling during the Cold War was that the scientist could better serve the nation than could the poet. Judging from the career plans of gifted children in the late nineteen-fifties and early nineteen-sixties, they evidently believed that the nation was worth serving. By far the largest number of students with high tested intelligence majored in the sciences, and many of them aspired to enter fields of technology that could somehow help the defense effort. Employment opportunities in these industries and professions were reinforced by the glamorization of science as humanity's most exciting modern frontier.

Yet the flurry of activity on behalf of the gifted left some unfinished business to haunt America ever since. Even the threat of *Sputnik* and the indulgence of excellence during the Kennedy era were not enough to guarantee that the needs of the gifted would be cared for perpetually at school. Instead, enrichment was considered a curricular ornament to be detached and discarded when the cost of upkeep became prohibitive. This is as true in the 1990s as it was in the 1960s, as evidenced by reports of cutting back on programs for the gifted as a result of budgetary crises and tax revolts in many school districts, where only programs for the handicapped learners are mandated by law to receive their usual share of special support (*New York Times*, November 29, 1992). Moreover, the fervor with which guidance counselors ushered gifted youths into sciences programs backfired to some degree as large numbers of these students changed their academic majors by the time they reached their sophomore years in college (Watley, 1968) and many who did stay on to pursue careers mapped out for them became victims of the shaky fortunes of the aerospace industry.

When the *Sputnik* scare began to wane, some special programs and curricula were retained, partly through the efforts of the newly formed advocacy groups on behalf of the gifted. But for the most part, the vast majority of educational innovations triggered by *Sputnik* and sustained in the Kennedy era proved trendy rather than long-lived despite their early promise. Perhaps the decline of interest in the gifted would have been inevitable, considering how conflicted the American public often feels about such children. Intimations of meritocracy can never fit easily into a democratic frame of reference. There will always be egalitarian-minded people who consider it necessary to withhold special opportunities that might aid the ablest to get far ahead of the pack. These critics often argue that bright children are advantaged and can fend for themselves, so why invest in them? This sentiment has circulated widely for a long time and is compatible with the popular notion of idealizing the norm, encouraging the deficient to reach as close to it as possible, and either ignoring or frowning on the efforts of the highly proficient to move far beyond it.

Nevertheless, it would be a mistake to assume that America merely grew tired of the gifted in the mid-1960s because its interest in them had been less than

wholehearted all along. While attention might have declined, the fact is that there were pressures forcing the nation's preoccupation away from the gifted toward realities that seemed to be far more relevant to the events of those days. Among the most prominent were the Civil Rights Movement, school integration, and compensatory education; Vietnam and the disenchantment of youth; and growing distrust of scientific discovery.

Focus on Underprivileged Minorities

The 1954 Supreme Court decision to desegregate public schools set off an inexorable movement toward updating the Constitution and the Bill of Rights. Once again, education became the linchpin of a national priority, this time for social justice, as it had formerly been for the Great Talent Hunt. Separatism and equality were declared an impossible combination and therefore unconstitutional. In 1955, Martin Luther King Jr began his leadership in the struggle for racial integration in all community institutions, including employment, housing, and transportation, as well as the schools, when he led his historic boycott of buses in Montgomery, Alabama, to protest at the treatment of black passengers, an event that led to similar action throughout the country. His efforts placed the classroom in perspective as one of many battlegrounds in America's all-out campaign to raise the status of its underclasses. Educators learned quickly that pressures were mounting everywhere—not just in the schools—to take decisive action to eliminate even the subtle forms of discrimination that had hardly been noticeable over the years. It was the wave of those times and it could not be ignored.

At the top of the educational agenda, far ahead of the needs of the gifted, was the cause of low-achieving disadvantaged children. There was a new sense of urgency to avert internal unrest by using every possible means to close the gap between the "haves" and the "have-nots", and it was generally acknowledged that schools would figure prominently in the process. Attention was thus shifted away from the need of the nation's talent reservoir to be kept well filled for the sake of defense and world prestige. The feeling was that somehow these problems could take care of themselves while only lightly attended to, whereas failure at school among the disadvantaged could not. In short, America was more concerned about bolstering freedom and equality within its borders than in playing the lead on the world stage, despite the unabated pressures of cold warfare that brought confrontations between East and West in Europe, Southeast Asia, and the Middle East.

In addition to diverting interest away from the gifted, the advocacy movement for the socially disadvantaged actually contested at least two features of special programs for able children: (1) the use of IQ tests and other conventional measures of mental functioning as a

means of determining who deserves to be called gifted, and (2) grouping children in special classes for the gifted on the basis of their performance on these kinds of assessments.

Since racial minorities, such as Hispanics, Blacks, Chicanos, and Native Americans, traditionally performed less well at school than did white majorities, it was logical to suspect ability grouping for the gifted as *de facto* racial segregation. Critics argued that schools were practicing blatant favoritism by creating special classes for children who were rated superior on conventional measures of intellect and also by offering the chosen few a kind of enrichment in their curriculum that was denied everyone else. Objections were not necessarily against special ability grouping *per se* for the gifted, or even the enriched educational experience reserved for them because of their ability. What created the furor was the practice of denying enough children from disadvantaged subpopulations their rightful access to these classes. There was an overwhelming sentiment favoring the idea that high potential is distributed equitably among all races, privileged or underprivileged, but that life's circumstances in some groups are oppressive enough to cast a shadow over their innate competencies. And since nobody had ever devised a way in which to locate and nurture giftedness that was thus hidden from view, it was impossible to integrate special classes for the gifted with balanced racial quotas.

American education could not reconcile its interest in the gifted with its concern for the disadvantaged, nor could it design a satisfactory methodology for locating and cultivating giftedness among minority groups. The dilemma was easy to resolve inasmuch as it reduced itself to a choice between battling for social justice to achieve egalitarianism as against pursuing excellence, and there was no doubt as to which of the two would better fit the mood of the post-Kennedy 1960s.

Vietnam and Dissenting Youth

Although Vietnam was by no means the first confrontation between West and East, it turned out to be disastrously different, despite the fact that Kennedy's successor, Lyndon B. Johnson, justified America's entanglement on the same grounds that his predecessor defended his risks of war in Berlin and Cuba. What started out as a limited police action that was supposed to last only a short time before the expected victory would be won and American soldiers returned home, it degenerated into a nightmarish entanglement with staggering sacrifices of life and no end in sight. The leadership in Washington kept the public's hopes for a quick end to the war alive by issuing deceptive reports about success on the battlefield. Eventually, the nation grew tired of war, suspicious of politicians' promises of a quick victory, and increasingly convinced that America was meddling in affairs of other nations rather than serving as a judge and enforcer of what was morally right in the world.

Among the many casualties of the Vietnam conflict was America's perception of giftedness and political leadership. The Whiz Kids of the Kennedy years, many of whom had stayed on in the Johnson era to help formulate strategy for the war effort, eventually turned out to be *The Best and the Brightest* (Halberstam, 1972). While they were quick-minded, articulate, hard-working, and self-confident, Halberstam argued that they lacked wisdom and sensitivity to the feelings of the masses. Their cerebral artistry proved to be flashy rather than profound. They were rapidly losing their image as people who could become heroes in public life by virtue of their brainpower alone. In fact, their sad history seemed to prove that being super-smart scholastically was not a guarantee of super understanding of humanity's most serious problems and how to solve them. Gifted youths on campuses throughout the country learned to despise them for their role in the Vietnam debacle rather than revere them as graduated honors students distinguishing themselves as national leaders.

A serious by-product of Vietnam was growing unrest among students in the colleges. Many of them saw the war as an unprincipled adventure of the establishment in Washington and perhaps even of the senior generation (ages 30 and above) who either did not care or did not understand how their actions were affecting the conscience of idealistic young people.

Kenneth Keniston, who studied campus protestors in great detail, made it quite clear that a complex mix of personal attributes, familial influences, peer associations, and school environments set them apart from their more conforming agemates (Keniston, 1971). However, it is noteworthy that a disproportionate number of disaffected youth on campus distinguished themselves in their studies at school and were frequently enrolled in some of the more enriched and prestigious programs. Their immediate targets were the colleges they were attending, which represented to them an establishment with archaic standards for success and unreasonable controls over their lives. Yet these same gadflies in centers of learning were themselves described in one study as possessing high degrees of intellectualism, defined as "concern with ideas—desire to realize intellectual activities—high valuation of intellectual creativities—appreciation of theory and knowledge—participation in intellectual activity (e.g., reading, studying, teaching, writing)—broad intellectual concerns" (Flacks, 1967, p. 70).

The unrest on campus underwent some dramatic changes over a relatively short time. As one observer remarked, "the key difference between the Berkeley [University] riots of 1964 and the Columbia [University] crisis of May 1968 is that in the pre-Columbian sense the major impetus for unrest stemmed from the perceived abuse or misuse of authority, whereas the later protest denied the legitimacy of authority . . ." (Bennis, 1970, p. 599). One might add that, when attention was called to the *misuse* of authority, it was an expression of protest, but when it evolved into doubts about the *legitimacy* of authority, it became a sign of insurrection.

The revolt was not only against institutions (educational or otherwise) and their leaders; it was also against a tradition of rationalism that sanctified ivory-tower scholarship. When Columbia University rioters willfully destroyed a professor's research files, the act may have carried a message that went beyond ordinary malicious mischief and vandalism. It seemed to imply that all the work invested in accumulating those files was a waste of the professor's talent, which ought to have been dedicated to building a better society rather than to dabbling in esoterica. And to make matters worse, the educational establishment expected its brightest students to follow in the footsteps of professors like him.

Many questions were raised among gifted college students as to whether they ought to funnel their psychic energies into a life of the mind. Many were attracted to the sensitivity-training movements, which told them that "talking is usually good for intellectual understanding of personal experience, but it is often not effective for helping a person to *experience*—to feel" (Shutz, 1967, p. 11). Accordingly, the human being was increasingly seen not as a thought machine but rather as a complex biological, psychological, and social organism that can fulfill itself through all these dimensions of being. Every part of the body had to be exercised to its fullest potential, which meant building up the strength and stamina of its muscles, its sensory awareness and aesthetic appreciation, its motor control, and the gamut of its emotional and social feelings. Inhibiting other aspects of self for the sake of the intellect was regarded as amounting to robbing life of its multi-dimensionality, so the task of individuals was to make something of *all* their capacities, even if in so doing they could not make the most of *any* of them.

Significantly, a new utopia emerged in the form of Consciousness III depicted by Charles A. Reich in his then best-seller, *The Greening of America* (1971). One of the postulates of this new world was described by Reich as follows:

Consciousness III rejects the whole concept of excellence and comparative merit . . . [it] refuses to evaluate people by general standards, it refuses to classify people, or analyze them. Each person has his own individuality, not to be compared to that of anyone else. Someone may be a brilliant thinker, but he is not "better" at thinking than anyone else; he simply possesses his own excellence. A person who thinks very poorly is still excellent in his own way. Therefore people are in no hurry to find out another person's background, schools, achievements, as a means of knowing him; they regard all of that as secondary, preferring to know him unadorned. Because there are no governing standards, no one is rejected. Everyone is entitled to pride in himself, and no one should act in a way that is servile, or feel inferior, or allow himself to be treated as if he were inferior (p. 243).

Thus we see how life for campus dissidents became strangely paradoxical. Many of them espoused the

habits of intellectualism generally associated with gifted students. At the same time they rejected excellence and its trappings as violations of democracy and too stultifying to the attainment of total joy and liberation. Even those consenting to live the life of the mind learned an unforgettable lesson from the events in Vietnam. No longer could they be adjured to cultivate their talents for the sake of their country's prestige and need for survival. The war in Southeast Asia tarnished the nation's image enough to discourage such commitments among a large number of students who could potentially be counted among America's high-level human resources. Besides, some may have felt it faintly dehumanizing to be treated like natural resources; it simply did not fit well with the new spirit of selfhood and individuality.

The Devaluation of Science

Gifted youth in the age of *Sputnik* had been bombarded with the message that a lifetime devotion to achievement in science in particular was not only in the interests of the state but of humankind in general. Such pursuits had their own built-in ethic, that any efforts at pushing back the frontiers of theory and research deserve the highest commendation because they attest to humanity's divine-like power of mastering its environment and creating its own brand of miracles. Suddenly the nation was told that science is as fallible as the one who advances it. Among the most vocal critics were the environment-minded scientists who warned that, in America's enthusiasm for conquering nature, it may be destroying its people in the process unless it imposes restraints on such activity (Bereano, 1969).

Perhaps the best known writer of the 1960s to forecast doom if science were to continue on its conventional course was the biologist, Barry Commoner, whose book, *Science and Survival* (1966), enjoyed wide circulation and influence. Commoner took the ecological point of view that the elements of nature are integrated, but human knowledge of these elements is so limited that it is not yet possible to see their connectedness. Expressing deep concern about science's preoccupation with the elegance of its methods rather than the danger of its products, he directed much of his fire at the polluting effects of such symbols of technological giantism as nuclear testing and industrial waste. He acknowledged the need for brainpower to enrich scientific thinking, but he also warned that "no scientific principle can tell us how to make the choice, which may sometimes be forced upon us by the insecticide problem, between the shade of the elm tree and the song of the robin" (p. 104). With such caveats, it became more difficult to convince gifted children that a life dedicated to science was the kind of high calling it had once been unless closer links were made between the intellect and the conscience.

Besides being tarnished because little account was taken of their human consequences, careers in science lost more of their glitter when the job market in various

related fields began to tighten. The manpower crisis dramatized by *Sputnik* gradually calmed down when America began to overtake the Soviets in the technology race and achieved a victory of sorts by transporting the first man to the moon in 1969. Previous personnel shortages in the various fields of science were no longer critical, partly because the flood of graduates in the early 1960s had filled available jobs and also because the Cold War was not considered serious enough to create new jobs through lucrative defense contracts. In fact, by the late 1960s, many Americans were suspicious of the so-called "military-industrial complex" for carving too much out of the tax dollar to support projects that they considered wasteful in times of peace. The primary need, as seen then, was to solve the problem of social unrest rather than to prop up defense technology. Many would-be scientists and engineers began to realize that these professions attracted neither the prestige nor the occupational rewards that would have been guaranteed only a few years earlier. However, the supply of scientific talent did not slow down in accordance with the reduced demand, and as a result of the imbalance, many highly trained personnel found themselves either unemployed or working at jobs outside their fields.

The American Experience: Renewed Interest in the Gifted in the 1970s

The decline of attention to the gifted in the 1960s is evident in the contrasting volume of professional publications on that subject at the beginning and end of the decade. The number of entries under "Gifted children" in the 1970 volume of *The Education Index* was less than half the number in the 1960 volume. Nevertheless, by the outset of the 1970s, there were unmistakable signs of a revival of interest.

Probably the biggest boost came from a 1970 Congressional mandate that added "Provisions Related to Gifted and Talented Children" to the Elementary and Secondary Educational Amendments of 1969. This document expressed a legislative decision to include gifted students among those receiving help from the Elementary and Secondary Education Act and the Teacher Fellowship Provisions of the Higher Education Act of 1956. It also directed the Commissioner to: (1) determine the extent to which special education assistance programs are necessary or useful to meet the needs of gifted children; (2) show which federal assistance programs are being used to meet the needs of gifted children; (3) evaluate how existing federal educational assistance programs could be used more effectively to meet these needs; and (4) recommend new programs, if any, required to meet these needs. The target population was defined as the upper three to five percent of school-age children with outstanding promise in six categories of giftedness: general intellectual ability, specific academic aptitude, creative or productive thinking, leadership ability, visual and performing arts, and psychomotor ability.

In response to the mandate, the then-commissioner Sidney P. Marland, Jr issued a report of his findings and recommendations that set the stage for doing something significant about the deteriorated condition of programs for the gifted (Marland, 1971). He estimated that only a small percentage of the 1.5 to 2.5 million gifted school children were benefitting from special educational services and that such services had a low priority at virtually all levels of school administration. Furthermore, even in those localities where there were legal or administrative directives to provide special offerings, little was accomplished due to other funding priorities, more threatening crises, and the absence of adequately trained personnel. Clearly, Marland saw the gifted as a deprived group whose talents were in danger of serious impairment unless appropriate intervention strategies were planned. He therefore declared his intention to initiate a series of major activities at the federal level with the hope of inspiring and pressing for more commitment on behalf of the gifted throughout the nation's schools.

As a result of federal encouragement and some public and private initiatives, the gifted were exposed to an increasing number of special educational experiences in the 1970s. While as late as 1973 fewer than four percent of the nation's gifted were receiving satisfactory attention at school, and most of the fortunate ones were concentrated in ten states, the nationwide picture improved considerably within the decade. Zettel (1979) reports the following outcomes of a survey conducted in 1977:

- (1) nearly 75% of the states already had statutory definitions of gifted children;
- (2) thirty-three (or 66%) of the states reported an aggregate increase of nearly 25% over the previous year in the number of gifted children served;
- (3) thirty-one (or 62%) of the states increased their appropriations for the gifted by 50%;
- (4) forty-two states reported sponsoring some kind of in-service training for persons interested in serving the gifted, a 110% increase over the previous year.

There was talk about possible legislation that would change the Federal Bureau of the Handicapped to the Bureau of Exceptional Persons, thus including gifted individuals as eligible for sustained support of their education, along with the handicapped. If this kind of move had been made, it would have gone a long way toward erasing the image of gifted education as being only a periodic fad in the schools. It was admittedly a way of forcing attention on the ablest by tying their fortunes to those of the handicapped, for whom funding has rarely abated appreciably. The change in name never came to pass, possibly because the American public could never feel equally sympathetic to the needs of children at both ends of the ability continuum.

Despite the fact that the definition of giftedness had been broadened by the Marland report, little more than lip service was given to children who showed precocity in domains other than academics. Even less fortunate

were the gifted among the underprivileged minority populations who remained largely neglected, except in the arts and sports, but not deliberately so. There is no doubt that many educators would gladly have initiated enrichment experiences for these children and that support was obtainable for such plans if they had stood a chance of success. However, the profession was stymied in its efforts to find a clear way of discerning high-level academic potential that was buried under a thick overlay of social and economic handicaps. In fact, it is hardly less difficult today than it was then to inspire the fulfillment of scholarly talent in the nation's underclasses.

In its desire to sustain interest in the gifted, the federal government funded projects designed to strengthen leadership in the field and to spread advocacy at the grass-roots level. The National/State Leadership Training Institute received federal funds to help state education departments develop viable plans for educating the gifted. In addition, Teachers College, Columbia University, was provided with support to coordinate efforts by seven universities in recruiting and training graduate students to become seminal figures in the field. It was seen as a long-range investment in the careers of men and women who had shown promise for making significant contributions in the 1980s and beyond. Besides these nationwide projects, the federal government, along with state, city, and private agencies, sponsored many regional and local programs for the gifted. The emphasis was mainly on enrichment practices, whereas research and experimentation received relatively little encouragement.

A review of the state of research for the years 1969 to 1974 reveals a fairly bleak picture (Spaulding, undated). These efforts continued to be limited throughout the 1970s, but there are several major exceptions worth noting. They include the 1971 initiation of Julian Stanley's (1976) continual studies of mathematical precocity, Halbert Robinson's (1979) investigations of the cognitive development of young able children, and Pauline Snedden Sears' (1979) and Robert Sears' (1977) assessment of the Terman population in their senior period of life.

What prompted the resurgence of activity in the education for gifted children after nearly a decade of quiescence? A full answer will probably never be known, but the explanation that seems most obvious is American's backlash against what it saw as a youth turned excessively self-indulgent, indifferent to scholastic achievement, and hostile towards some sacred, scholarly traditions. Wagner (1976) published a scathing indictment of universities for compromising academic standards, inflating grades, and diluting degree requirements to fend off unrest among students. His sentiments, shared by many other educators at the time, were signs that the pendulum had swung away from extreme egalitarianism in the direction of excellence. It is hard to imagine the youth of the late 1970s accepting the Consciousness III notion that brilliant minds are not better at thinking than anyone else. However,

the revival of interest was no more a sign of pure historical inevitability than was its decline a decade earlier. What accounted for the revival, at least in part, was evidence of initiatives taken by people who believed in differentiated education at every ability level and who participated in vigorous campaigns to save the schools.

Prescriptive Teaching for All Children

When Riessman published his highly influential book on the culturally deprived child in 1962, he reiterated a number of criticisms of the schools made some fifteen years earlier by Davis and Havighurst (1947). The charges were that the curriculum was excessively loaded with verbal content and therefore placed underprivileged children at a disadvantage; that the subject matter was irrelevant to the vital concerns of these children; that teachers espoused values and behavior codes that were oriented too narrowly toward middle-class living; and that schools were so preoccupied with teaching the disadvantaged how to become socially mobile that they were in effect trying to create a melting pot rather than striving to strengthen cultural pluralism. However, researchers did not take their lead from such charges. Instead of tampering with the old curriculum, they tried to create a learning environment that would enable the disadvantaged to meet the more conventional demands at school.

Among the most notable experiments that sustained their influence at the time were those conducted a decade earlier by Martin Deutsch (1964) and his associates. They attempted to forestall educational retardation by intervening early in children's lives and equipping them with the readiness skills that they could not derive from their social milieu. This required developing elaborate ways in which to diagnose individual learning profiles and to match instructional treatments to them. It paralleled developments in special education for the handicapped, which emphasized prescriptive teaching based on increasingly sophisticated methods of diagnosing intellectual processes. This orientation led to nationally mandated requirements that every handicapped child have an individual diagnosis, prescription, and evaluation.

Attention to specific competencies among the handicapped dramatized the need for individualized education, with *all* children receiving a fair share of what is uniquely appropriate for them, regardless of how deficient or proficient they are in mastering curriculum content. Advocates for the gifted argued that these children should also receive special attention to accommodate their unique learning strengths and thereby demonstrate the educator's attention to human differences. These protagonists pointed out that the more sophisticated educators become in discerning human individuality, and the more inventive they are in providing for individual needs of the ablest, the more likely that America could achieve equality at school.

The Role of the Gifted in "Rescuing" Public Education

It is no secret that educators in the 1970s searched desperately for ways in which to maintain order in thousands of classrooms. This was especially true in big-city schools where ten percent of the nation's pupil population was enrolled. The dismal picture was a familiar one: scholastic achievement levels were three, four, and even five years below norms; drugs, violence, vandalism, and truancy reached epidemic proportions; and costs climbed to such a height that there was always the danger of insufficient funds to pay the bills while maintaining an adequately staffed program. Many middle-class families fled the inner city in the 1970s or sought help from private schools in order to provide a meaningful educational experience for their children. This further aggravated the situation in urban centers.

School administrators became aware that one way in which to bring back the middle classes to inter-city schools was to initiate special programs for the gifted. They therefore opened so-called "magnet schools" that offered enrichment activities in particular subject matter areas to attract sizable numbers of children who would otherwise have been studying elsewhere. The presence of the ablest began to make a difference in the total school atmosphere, which demonstrated that these children were capable of enhancing all education if their learning capacities were properly respected. Again, special education for the gifted was initiated for the sake of solving social problems rather than solely for the sake of those who need, or could benefit from, it.

The American Experience: Peaks and Valleys in the 1980s

At the conclusion of his personal retrospective on three decades of education for the gifted in the United States, Passow (1980) wrote: "I was once again struck by the cyclical nature of our interest in and efforts on behalf of the gifted and talented" (p. xvi). Perhaps the most positive statement that can be made about the gifted in the 1980s is that they prevented George Orwell's "Big Brother" era from arriving in 1984 as he had predicted. In fact, if Orwellian forecasts ever come true, it will be tragic proof of how ineffectual educators have been in nurturing talent for the strengthening of selfhood in the human family. But even the failure of "Big Brother" to materialize is no guarantee that America will succeed in finally breaking its vacillation between public enthusiasm and apathy toward gifted children in the foreseeable future. All that can be said about the 1980s is that there were both positive and negative developments in the school and society, and that it is too early to tell what the eventual effects of these developments will be.

New Sources of Talent

It was already apparent that women and low-status minorities were moving toward parity with middle-class white males in the extent and variety of their advanced education. Trends have indicated a sharply rising representation of women in every creative field over the ten-year span from 1975 to 1985, when there was only a 6% increase in first professional degrees for men, as compared to a huge 122% increase for women. During the same period, the number of earned doctorates among men inched up from slightly under 27,000 to about 28,000, or 4%, whereas for women the jump was from some 8000 to about 14,000, or about 75%.

Considering the changing status of women in society, it is difficult to imagine that talent among them will continue to be suppressed as in former generations. Parents of school-age girls do not tolerate such biases as readily as the girls' grandparents might have, especially if the mothers of these children are themselves members of the new generation of women with advanced training and are in mid-career. Furthermore, opportunities for employment at higher skill levels have increased dramatically for women in recent years, and will continue to do so in the foreseeable future. According to the U.S. Bureau of Labor Statistics, the number of men added to the labor force from 1979 to 1985 was 8.1 million, not even half the 16.5 million figure for women. By 1995, more than 60 of every 100 women of working age will be employed, an increase from 43 per 100 in 1970. They will then constitute over 45% of the prime-age work force. Some of the professional occupations filled mostly by males possessing marketable talents that require advanced training are now absorbing unprecedented numbers of women. These professions include engineering, law, medicine, dentistry, and the life sciences.

The educational and occupational opportunities for bright African-Americans has also improved over the past half century. In 1940, total black enrollment in post-secondary education was less than 50,000, and over 95% of that group was enrolled in traditionally Negro Colleges (Pifer, 1978). By 1976, the number of blacks in colleges and universities had risen dramatically to 1,062,000, and for the 1975-1976 academic year alone, more than 83,000 blacks earned baccalaureate, masters, medical, law, and PhD or EdD degrees (Pifer, 1978; National Center for Education Statistics, 1978).

There is reason to expect the upward trend to continue as more and more people from minority groups are accepted into the managerial, professional, and technical segments of the labor force. What women, blacks, and other minorities have found in the high-skill labor market in the late 1980s is an increase of about 29% over the mid-1970s in the number of professional, technical, and kindred occupations. What they also discovered, unfortunately, is that the total number of adults with advanced education increased more sharply, thus dimming the employment outlook for them. The

openings for PhDs over the 1972–1985 period for growth and replacement was about 187,000, whereas the actual supply of new PhDs numbered as many as 580,000 in the second half of the 1980s. It stands to reason, therefore, that doctoral recipients from all subpopulations have found it difficult to locate work commensurate with their training. But the women and other minorities are most vulnerable on account of age-old prejudices that bar them from many positions of prestige.

New Trends in Diagnosing and Nurturing Excellence

Traditional tactics for identifying gifted who might qualify for the talent pool are under pressure to undergo change, some of it radical. There is no end in sight to the debate over the meaning of IQ, its measurement, and the nature–nurture issues that revolve about it, all of which arouse powerful emotions as well as scientific interest. In the 1970s, some behavioral scientists (Estes, 1976; Voss, 1976) foresaw a decline in the concept of intelligence as a useful description of higher-level cognitive powers. They expected it to be replaced by more diagnostic analyses of the patterns and processes of human functioning. This kind of orientation to the measurement of intellect conforms to the pioneering approach taken by Piaget (1952) in monitoring clinical development of children’s problem-solving behavior.

Despite the criticisms of IQ for identifying gifted children, there has never been a complete let-up in such practice. In a recent review of all empirical studies published in the *Gifted Child Quarterly* over two years (1990 and 1991), Tannenbaum (1992) discovered that in the 22 published reports of research on the gifted, all of them listed IQ, or alternative tests that correlate highly with IQ, as the measure of choice for identifying experimental samples. This is not surprising in light of previous findings by Snyderman and Rothman (1988) which show that psychologists and educators knowledgeable in areas related to intelligence testing generally agreed that IQ instruments are valid and useful in measuring some of the most vital aspects of intelligence. Obviously, test users have been paying little attention to the advice and efforts of academic psychologists to promote new ways of assessing high potential in children.

Among the changes strongly advised by theoreticians has been to examine specialized talents that demonstrate extraordinary rates of mastery and of creativity. Gardner’s (1983) list of such aptitudes has been widely circulated, and includes linguistic, logical-mathematical, spatial, bodily-kinesthetic, musical, interpersonal, and intrapersonal intelligences.

Another major trend in describing high potential in children is through the study of mental processes, exemplified by Sternberg’s (1986) “Triarchic Theory”, so named because it contains three sub-theories. One of them is “componential”, and it consists of three kinds of components involved in the performance of

separate mental operations: (1) metacomponents, or the executive processes needed for planning, monitoring, and decision-making in a problem-solving situation; (2) performance components, which include processes needed for executing a task; (3) knowledge acquisition components used in the selective encoding, selective combination, and selective comparison operations. Another sub-theory is called “experiential”, which incorporates the ability to deal with novelty and the ability to automatize or habituate information processing. The third sub-theory is called “contextual”, which refers to the organism’s selecting, shaping, and adapting to its real-world environment.

Ramos-Ford and Gardner (1991) have experimented with ways of departing from the usual pencil-and-paper tests of ability to monitoring children carefully and systematically for their performance in learning environments that bear some resemblance to real working conditions. It remains to be seen whether such an approach can improve upon conventional testing methods, which critics consider antiquated and inefficient.

A sharply different testing method has been developed by Feuerstein (1979), who also opts for measuring the dynamics of human potential. This means determining the extent to which children’s functioning levels can be modified through what he calls mediation, or the examiner’s use of appropriate helping tactics and practice materials. The idea of mediating the child’s entering behavior in a test situation is novel in that it revises the role of the examiner from that of an objective observer to a participant observer who orients the child to the underlying cognitive principles involved in the test experience. Feuerstein asserts that the organism is so modifiable that mediated learning affects not only the cognitive functioning of the individual but the structure of intellect as well. Such is the power of regulated encounters between the individual and environment.

Programs and Provisions

In 1954, Tannenbaum conducted an informal survey of American schools singled out in a 1941 published report as offering exemplary enrichment programs for gifted children. The purpose of the communication was to find out what had happened to those programs over the intervening 13 years and how schools in 1954 could benefit from the experiences, including the successes and failures, of the 1941 programs. Of the 100 schools contacted, nearly all replied, and in every case the original programs were no longer in operation. In fact, they were never meant to last a long time. What they had amounted to were imaginative projects initiated by talented teachers and supported by administrators who shared their concern about the plight of the gifted.

The survey revealed a fundamental difference between *programs* and *provisions* for the gifted. A program can be defined as a comprehensive offering, sequenced over a long period of time, usually designed as a

requirement, and very much a major part of the total school curriculum. Thus, the school offers programs in mathematics, literature, art, social studies, and the like. A provision, on the other hand, is more fragmentary, an *ad hoc* offering, relatively brief in duration, often designed by an individual teacher with special abilities rather than by a curriculum committee, and supplemental to the major offerings, not integral with them. What the 1954 survey revealed is that the 1941 schools had offered provisions rather than programs. Indeed, wherever enrichment of any kind has been initiated into the school curriculum, in most cases it has amounted to add-on provisions that sooner or later disappeared because of lack of strong enough commitment or sufficient funds to retain what was generally seen as a curriculum luxury rather than necessity. In fact, the lesson learned in the 1954 study was confirmed more than 30 years later. The Richardson sponsored investigation (Cox et al., 1985) reports a survey of some 16,000 schools (of which only about 10% responded, an ominous sign in itself) that found once again only fragmentary enrichment provisions, not programs, in most schools that claimed to be servicing the needs of the gifted.

Despite schools' reluctance to invest in long-range programmatic development for the gifted, there were some encouraging signs in the 1980s that conceptual frameworks for curriculum development could at least be available to those interested in them. School officials were offered program paradigms that they could adapt or adopt for actual implementation. In Renzulli's (1986) *Systems and Models for Developing Programs for the Gifted and Talented* no fewer than fifteen such designs are described in detail by their creators. They are by no means the only ones available for implementation. Not included, for example, is the work of Stanley and the Johns Hopkins Study of Mathematically Precocious Youth (SMPY). Initiated in 1971, SMPY has spread to nearly every corner of the United States, with more and more school systems subscribing to Stanley's ideas about fast-paced instruction for junior high school-age children who are advanced in mathematics. By now, large numbers of young adolescents throughout America, and recently in Germany as well, are being tested in hopes of being placed in any of a number of enrichment settings, such as afternoon and summer classes as well as college courses that offer advanced study. If SMPY and other enrichment paradigms are adopted increasingly in the United States and in other Western countries, it will signal a movement away from *ad hoc* provisions to much longer range programs for the gifted.

Unquestionably, the largest-scale effort on behalf of the gifted in the last decade of the twentieth-century and possibly of all time, is the federally funded project conducted by the National Research Center on the Gifted and Talented. Initiated by Renzulli at the University of Connecticut, it involves three additional universities in joint leadership for the development of theory, research, and programs across the United States. More than 200 elementary and secondary schools throughout the

country collaborate as experimental sites, and as many as eleven major so-called "stakeholders" are targeted for dissemination and impact. "Stakeholders" include lay and professional organizations, business, industry and labor, legislative bodies, and the media, among others.

In its own summary of objectives (Renzulli, Reid, and Gubbins, undated), the Center is committed to designing and carrying out "theory-driven quantitative and qualitative research that is problem-based, practice-relevant, and consumer-oriented" (p. 3). It has thus dedicated itself to providing intellectual leadership that will hopefully ensure continued public attention to the needs of the gifted for years to come into the twenty-first-century.

It is much too early to assess the Center's realization of its lofty hopes. But it bears monitoring closely as a model that may deserve preservation and replication in Western countries because of its sheer scope, size, ambition, and organization, should it prove successful in the long run.

Final Thoughts About Present and Future Trends

Current prospects for recognizing the special needs of gifted children worldwide are still subject to the excellence-egalitarianism dilemma which Fetterman (1988) regards as universal. At the conclusion of his international survey of enrichment offerings for the gifted, Brickman (1979) observes: "the dogma that democracy is at the opposite pole from meritocracy based on individual talent, skill, aptitude, ambition, and ability is at least open to serious difference of opinion . . . A democratic society can pursue an egalitarian policy if it provides the fullest possible education for each person without regard to background and status, social, economic, political, religious, racial, sexual, physical, and mental. Under such a policy, all individuals will receive their democratic due, including those who are gifted and talented" (p. 329).

Indeed, there are some signs that Brickman's optimism may be justified. The membership in the World Council on Gifted Children consists mainly of professionals and lay advocates from democratic nations, and its biennial meetings have drawn large numbers of participants from these and other countries. Similar lively participation is shown at conferences sponsored by national and local associations on behalf of the gifted in the United States. Educationally, European democracies have tended to maintain their traditional school structures which differentiates education for university-bound students. These countries have also exposed at least some of their precocious children to various kinds of enrichment experiences in and out of school. Some of this activity is especially noteworthy, as more and more Western and Western oriented democracies are making highly promising contributions to the field. For example, Heller's six-year longitudinal study of the gifted in Germany is designed to clarify

identification criteria that may be used in all special programs; Israel's Ministry of Education is sponsoring many adventurous enrichment experiences for the gifted at the elementary and secondary levels, and the newly established Israel Academy for the Sciences and Arts has initiated an extraordinarily imaginative program for the gifted that is attracting worldwide interest; the SMPY program for the mathematically gifted is spreading throughout the United States and beyond; and the enrichment curricula designed by a permanent committee of expert educators in Singapore has been operating with notable success in recent years. (The emergence of national policies in a number of nations is discussed in Chapter 2.)

Yet, ambivalent feelings toward the gifted persist even to this day. Aside from fears of elitism in a democracy, there are suspicions that only a thin line separates genius, or even giftedness, from insanity. Some argue that in the interest of cosmic fair play, nature somehow balances off mental superiority with emotional or physical handicap. Others are suspicious of the creative as potential iconoclasts who make life uncomfortable; they find it easier to live with the familiar than to be prodded into the unknown by unconventional ideas, be they political, social, artistic, literary, or scientific. Still another, more recent, tradition is the belief that super-rational powers, which are so popularly associated with so many kinds of giftedness, are not all that critical in affecting the human condition, either because irrational impulses also figure greatly in individual accomplishment (according to Freud), or because no amount of effort by any one person, however brilliant he/she may be, can cause more than a ripple in the inexorable tides of history (according to Marx).

Opponents of differentiated education for the gifted surface time and again in professional journals and forums. They believe that talent is irrepressible in some children and impossible to nurture in others. Why, then, invest in special programs for the gifted? Sometimes the question is raised cynically by those opposed to any kinds of special programs, except for the handicapped. Many more objectors are skeptical rather than cynical about the need for providing "extras" to children who can allegedly excel without them. In the past, these periodic criticisms have placed advocacy for the gifted on the defensive despite anything anybody could say on its behalf.

The Changing Status of Gifted Achievement

Usually, an account of history of/and giftedness in Western society deals with outstanding individuals and their nurturance. There is rarely any doubt that gifted performance or production matters in the sense that it attracts critical admiration, even acclaim, temporarily or for all time. This seems to be changing. It is now necessary to take into account the prospects of noteworthy achievement *per se* by asking whether indeed it has a future.

Examples that come to mind include the classical

symphony orchestra and its repertoire as well as the literary novel that is written by an author and bound in the usual print form. Of the symphony orchestra, the Arts and Leisure section of the *New York Times* (January 31, 1988) offers the following speculation:

The date is January 31, 2038. At eight o'clock tonight, Carnegie Hall will be the scene of a special concert of rediscovered music—music that has not been played for three decades. There will, however, be no orchestra—not enough people play the violin, or the cello, or the oboe, anymore. All of the instruments will be played on a new computer, programmed for the occasion: the Bach 9000, which sounds more like an old-fashioned symphony orchestra than the real thing. For the last thirty years, Carnegie has specialized in Pop, Rock and Rage, the new fusion of New Age and Rock, but not tonight. The rediscovered works: Symphony #9 by Ludwig van Beethoven, Eine Kleine Nachtmusik by Wolfgang Amadeus Mozart, and Brandenburg Concerto #2 by Johann Sebastian Bach.

Such a scenario depicts a total break with the past rather than a creative accretion to it. Vivaldi and Schnittke do not survive in the company of their successors. Instead, the masterpieces of previous generations are banished to the archives, to be revived only on rare nostalgic occasions. Never before have artists and their art been declared obsolete, irrelevant, and unwelcome with such finality, as projected so seriously in the *New York Times* feature essay.

Should these speculations come true, they will constitute a major threat to the very concept of excellence as it is now known and accepted. No matter what differences exist in the way people define and evaluate giftedness, creativity, and genius, all agree that a high quality of human productivity or performance is a *sine qua non*. Some individuals who are celebrated for their work, even for many years, may eventually fall into disrepute. But at least the legacies of some *do* survive to maintain society's cultural treasures. By nullifying *all* of them at once, or even in time, raises doubts as to whether quality *per se* can survive as an essential ingredient of excellence. Surely *some* artists and their artistry contain enough brilliance to ensure their immortality. If they don't endure, then the criterion of quality has been replaced by something else. By what? Is it possible that mediocrity will some day be extolled for no other reason than its being new and different? How will music be critiqued, if not by its aesthetic value, however that is judged? Could Western society be entering an era when the beauty of musical statements counts for nothing, and all that matters is the arousal of people's deep impulses by *any* pounding, persistent beat with accompanying sound, however pedestrian it may be, even if it is programmed for "performance" electronically rather than *interpreted* by an instrumental artist? If so, giftedness in music will take on a radically new meaning, if indeed it retains any real meaning at all.

With respect to the future of literature, the novelist, Robert Coover (*New York Times*, June 21, 1992) states:

In the real world nowadays, that is to say, in the world of video transmissions, cellular phones, fax machines, computer networks, and in particular, out in the humming digitalized precinct of avant-garde computer hackers, cyber punks and hyperspace freaks, you will often hear it said that the print medium is a doomed and outdated technology, a mere curiosity of bygone days destined soon to be consigned forever to those dusty unattended museums we now call libraries. Indeed, the very proliferation of books and other print-based media, so prevalent in this forest-harvesting, paper-wasting age, is held to be a sign of its feverish moribundity, the last futile gasp of a once vital form before it finally passes away forever, dead as God.

Coover observes that the novel "is perceived by its would-be executioners as the virulent carrier of the patriarchal, colonial, canonical, proprietary, hierarchical and authoritarian values of a past that is no longer with us". In the novel, as it is traditionally constructed, the author is alleged to wield dictatorial power, not only over plot and character, but also over the format through which they are presented: on lines to be read from left to right (right to left in some languages), in sentences, paragraphs, pages, and chapters. Freedom from this kind of literary tyranny is supposed to come from the so-called "hypertext", in which the linear-sequential structure is eliminated with the help of computer programming. Unlike print text, hypertext liberates readers from control by the novelist and, instead, allows them to become partners in the creative enterprise by involving them in the process of mapping and remapping textual content, "not all of which is provided by what used to be called the author" (in Coover's words).

As the novelist is relieved of the burden of unilateral creation, he/she is no longer the shaper of a complete narration, but instead becomes a collaborative arranger of text, together with erstwhile consumers of text. This is done by providing readers only with sketches of fictional events in no particular sequence and allowing them to fill in details independently in any way they choose to form webs of connection among the sketches. In other words, talent in writing novels becomes democratized, as everybody enjoys the right to participate in the process of producing plot and character on an equal footing with the gifted novelist. By thus being stripped of the task of composing stories in full detail from beginning to end *alone*, creatives in this domain lose their distinction and even their visibility as potential contributors to quality literature.

The mere speculation about such changes raises questions concerning gifted children with promising careers on the concert stage and superb young writers of narrative who may have the next great novel stored in their imaginations.

In another vein, consider Flynn's (1987) large-scale

study of intergenerational gains in IQ in countries where such data were available. He found that present-generation 20-year-olds in Holland score about twenty points higher in IQ than did their counterparts some 30 years earlier. Both groups were compared on the same test using the same norms. An increase of such dramatic magnitude means that, in his sample at least, the number of persons with IQs of 150 and above has increased proportionately by a factor of almost 60 from the previous to the following generation. Yet, the number of patents granted has actually diminished, with the 1980s showing only sixty to sixty-five percent of the yearly rate for the 1960s. This may mean that IQ is no longer as relevant to the world of invention as it once was, or more probably, as scientific knowledge accumulates and inventions become more and more sophisticated, the threshold IQ has to rise in order to qualify a child as a potential producer of scientific ideas.

The Flynn (1987) results may be symptomatic of a trend toward fewer and fewer people capable of mastering more and more sophisticated knowledge, much of it sheltered from more popular consumption by convoluted neologisms. University professors in the 1960s were attacked by student activists who felt their would-be mentors were, in-effect, "fiddling while Rome burned". The students felt that the professors were elitist snobs, so tunnel-visioned that their own theories allowed no room for alternatives. Such criticisms may have led to the Consciousness III declarations of exasperation and Reich's (1971) rejecting the concept of excellence and comparative merit.

The Reich suggestion that everybody is brilliant implies that brilliance has no distinctive meaning. It democratizes abilities and thus leads to the conviction that all products of the mind are created equal, free of criticism or comparative evaluation. This stance is entirely compatible with that of Paul de Man, the Belgian scholar who was instrumental in spreading the theory of deconstructionism in the liberal and fine arts. Supporters of the theory regard it as a reexamination of the humanist legacy, but opponents see it as an attack against the traditional canon.

According to deconstructionism, language in literature, art, and music, never means what it appears to mean. It discards the evaluational aspects of these creative products by declaring them neither good nor bad. Also discarded are attempts to analyze the ideas of writers, artists, and composers. What counts instead is the emotion that literature, art, and music generates in the reader, viewer, and listener, regardless of whether these feelings are embedded in the creative products *per se* or in any way intended by the creators of these products.

The reactions to masterpieces are so personal and so differentiated according to who is reacting that the objects of these responses need not be masterpieces at all; anybody's work can qualify as a stimulator, which makes anybody as important a creator as everybody else. Sometimes the responses embody deeply felt political or

social convictions, or even sexual meanings (McClary, 1987).

Aside from the philosophical consideration of deconstructionism, if the excellence of a creative product counts for nothing because there is no concern for standards or criticism or appreciation, what is the meaning of precocity and its cultivation? How can educators differentiate curriculums for the gifted when there are no human differences acknowledged in a society where *all* children are considered gifted, or not gifted? Can there be patronage of the arts which have no intrinsic value except as objects of highly personal projections? In other words, is the world of ideas witnessing the end of history of the gifted?

Similar questions may be raised in relation to a growing distortion of multicultural education. Traditionally, multiculturalism has advocated the incorporation of great ideas of all cultures and subcultures in the curriculum. It has also fostered the appreciation of the different histories, languages, life-styles, and values of foreigners as a means of combatting xenophobia and racism. However, these highly constructive and much needed additions to school curricula are occasionally ignored in favor of a radically different version of multiculturalism, exemplified in the Stanford University students' chant, "hey, hey, hey—ho, ho, ho, Western Civilization's got to go". "Western Civilization", in this case, refers to the required course of reading great Western literature written by authors caricatured as dead white European males (DWEMs). Some of these great works, which have been treasured for centuries in Western society, had to be discarded from the requirements list and replaced by works selected primarily on the basis of their representing minority subcultures and achieving more of a balance of representativeness among the races and sexes.

Again, excellence is democratized by removing quality as the sole criterion for judging it and substituting in its stead an adherence to subcultural representation for its own sake. The gifted can continue making history and being part of history only if their products and performances are judged strictly by their worthiness, not as commonplace instruments for flushing out other people's emotions or *only* because they emanate from a minority group that seeks and deserves its place in the sun. It remains to be seen how long the element of quality in giftedness, talent, precocity, and genius will remain under attack in the years to come. The stakes are higher than ever in the world of the gifted, and indeed in the world at large.

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National/State Policies Regarding Education of the Gifted

A. HARRY PASSOW

Teachers College, Columbia University, New York, U.S.A.

Introduction

The history of education of the gifted and talented has been a cyclical one with periods during which interest and programs have waxed and waned. Gifted education advocates have long asserted that one factor affecting program development has been the presence or absence of a policy, whether such policy be clearly stated or only implied.

A policy is a plan which provides guidelines for action. A national or state policy, for example, can mandate that giftedness be recognized, fostered and nurtured or it can actually limit or even prevent the development of programs for the gifted. A fundamental canon of a policy in support of gifted education is that there are children who, because they have manifested potential for outstanding achievement in a socially valuable area, require differentiated educational experiences adequate and appropriate to their special needs. What actually is considered "adequate and appropriate" may well differ from nation to nation or state to state, depending on the society and the educational system.

Because policy in the United States is expressed and imbedded in various federal and state legislation, regulations or rules, the U.S.A. provides good examples of the nature and impact of policy on the education of the gifted. Developments in the U.S.A. are first examined in detail as a case study of policy formation, followed by the experiences in a number of other nations.

The Nature and Impact of Federal and State Policy in the U.S.A.

The U.S. federal (national) government's educational role is limited by a constitution which leaves education as a function to be performed by the individual states. Each of the 50 states organizes, operates and supports its own schools, setting policy which is then implemented at the local level. It is state-level policy which drives and guides local education policy and program. Although local control of education has been the bedrock on which the common school and universal education have rested, the federal government exerts influence on both state and local policies, much of it indirectly since its

financial support is quite limited. While its share of funding ranges only between 5–7 percent of the nation's total educational expenditures, the actual federal impact and direction are much greater.

The federal government's significant involvement in educational policy direction and leadership began with the Soviet Union's launching of Sputnik in 1957. The perceived threat to America's national security triggered, among other activities, a resurgence of interest in gifted education. A year later, the National Defense Education Act of 1958 (NDEA) was passed, aimed at upgrading science, mathematics and foreign languages through curriculum revision and staff development. NDEA proved to be watershed legislation in that, for the first time, federal policy asserted a commitment to funding needed to enrich curricula and support staff development for teachers who would deliver the new curricula. While not specifically aimed at the gifted, many NDEA projects gave special attention to the needs of the "academically talented students" and gifted students profited from this federal policy which aimed at improving the quality of instruction and teacher education in order "to meet the challenge of the Soviet Union". Together with related agency efforts, such as those of the National Science Foundation, federal programs stimulated support and activity from states as well as philanthropic foundations. These efforts gradually dwindled as national priorities shifted and attention was diverted to other educational and political crises and issues. It was not until the 1970s that attention focused once again on the gifted.

While programs for the gifted were established long before the NDEA federally-supported activities—some programs trace their beginnings to the turn of the century—it has been federal policy and legislation which has stimulated most of recent and current state and local endeavors. Since the majority of state legislation and guidelines were developed after the publication of the *Marland Report* in 1971 and the enactment of the Education for All Handicapped Children Act of 1975 (Public Law 94-142), it is arguable that those two events were significant for subsequent developments in gifted education.

Although P.L. 94-142 was aimed at providing appropriate special education to "handicapped children", nine

states include the gifted as “another exceptionality”. The State of Alaska, for example, requires each local district to establish and implement written procedures for identifying all children ages 3–21 who require special education and related services, including those who are gifted. Pennsylvania’s standards for Special Education Services and Programs include the “mentally gifted”. P.L. 94-142 requires the preparation of an Individualized Education Plan (IEP) for each identified child. Thus, a federal law setting policy regarding handicapped children has resulted in a number of states complying with the legislation by including the gifted as one area of exceptionality.

Federal/National Policy Influence

The so-called *Marland Report* had considerable significance for gifted education. One of the Education Amendments of 1969 directed the U.S. Commissioner of Education, then Sidney P. Marland Jr, to undertake a study with four basic policy objectives:

- (1) Determine the extent to which special educational assistance programs are necessary or useful to meet the needs of gifted and talented children.
- (2) Show which federal education assistance programs are being used to meet the needs of gifted and talented children.
- (3) Evaluate how existing Federal educational assistance programs can be more effectively used to meet these needs.
- (4) Recommend new programs, if any, needed to meet these needs (Marland, 1971, p. viii).

The findings of the study, Marland reported, provided ample evidence of the need for action by the U.S. Office of Education to eliminate the widespread neglect of gifted and talented children. Federal leadership in this effort is required to confirm and maintain provisions for the gifted and talented as a national priority, and to encourage the States to include this priority in their own planning (p. xii).

Marland declared a need for federal efforts on behalf of the gifted, urged that immediate steps be taken and offered eleven recommendations, ten of which were to be taken under existing federal legislation.

The law required the Commissioner to define gifted and talented for the purposes of federal education programs and the *Marland Report* definition soon was labeled the “U.S. Office of Education definition” and became the guide for many state and local education agencies. It was as follows:

Gifted and talented children are those identified by professionally qualified persons who by virtue of outstanding abilities, are capable of high performance. These are children who require differentiated educational programs and/or services beyond those normally provided by the regular school program

in order to realize their contribution to self and society.

Children capable of high performance include those with demonstrated achievement and/or potential ability in any of the following areas, singly or in combination:

- (1) general intellectual ability
- (2) specific academic aptitude
- (3) creative or productive thinking
- (4) leadership ability
- (5) visual and performing arts
- (6) psychomotor ability.

It can be assumed that utilization of these criteria for identification of the gifted and talented will encompass a minimum of 3 to 5 percent of the school population (Marland, p. ix).

Beyond the broadened definition, use of the phrase “gifted and talented” and the assertion that these children and youth had special needs which required differentiated educational experiences, the *Marland Report* began the formulation of a national strategy for identifying and educating this special population. An Office of the Gifted and Talented (OGT) in the U.S. Office of Education was established which, although it lacked any programmatic influence, could stimulate activity through what could be called “persuasive advocacy”. The OGT undertook a needs assessment and a survey of what was happening around the country. It began a state level leadership training in order to:

(a) shore up already existing support among those in the field who had long been committed to gifted child education, (b) reach key educators, opinion shapers, and legislators, and to begin to develop the potential parent constituency, and (c) provide concrete skills in planning and program building at the state level.

In August 1972, some five months after the *Marland Report* was issued, the National/State Leadership Training Institute for the Gifted and Talented (LTI) was formed, funded primarily with a grant from the Education Professions Development Act. The LTI directed its efforts to translating the ideas of the *Marland Report* and the Office of the Gifted and Talented into planning and program development at the state and local district levels. The LTI focus was on effecting policy changes at state and local levels using three strategies: “(a) developing awareness of the educational needs of gifted and talented children; (b) training educational leaders in appropriate pedagogical strategies for these children; and, most importantly, (c) planning for the educational needs of gifted and talented children at state and local levels” (Jackson, 1979, p. 55). Between 1973 and 1975, three national and nine regional conferences with a total of 48 state teams received training in the development of long-range state plans for educating the gifted and talented. The LTI also developed a national network of individuals and agencies concerned with educating

the gifted and a publications program designed to assist advocates of gifted education with policy-making and instructional planning.

In 1975, for the first time ever, categorical funding for the gifted and talented was made available under the provisions of a section of Public Law 93-380. While the \$2.56 million which was appropriated was not very much, it was perceived at the time as "a beginning". Having an approved state plan in place was one of the requirements for grant applicants. More than half of the funds (\$1.5 million) were allocated to 26 state agencies for professional staff development. Another \$0.52 million went to local projects and model programs in selected categories and \$190,000 for graduate training for leadership personnel. To the regret of many educators, nothing was appropriated for research, research training or dissemination of findings from studies. In sum, the scarce funds were used for essentially "priming the pump", i.e., to both stimulate interest and activity on the part of the state and local education agency and to respond to their growing concern for the gifted and talented.

Through much of the 1980s, the federal role in gifted education declined significantly until the passage of the Javits Gifted and Talented Students Education Act of 1989. Once again the U.S. Department of Education had funding available to support programs for the gifted and talented and subsequently made more than 50 grants. By focusing the requests for proposals on projects aimed at identifying and nurturing the gifted among traditionally underrepresented groups (i.e., racial and ethnic minorities and poor children), the federal government influenced policy at the state and local levels. In addition, the Department of Education provided funds for a National Research Center on Gifted and Talented.

State Policies

Prior to the publication of the *Marland Report* in 1971, only two states had mandated programs for the gifted and three states had enacted discretionary or permissive programs. By 1990, all 50 states had policies on educating the gifted and talented in place. With the exception of the State of New Hampshire, all had state legislation (laws or regulations) which mandated services or which supported discretionary/permissive programs for the gifted and talented (Lukenbill, 1991).

While New Hampshire was alone in having neither mandatory nor discretionary legislation, it did have an Office of Gifted Education in the state education department, the creation of which was itself an expression of a positive policy regarding the gifted. New Hampshire's Office of Gifted's 128-page planning guide was meant to be a practical resource to aid schools in planning and implementing programming for the gifted and not "a mandate or a prescriptive set of policy requirements". New Hampshire's policy does not "mandate specific

actions, decisions, or models; impose on any school a specific set of methods or materials; require the use of specific identification instruments or procedures; limit or constrain the services which can be offered or the students for whom such services are provided by individual schools" (New Hampshire State Department of Education, 1989, p. 1). However, a clear message is sent encouraging "schools to conceptualize and define programming constructively" and the major areas in which decisions must be made are identified.

By enacting legislation, promulgating regulations, formulating rules or simply providing guidelines, however, every state has made a positive statement regarding education of gifted and talented students. In different ways and to different degrees of specificity and conviction, every state now acknowledges that there are gifted and talented pupils, though there is no single definition nor description of such students. In different ways, every state recognizes that nurturing talent potential is essential for self-fulfillment as well as societal benefit. Every state acknowledges that gifted pupils can and should be identified and that they require differentiated educational experiences and opportunities. Every state seems to grant, though not all provide for them, that extra or additional resources are needed in order to provide programs for the gifted. The policies of many states include attention to program options, teachers and program evaluation. There is no single model shaping the policies, regulations, rules and guidelines for gifted and talented education in the 50 states.

There are considerable variations in the extent and ways in which local school districts—the units which actually deliver educational services—implement state policies and translate them into instructional programs. Even within a state, there is often considerable diversity in the actual implementation of a state's rules and regulations, depending on the nature and extent of state control. A significant determinant of the implementation of a state policy which either mandates a gifted program or supports a discretionary one is the nature of the relationships between the state education agency (SEA) and the local education agency (LEA)—i.e., the kind of accountability, curricular and instruction direction, supervision or monitoring, funding, etc. that the state requires from or provides for its local districts in general. Because of these different relationships between SEAs and LEAs, it is not possible to state which policy—one that mandates or only permits programs for the gifted, one that is more or less specific, one that has clearer or less clear standards or one that provides more or less detailed directives, rules or requirements—actually results in gifted programs which are "better", more stable and have greater continuity.

A key element of policy is whether programs or provisions for the gifted are mandated or discretionary. Mandated services are required services, carry with them some variation of a *must* directive for local districts and usually include some provisions for accountability. However, the nature of the mandates vary

widely from simple, direct statements to quite detailed ones.

The State of Wisconsin, for example, requires each local school district to "provide access to an appropriate program for pupils identified as gifted and talented". The Georgia State Board of Education directs "the development and operation of programs of gifted education for pupils who have high intellectual abilities and the potential for exceptional academic achievement in grades K-12 in the public schools of this state".

In 1963, the first state to mandate that local districts provide for the gifted was Pennsylvania. Its 1986 guidelines set forth program requirements as follows:

All gifted school-age exceptional persons in Pennsylvania must be provided with a free public education that is appropriate and individualized. The individualized instruction may be provided as a special education approved program or as an approved differentiated basic education program. A combination of both options provides the greatest opportunity for flexible programming to meet the needs of the gifted.

Regardless of program option all programs for the gifted must provide for procedural safeguards including but not limited to: Screening and assessment, MDT, IEP, NORA, Biennial evaluation, Annual IEP review, Parent participation, Continuous access to due process, Confidentiality of records.

The student must be provided instruction at an appropriate level of challenge and with adjustments that accommodate individual needs in both program options.

The program must be described in the special education plan of the school district and intermediate unit and approved by their respective boards even if only differentiated basic education alternatives are used to meet the needs of school-age gifted persons. This plan must be reviewed and revised at least once each year. Programs shall be developed in accordance with planned courses (curricula) to provide a continuum of programs and services appropriate for the student's age and development (Pennsylvania Department of Education, 1986, p.12).

The policies of a number of states include either a recommendation or a requirement that local districts prepare a written plan for identifying and educating gifted and talented children with some specifying the specific components of such a plan. The State of California's policy regarding a written plan is as follows:

The district shall develop a written plan for the district program which shall be available for public inspection. The written plan shall describe the appropriately differentiated curricula for identified gifted and talented pupils as well as specify the methods used to examine the appropriateness of the identified pupil's total education experience including articulation with other specially funded programs

which serve gifted and talented pupils. The plan shall include:

(1) The purposes of the program, including the general goals and specific objectives which pupils are expected to achieve;

(2) The rationale for the district's method of identification of gifted and talented pupils;

(3) Where appropriate, procedure for the consideration of the identification and placement of a pupil who was identified as gifted or talented in the district from which the pupil transferred;

(4) The services to be rendered and the activities to be included for pupils participating in special day classes, receiving special services, or participating in special activities for an amount of time specified in Education Code Section 52206.

(5) Plan for evaluating the various components of the program. Evaluation shall include an annual review of pupil progress and of the administration of the program;

(6) Procedures for modifying the district gifted and talented program on the basis of the annual review;

(7) A staff development plan based upon a needs assessment which includes specification of requisite competencies of teachers and supervisory personnel;

(8) Procedures for ensuring continuous parent participation in recommending policy for planning, evaluating, and implementing the district program;

(9) A procedure to inform parents of a pupil's participation or nonparticipation in the gifted and talented program;

(10) An objective related budget (California State Board of Education, 1989, pp. 13-14).

The legislation or regulations of a number of states include statements which express a philosophy about the nature of gifted children and their education and provide a rationale for the policy for such programs. For example, the State of Kentucky voices its "Philosophy of Gifted Education" as follows:

All students shall be provided with an educational program which allows them to develop to their maximum potential. Gifted students possess superior abilities and/or capabilities and, therefore, are a unique segment of Kentucky's school population. In order to realize their potential, they need educational opportunities that differ from those available through the regular school program.

Gifted students exist at all levels of society regardless of sex, race, socio-economic, or ethnic origin. They must be identified through their outstanding intellectual capabilities, academic aptitudes, and/or creative abilities. An articulated K-12 program shall be provided with educational experience commensurate with their abilities. Such a program shall be conducted in an environment which will make it possible for these students to interact with others of high ability. The program shall afford students the opportunities to reach the highest level of learning

and accomplishment of which they are capable at each stage of their development (Kentucky Department of Education, 1988, p. 1).

The State of Wyoming's philosophy is phrased as follows:

All children and youth in Wyoming need opportunities to develop their individual talents, and the gifted and talented are no exception. The complex nature of giftedness may manifest itself through the interplay of many different intellectual abilities as well as through a variety of creative expression and non-academic talents. Giftedness implies that each child is distinctly different from children in general and from other gifted children, yet their unique abilities and interests are found in every culture, ethnic and socioeconomic group (Wyoming State Board of Education, 1981, p. xi).

The *Marland Report* definition of giftedness (see "Office of Education" definition above) used in federal policy and legislation influenced those adopted by states as well. The Lukenbill (1991) survey found that:

General intellectual ability was reported by 46 states to be the **most common area of giftedness identified** by their state's definition. Forty-four states report *specific academic aptitude*, followed by *creative thinking ability* (37 states), *advanced ability in the fine/creative arts* (32 states) and *leadership ability* (26 states). *Psychomotor ability*, *psychosocial* and *vocational aptitude* were included in the definitions of 5 or fewer states.

The State of Virginia was unique in including *practical arts ability*: "students who excel consistently in the development of a product or performance in any area of vocational education to the extent that they need and can benefit from specifically planned educational services differentiated from those generally provided by the general program experience" (Virginia Department of Education, 1984, p. 3).

In their policy statements, a number of states either used the Office of Education definition directly, paraphrased it or modified it to include only some of the original six areas. (*Psychomotor ability* was subsequently eliminated in federal legislation and usage.) Nevertheless, while the traditional areas of general intellectual ability and specific academic ability dominate state definitions, other elements of the *Marland* definition—creativity, fine and creative arts, and leadership ability—are included in more than half the policy statements.

Many policy statements are quite specific in detailing the procedures and, in some cases, the instruments which local districts may use in identifying gifted and talented students as defined by state legislation or regulation. The State of Arkansas's standards, for instance, require the "use of at least two objective and two subjective measures (one of which must assess creativity), chosen from" the list provided (Arkansas Department of Education, 1986, p. 13).

A number of state policies stress or specify procedures and instruments for identifying gifted youngsters who are "economically, culturally and/or environmentally" disadvantaged. More than half the states recommend or require the use of multiple criteria in identifying gifted students. Most include individual or group intelligence tests and achievement tests. Several states require or suggest that the identification process be conducted in two or three stages, such as screening, identification and placement.

Some states have established standards regarding the identification process to which local districts must adhere. The State of Colorado, for example, recommends that LEAs incorporate the following very comprehensive standards into their program plan, relating the identification to the instructional programming:

Referral and Assessment: It is recommended that students be referred for assessment by a variety of methods, such as parent nominations, teacher nominations, self nominations, peer nominations, scores on group tests of intelligence, product evaluations. Comprehensive and multiple criteria including tests of intellectual ability, achievement tests, teacher checklists, parent checklists, creative performance, grade, and product evaluations should be used for identification purposes. It is recommended that no student be denied the opportunity for needed programming on the basis of any one assessment criterion. It is recommended that specific plans be developed to ensure the identification of subpopulations of gifted and talented: minorities, girls, underachievers, highly gifted, and learning disabled and/or handicapped. Logical connections must be demonstrated between any diagnostic test administered, the areas of perceived educational need and programming delivered. Student learning plans based on assessed needs may be developed (Colorado Department of Education, 1989, p. 4).

"Program for the Gifted" has many different meanings in state policies. In some instances, "program" encompasses everything that has to do with the gifted including identification, instruction, organization, funding, etc. In others, the term is limited to the instructional aspects, the arrangement of teaching and learning conditions.

States vary with respect to the program elements required or suggested, although there is consensus that programs should be developed locally according to the needs of the population of a particular school community. The states differ in the components they choose to deal with—some stressing program parts such as rationale, goals, objectives, teaching methods and evaluation plans while others choose to highlight such aspects as grouping structure or early admission provisions. The various state policies include a variety of program recommendations such as part- or full-time classes, magnet schools, cluster grouping, resource rooms, special classes, Advanced Placement Program,

International Baccalaureate, independent study, summer and out-of-school classes, counseling or guidance programs.

The State of Oklahoma, for example, requires that: "School districts shall provide differentiated education for all identified gifted students. This differentiated education will include multiple program operation which shall be carefully matched with students' needs and interests" (Oklahoma State Board of Education, 1990, p. 1). Some states provide detailed criteria which must be applied by the local districts to their programs for the gifted while the policies of other states include sets of general standards that apply to all types of gifted and talented programs. Georgia urges schools to use a combination of the three delivery models—Self-contained Classroom, Resource and Facilitator—presented in its state regulations.

In those states where provisions for the gifted are tied to Public Law 94-142, Individual Education Plans (IEPs) are required. Some state departments require that detailed program plans be approved while others have few requirements.

Although most state policies refer to, advocate or even mandate "differentiated curriculum" or "appropriate curriculum", there is generally little specificity as to what is intended or required. Many states do not even mention the term "curriculum". Some policy statements specifically relate curriculum for the gifted to the regular curriculum. The State of Georgia specifies student competencies in its requirements:

Gifted curricula shall incorporate the 76 student competencies and State Board of Education approved curriculum, resource guides and courses. The Skills Areas Basic to Gifted Education shall be incorporated at each grade grouping in one or more of the following content areas: language arts, mathematics, foreign language, social studies and science. These skills shall not be presented as independent curricula.

The Skills Areas Basic to Gifted Education include—Area I: Cognitive Skills; Area II: Learning Skills; Area III: Research and Reference Skills; and Area IV: Communication Skills (Georgia Department of Education, 1988, p. 2).

The State of Arizona requires local school districts to develop a modified curriculum scope and sequence that will ensure that gifted students engage in learning experiences commensurate with their special abilities and potential. Each LEA is required to report annually on how special education for the gifted differs from regular education in areas such as: "(a) Content, including broad based interdisciplinary curriculum; (b) Process, including higher level thinking skills; (c) Product, including variety and complexity; and (d) Learning environment, including flexibility" (Arizona Department of Education, 1991, p. 2).

Some states encourage or even require accelerated instructional programs, while others simply permit acceleration.

The State of Kansas, for example, permits students "to test out of, or work at an individual rate, and receive credit for required or prerequisite courses, or both, at all grade levels if so specified in that child's individualized education program" (Kansas State Board of Education, 1990, p. 4). Kansas students may also receive credit for college-level study whether done at a college or high school—providing the student is responsible for college tuition costs.

Particularly in states in which the gifted are considered part of special education (P.L. 94-142), it is generally recognized that such students require guidance, psychological and other support services. For example, Wisconsin's statutes state that: "Many gifted children are at risk and need attention, counsel and support to help them realize their potential" (Wisconsin Department of Public Instruction, 1990, p. t-2). However, in a few states, the gifted and talented are specifically omitted from psychological and other support services mandated for special education students.

A number of states require involvement of such specialists in the identification process only, calling for the professional judgment of teacher specialists, counselors, psychologists or other "qualified professionals". A few states suggest that support services be given to particular populations such as underachieving gifted students. Others indicate that gifted and talented students have special needs, particularly in the affective areas of social and emotional development, requiring special counseling or psychological services. The State of Utah requires that districts "provide guidance to assist [gifted] students in addressing personal and interpersonal needs, in program selection, and in career and college choices" (Utah State Office of Education, 1988, p. 2).

Most state policies regarding the gifted require, recommend or suggest that parents be involved in their gifted child's education. Arkansas's standards require that parents grant permission for individual testing, be informed of program placement criteria, give written permission for their child's participation in the program and appeal a placement with which they disagree.

Colorado's standards for program development call for parental involvement in a variety of aspects:

It is recommended that parents be encouraged to take an active role in the education of their gifted and talented children, and that efforts be made to provide educational programs for these parents to orient them to the district's program and to help them address the needs of their own children. It is recommended that involvement of parents be documented at the local and state levels, and that parents be encouraged to participate on advisory and steering committees at the state, district and local school levels. It is also recommended that they be encouraged to join local and/or district parent groups supporting gifted education (Colorado Department of Education, 1989, p. 6).

Although state legislation and regulation have a good deal to say about the role and importance of

teachers in the identification and education of gifted students, relatively few have special certification or endorsement requirements. Many refer to the need for staff development and urge that it be provided but are often vague about the nature of such inservice education. Lukenbill (1991) reported that 14 states had special teacher certification requirements which "is accomplished primarily with graduate hours, in-service hours or levels of competency" (p. 33). In fact, program funding for the gifted/talented programs is linked to special teacher certification in 17 states (p. 33).

A few states list what are perceived as desirable competencies and characteristics of teachers for the gifted for LEAs to consider in selecting staff for such programs. Most state policies require that teachers have, at a minimum, valid teaching certificates for the grade levels or subject areas included in the gifted program.

Utah's mission statement sets forth both preservice and inservice goals in the form of nine standards and requires LEAs to promote statewide networking of approved endorsement programs through institutions of higher education. Several states spell out in considerable detail the requirements for certification as a teacher of the gifted, usually in terms of a minimum number of semester hours of study at a college or university.

While not requiring that teachers be certified in gifted education, LEAs in Texas must provide a prescribed number of days of staff development for teachers who have not previously received training in the area of gifted education and, beginning in 1991, teachers must have been trained prior to their assignment to the program for the gifted (Texas Education Agency, 1990, p. 26).

Evaluation plays an important part in many state policy statements—sometimes required, more often only recommended or suggested. In a number of states, no mention at all is made of evaluation. Where written district plans are recommended or required, program evaluation is usually a component of such plans. Program evaluation is often a part of the SEA's monitoring process, especially when the gifted program is linked to other special education programs. Evaluation requirements or recommendations may focus on either individual student assessment or program appraisal and states may provide specifics regarding the process, detailing what is assessed and how the assessment should be done.

Several states discuss evaluation as an integral part of an LEA's decision-making process, examining the appropriate use of both formative (continuing) and summative (final) evaluation. New Hampshire's guidelines discuss the reasons why evaluation of gifted programs is an important but difficult process—e.g., the complexity of outcomes, the delayed impact or benefits of gifted programming, the intricacies of isolating the impact of gifted program components from the rest of the school program and the diverse criteria needed to assess the effectiveness of a variety of program services.

The State of Kansas requires that every three years students in approved gifted programs undergo a comprehensive reevaluation by a multidisciplinary

team of professionals using multiple sources of data in order to decide whether to continue or discontinue services. Detailed suggestions are provided regarding sources of data, techniques and procedures for product evaluation, use of test data and "additional testing information indicated by specific needs including self-image, learning styles, career/vocational aspirations, creativity, cognitive or academic achievement, and other [specific needs] as identified by the reevaluation team".

The State of Florida provides a planning guide specifically aimed at helping extend educational opportunities to culturally diverse learners and minorities in gifted programs. The guide calls for an evaluation design which addresses specific questions regarding increased participation by students from these groups:

Possible activities include evaluating how effective the implementation of each component—screening and referral; criteria for eligibility student evaluation; instructional program philosophy; curriculum modifications or adaptations, and support services; and evaluation design—was in achieving the goal of increased participation of under-represented groups and ensuring their success and continued participation in the existing instructional programs (Florida Department of Education, 1992, p. 15).

Approximately 40 states distribute funds to local school districts or intermediate agencies employing a variety of funding formulae. In Fiscal Year 1990, total state funding for gifted programs ranged from as little as \$100,000 in Montana to \$87,989,649 in Florida, the latter serving 61,458 gifted/talented students (Lukenbill, 1991, pp. 24–25). States used a variety of bases for determining distribution of funds, including foundation units, weighted per pupil units, and fixed per pupil amounts. Depending on the state, local districts might be reimbursed for costs involved in identification, staff salaries and benefits, instructional materials, transportation and evaluation. Some states require approved written plans before considering funding. A few states link evaluation to funding.

Funding in the federal government and many state governments is a two-stage process: the legislative body first agrees to an amount of money and then actually allots or provides the funds. It is possible to take the first action but not the second—i.e., not to provide any money or a lesser amount. Thus legislation for the gifted does not guarantee appropriation of funds. The financing of programs for the gifted has been and remains precarious.

The Impact of Policies in the USA

What is different about education of the gifted during the past two decades since the publication of the *Marland*

Report is that states have enacted legislation, formulated rules and promulgated regulations which express policies favorable to providing for the gifted and talented. In a sense, gifted education has finally been legitimized and institutionalized.

All 50 states now have policies on educating the gifted and talented in place. These policies are quite diverse—some stronger, more comprehensive, more supportive, more directive than others. Even those policies which provide the strongest mandates provide leeway for local school districts in the design and implementation of programs.

The fact that all of the states have legitimized gifted education, sometimes through mandate and sometimes through discretionary support; that most states have established offices or bureaus for gifted education in their state departments, sometimes with full-time and sometimes with part-time directors or coordinators; that many states provide funding at various levels for various elements of gifted education; that many state departments produce or disseminate curriculum and other instructional materials for the gifted; that many states now require evaluation of programs for the gifted, sometimes as a requisite for funding—are all indications that education of the gifted and talented is, in some ways, on a firmer footing than it has ever been. The enactment and implementation in 1988 of the Javits Grant Program for the Gifted and Talented symbolized a new leadership from the federal government in educating gifted and talented. The focusing of most of the grants on the traditionally underrepresented minorities and poor demonstrates how federal policy influences state and local practice.

However, despite these positive consequences of policy on behalf of the gifted, such education does not take place in a vacuum or in isolation from other policies. A decade of intense activities aimed at school reform and restructuring, continuing controversy concerning issues of excellence and equity in an increasingly diverse society, greater understanding of individual differences and diversity, intensification of efforts to create national goals and standards and a variety of other problems and programs have resulted in policies or issues which have a direct affect on policies dealing specifically with the gifted and talented. When in 1991, federal, state and local districts throughout the nation experienced severe financial crises, funding for the gifted suffered once again. A number of states legislated funding or continued existing funding legislation but either failed to appropriate the monies or allocated a much smaller amount than was called for. Funding for state coordinators and offices for the gifted was reduced and even eliminated. In many districts, local funding for programs for the gifted was also reduced or eliminated.

In a sense, through various policy formulations, gifted education in the United States has won numerous battles but still has yet to win the war.

The Nature and Impact of Policy in Some Other Nations

It is not possible to survey policies in the many other countries which provide for the gifted in some way. Instead, a small sampling of how national, state or provincial policies have impacted on gifted education in a few other nations follows. Because each national education system has its own structure, sets of relationships and own contexts, the discussion which follows is necessarily somewhat limited.

Policies on education of the gifted in other nations are often not expressed in the same way as in the United States. Federal and state policies in the United States are communicated in the legislation, regulations, rules and guidelines of governmental agencies. Policies of the local school districts (LEAs) are usually expressed in the programs that are developed and implemented. This is, in part, a function of governmental structure. Different governmental structures—such as a centralized versus decentralized national educational systems—affect the ways policies are formulated and implemented. Different relationships between the national or state and local schools with respect to control, funding, accountability, etc. affect the nature of policies. Different social, cultural, political and economic contexts affect policy statements.

Thus, stated or implied policies of nations may range from outright hostility to an ignoring of the issue (“benign neglect”) to permissive or discretionary backing to strong positive support, including financial.

Cohen (1990) has observed that: “Public policy decisions and issues concerning services to the gifted rest on the values and attitudes of certain groups of people in particular time periods. Some ongoing issues include equity or excellence, perception of the gifted by others, cost effectiveness, funding, where gifted is housed, and accessibility” (p. 254). Similarly, Cropley (1989) notes:

Some political groupings, especially in Western European/North American societies, stigmatize special educational provisions as a device for maintaining the privileged position of certain groups, or for justifying and even increasing educational inequality, since the unusually able are assumed to be preprogrammed for success; in Europe this view is common in the Federal Republic of Germany, France and Italy, where there is nonetheless a certain degree of provision for the gifted, and in the Scandinavian countries, where there is little (p. 377).

Sweden and other Scandinavian countries provide a good example of how the socio-political context affects gifted education. Cohen (1990) attributes the few provisions for the gifted in Scandinavia to the fact that “the egalitarian ethic is dominant and special provisions for the gifted are viewed as a means of maintaining the privileged positions of certain groups” (p. 254). Edfelt (1992) traces the absence of any special educational programs for the gifted in Sweden to the work of

a 1968 governmental committee chaired by a leading theorist of the Swedish social democratic party, Dr Alva Myrdal. He points out that in "Sweden it is considered undemocratic not only to be mentally gifted, but also to be gifted and demand special treatment because of this fact" (p. 47). Whether or not Edfelt's characterization is totally accurate, clearly programs for the gifted are limited in Sweden and its Scandinavian neighbors.

In a number of European countries, particular secondary schools—e.g., the English grammar school, the French *lycee* and the German *gymnasium*—have long been viewed as providing an appropriate education for academically able students and constitute governmental policy regarding that population.

United Kingdom

On the basis of a year-long study some three decades ago, Passow (1961) found that the term "gifted" was rarely used in England. At the time, the grammar schools for which youngsters were chosen through the "Eleven-plus" selection process and the three years of highly specialized study from age 16 on in the Sixth Form were seen as the ways in which England provided for its most intelligent, academic-achieving students. At the time, comprehensive secondary schools were coming into being, particularly in LEAs where the Labor Party governed.

By the 1980s, changes in the tripartite secondary school system, including the selection processes, brought significant changes regarding the education of the gifted or highly able. In the early 1980s, for example, 30 LEAs participated in a Department of Education and Science (DES) sponsored Schools Council Gifted Pupils Project, a project which created a cooperative network and produced curriculum and instructional materials. Noting that the English were beginning to talk about the top 10% as including the "able child" (rather than the "gifted child"), project coordinator Callow observed:

There is far more support both philosophically and politically for provision through a move towards a process based curriculum and teacher effectiveness than by specific programmes of extraction or acceleration. While both main political parties claim to support help for the gifted/able child they differ widely in their approach. Conservatives see the answer to the problem in the provision of assisted places at Private Schools while the left wing socialists would be against any form of recognition or help for the able. At least one very promising programme was shut down due to a political wrangle (Passow, 1985, p. 40).

A 1982 National Association for Gifted Children (1982) survey found that, of the 59 LEAs that responded to the questionnaire, 54 supported the principle of enabling teachers to acquire skills and understandings

needed to work with gifted, 35 had established working parties on educating gifted and 20 had published guidelines on their provisions for able children. Several LEAs had appointed program coordinators.

Freeman (1992) points out that currently 35 of the 108 Local Education Authorities have at least one person responsible for the highly able and that for more than a decade "bright children can receive enrichment in many subjects; mostly offered out of school, in weekend and summer courses, either provided free by the Authority or privately at about 12 centres across the country" (p. 60). Nevertheless, Freeman reports that "there is no specific overall educational policy for the gifted in Britain where teachers prefer keeping able children in the regular classroom and are wary of any form of 'elitism', whether of wealth or ability, and are unhappy about categorizing children into ability groups" (p. 67). She observes that teachers prefer low-cost provisions such as acceleration or pullout enrichment programs because they worry that gifted programs will take scarce resources away from other children.

Clearly, the most significant governmental policy change in British education in recent years was the passage and implementation of the 1988 Education Reform Act, incorporating for the first time a National Curriculum. The National Curriculum requires that every child study the core subjects of mathematics, English, science, history, geography, music, art and physical education, as well as foreign languages at the secondary level. Each subject has ten defined levels of attainment which teachers are to assess. Freeman (1982) describes the issue the policy of a National Curriculum poses for the gifted child as follows:

In theory, the needs of the individual are given the highest priority, each child working through the level from its own starting point, at its own pace, and to the extent that it is able. This ought to be a truly differentiated approach, but it may restrict the ablest. For example, because the assessment of attainment is defined by a national age average at 7, 11, 14 and 16, it may concentrate teaching those prescribed standards, as though they were the limit of what might be expected at those ages. As a result, teachers may not realise that the attainments of some children could be well beyond them (p. 59).

Interest in the gifted had been growing steadily, Freeman noted, subsequent to issuance of the 1989 Annual Report of Her Majesty's Inspectors of Schools which had asserted that, in most schools, able students were simply not being sufficiently challenged. The following April, the Department of Education and Science convened more than 100 senior U.K. educators to examine ways of adapting the National Curriculum for the highly able. There is now, Freeman points out, a policy of official acknowledgment of a need for enrichment opportunities for both fast and slow learners. Ways of implementing the policies and meeting the issues posed by a National Curriculum are being seriously explored.

Germany

Policies regarding the gifted in Germany are promulgated on two levels—the federal and the *lander/states*. Educational policies are complicated by the need to integrate the “two Germanies” which had operated drastically different school systems.

At the opening session of the Sixth World Conference on Gifted and Talented Children in Hamburg in 1985, Minister of Education and Science Dorothee Wilms (1986) expressed the view that “the Federal Republic of Germany cannot shun the responsibility to give talented children more recognition and increased support” and considered “it an urgent educational task to make up the scientific leeway in this field and, after prolonged neglect of gifted education, to create an educational climate which enables an unemotional discussion to be conducted in this country too” (p. 17). The forum of the World Conference was viewed as providing a platform for discussion of the issues and as a stimulus to policy and program development in Germany.

Blanke (1992) has pointed out in planning support for the gifted, the national government has several basic premises: “participation is voluntary; development of academic and social abilities; early identification and support; constant counseling; inclusion of the parents; no exclusivity; variety of measures and sponsors; opportunity for private initiatives” (p. 14). The federal government now provides support for competitions, school academies and other extracurricular areas; vocational training in institutions for the promotion of talent; university scholarships for graduate study; and research. This policy has led to the federal government’s initiating research on early identification, differentiation and expansion of program support and inclusion of groups of gifted who have been underrepresented to date.

According to Knauss (1992), the ministers and senators of culture for the various German *lander/states* have declared their “agreement that it is the task of the schools to provide each student [including the gifted] with appropriate education according to their abilities” (p. 76). The various states employ three basic models for educating especially gifted students: (a) Enrichment Programs, (b) Acceleration Programs, and (c) “creation of special classes or schools with special performance demands and educational concepts” (p. 77). Together with the Federal Republic, the Standing Conference of Ministers and Senators has declared support for a number of country-wide competitions aimed at locating and nurturing special talents in specific areas of giftedness.

Since the school year 1984–5, the policy of the state of Baden-Wurttemberg has been to nurture giftedness through more than 500 work groups which focus on especially challenging and interesting topics and which operate outside regular classes and are independent of the school curriculum. These work groups are supplemented by state competitions as well as seminars. In four locations, Baden-Wurttemberg has also recently been

experimenting with gymnasia with an eight-year course in which especially motivated and talented students can save a year of schooling, graduating in eight years with a college preparatory degree without experiencing any loss of quality in their education.

On the other hand, Bavaria operates four parallel school types as well as differentiations within these types—e.g., there are gymnasia that focus on ancient languages, modern languages, music, business and social science. In addition, in order to nurture special talents, the state supports vacation seminars for especially talented and interested 11th and 12th graders; optional “plus-courses” which are not linked to specific grade levels and which help prepare students for competitions; the practice of grade-skipping of one year through school or vacation seminars; and the provision of scholarships for all-round highly gifted gymnasium graduates. Similarly, the policy of the state of Saxony has been to support special schools for the nurturing of mathematically, scientifically and musically talented students. After 1989, these schools were changed to *gymnasien*, each with a special profile. In addition, the state supports competitions which are particularly relevant for talent searches, including mathematics and science olympiades (Berenbruch, 1992).

Thus, in Germany the recent policy of the federal government is to support gifted education but implementation of that policy is limited to the policies of the states because of the federal structure of education. The Standing Conference of the Ministers of Culture of the States, a group consisting of ministers and senators from all of the states or *lander*, has taken a stand in support of gifted education as well. However, since, as in the United States, each of the German states/*lander* operates its own schools, there is diversity in their operating policies.

South Africa

In 1988, the Work Committee on the Education for Highly Gifted Pupils submitted its 442-page report titled *Education for Gifted Pupils* (1988) to its parent-group, the Human Sciences Research Council (HSRC), expressing the belief that its recommendations would make a valuable contribution toward developing gifted education in the R.S.A. Provisions for the gifted in the Republic of South Africa have been complicated by the separate and unequal school systems operated under *apartheid* and by the relationship of the provincial governments to the national government. The Work Committee’s study focused largely on the education of white students.

A 1964 National Advisory Education Council had recommended that primary school gifted students should be grouped homogeneously and “be educated accordingly”; that if there were too few gifted students, they be provided with individualized instruction in an

intra-class group; that acceleration and enrichment be introduced to make it possible for gifted students to progress at their own tempo; and that the curriculum content be revised to pose a challenge to gifted pupils. At the secondary level, the Council recommended the following fields of study—technical, commercial, agricultural, natural science and art—be offered at different specific secondary schools including general secondary, technical, agricultural, commercial and art (ballet, art and music).

A 1981 study by the HSRC Committee found that the implementation of the 1964 recommendations had been minimal: the Cape Education Department had organized a decentralized form of enrichment and pull-out within the ordinary school systems; the Transvaal Education Department had established extracurricular centers for the highly gifted; and the Natal Education Department gave special attention to identification and provided special education programs.

The HSRC Work Committee surveyed programs and practices in the R.S.A., reviewed a body of research literature from abroad and sought to lay down guidelines regarding all aspects of the gifted: definition, identification, educational programs, educational facilities, underachievers, school guidance, attitude development, curriculum development, handicapped and teacher training. The committee concluded: "If the educational authorities take note of these guidelines in the planning of education for gifted pupils, these pupils should come into their own in the educational system" (HSRC, 1988, p. 321). Political developments focusing on elimination of *apartheid* and other problems created by the separate school systems have seriously impacted on the implementation of the guidelines proposed by this quasi-governmental research and policy group. Each of the provincial governments continues to implement policies already in place and the policy recommendations of the Human Science Research Council are, for the most part, held in abeyance. The Cape Province has declared the aim of education to be that of offering each pupil opportunities to develop his/her potential and asserted it to be "the responsibility of the school and the community to create opportunities in academic, sport and cultural fields for developing and nurturing the potential and proven giftedness of their children" (Cape Education Department, no date, p. 1).

Australia

Like the U.S.A. and Germany, schools in Australia are operated by states and territories with some policy direction from the Commonwealth national government. Writing about gifted education in Australia some three decades ago, Radford (1961) observed that there was little concern expressed about what constitutes the "best education" for the gifted in that nation

because "most of the courses in secondary schools have in the past been written with the needs of the more able part of the student population in mind" (p. 227). Nor did Radford find "much evidence of informed concern about giftedness in the fields of art, music, literature, sculpture, drama or creative dance" (p. 227). Radford noted that a few special programs could be found such as "Opportunity C Classes" in New South Wales, "Scholarship Classes" in Victoria and "Terman Classes" in Western Australia and that some schools practiced streaming and acceleration. Radford was convinced that the increasing interest of the community for more secondary and tertiary education might lead to making "money available to encourage able persons to teach and to use educated gifts when they are available" so that hopefully "the gifted child will receive his due—not in a separate class or institution or with a totally different approach, but through developing his individual gifts within the framework of present organization" (p. 235).

In a comprehensive study, Braggett (1985) has traced the series of events between 1940 and 1975 that had reshaped and reformed education in Australia to widen its scope and "to cope with all levels of interest, ability and talent and to promote the social purposes of an egalitarian society" (p. 298). He observed that in the early 1970s: "Provision for gifted and talented children was not a popular cause to espouse in a nation that decried special attention to academic precocity and equated giftedness with privilege" (p. 1). In 1972 and 1975, the Federal Labor Government had attacked what it viewed as social injustices, had funded projects aimed at assisting the disadvantaged and had designed programs to equalize education for all. The prevailing attitude of the federal government—reflected forcefully in its policies—was "to assist disadvantaged children within an egalitarian framework, and gifted children were not acknowledged to be needy or handicapped. Any realignment of policy in favor of gifted children might be denigrated as elitist" (p. 1). When, in 1974, a survey was conducted to determine the attitude, as reflected in policy, of each of the states toward gifted education, it was clear that few long-term plans existed leading the authors to conclude that "children of high intellectual potential were not seen as a group worthy of any special consideration by teachers or education departments" (Braggett, 1985, p. 2).

At a 1976 meeting of all the Australian Director-Generals of Education, reports from each of the eight states and territories together with a paper from the Commonwealth Schools Commission were reviewed. In general, the states reported no official policies on the education of the gifted and few programs. The Commonwealth Department of Education's paper welcomed placing the topic of giftedness on the agenda, regarding it for a variety of reasons as "an important one worthy of special attention at this time" (Braggett,

1985, p. 2). The papers detailing the policies of each of the states and territories showed diversity but, for the most part, lack of support for gifted education. For example, Victoria noted that suggestions that something be done for the gifted inevitably triggered accusations of elitism and intellectual snobbery and, although there was no official policy on education of gifted children nor any official programs, "teachers were becoming increasingly aware that giftedness might be disguised behind underachievement, lack of motivation, and behaviour problems, and some were seeking advice on methods of catering for such youngsters" (p. 3). The Australian Capital Territory reported no specific system programs nor any attempts to identify gifted children and noted that since the 1960s, there had been a move away from ability grouping toward "deliberately homogeneous groupings with an emphasis on individual development and progression" (p. 3). Tasmania reported very few classes for the gifted and the occasional use of enrichment and recognition of individual differences. The reports of the other states and territories added to "striking evidence of the low priority afforded the education of gifted children in Australia in the mid-1970s" (p. 5). Braggett observed that the Labor Party's policy and the Schools Commission's direction during its early years had contributed to a trend against gifted education.

Prof. Miriam L. Goldberg of Teachers College, Columbia University, visited Australia in 1978, inspected a number of schools and institutions in five of the states and prepared a report—the first on gifted and talented children in Australia—in which she examined "Australian ambivalent attitudes to egalitarianism and excellence and explored the issues of definition/assessment, the criteria for judging appropriateness of special programs, various organizational alternatives, and the problems of staffing pertinent program initiatives" (Braggett, 1985, p. 305). At the invitation of the Schools Commission, Goldberg returned in 1980 to review and critique developments since 1978. This time she visited all states and territories. Her report was subsequently published by the Schools Commission and apparently influenced their deliberations (Goldberg, 1981).

In the 1980s, a shift in attitudes toward the gifted began to occur. The Australian Schools Commission issued a discussion paper titled *The education of gifted students* (1980). The Commission reviewed a number of issues which had framed the debate within Australia and which had contributed to the general ambivalence towards the education of gifted students. These dealt with a wide range of issues including definition, identification, appropriate means of delivering education, curriculum, staffing, teacher education, administrative arrangements and evaluation procedures. The report ended with the suggestion that Australia needed to openly address three important questions with policy implications:

—Can the provision of special educational services for the gifted be seen as consistent with the goal of schooling being socially comprehensive?

—Can extra provision for gifted students be regarded as equitable in terms of equality of opportunity and the encouragement of all children to achieve their potential?

—Are students with special talents really held back by the way their schooling is provided? (Australian Schools Commission, 1980, p. 40).

The Schools Commission recognized that these are not easy questions and expressed its interest in working with other agencies and education authorities "in activities which will provide a leading edge to thought and practice in the area" (p. 40). Braggett maintains that the Schools Commission:

has proved a vital factor in the development of policies and projects designed to enhance the cause of gifted education within Australia. It has fully supported moves to broaden the concept of giftedness, to cater for an increasing percentage of the student population, and to foster a diversity of gifts and talents. Ideally it would prefer this to be accomplished within existing organizational frameworks and with a recognition of "a wide range of special abilities and talents not simply defined in cognitive terms" (p. 306).

A First National Conference on the Education of Gifted and Talented Children took place at the University of Melbourne in August 1983. The group planning the conference envisaged an Advisory Committee, but this failed to materialize when three of the major Victorian teacher unions and both state parent organizations declined to participate. Nevertheless, the conference was successful and well-attended. A 516-page conference proceedings consisted of the plenary session addresses and the texts of 82 presentations.

By the time the Second National Conference took place in 1985, an Australian Association for the Education of Gifted and Talented and state groups had been formed. The conference theme was "Gifted and Talented Children—A National Concern". In the opening address, the Queensland Minister of Education, I. J. Matheson (1986), described that state's policy asserting that: "Provisions for gifted children must always be viewed within the context of the principal aim of education in State schools in Queensland . . . The schools are then committed to individualizing and differentiating their offerings to accommodate all children, including the gifted" (p. 1).

Between 1978 and 1985, with the exception of Victoria, all states and territories had issued policy statements on educating gifted and talented children. These varied in "emphasis and thrust and in the practical support they afford . . . some have concentrated on intellectual giftedness, some have sought to accommodate the six categories of the Marland Report, others have been

heavily influenced by Renzulli's Model, while others have developed an eclectic quality" (Braggett, 1986, p. 15). While the State of Victoria had issued no policy statement, a group of educators and the Victorian Catholic Education Commission had issued their own statements supporting gifted education.

Braggett (1986) observes that: "In one sense many of these new documents are not true policy statements at all: some are *philosophical* statements which stop short of policy ramifications and refrain from committing resources" (p. 15). He argues that the statements must be "judged within the context that some educational leaders are not in favor of providing additional system-support for such students. In such a climate, the mere existence of a policy is an important achievement" (p. 16). Braggett also notes that gifted education is a politically sensitive issue and that some policy statements are promulgated strictly for political reasons.

The success of the Eighth World Conference on Gifted and Talented Children, held in Sydney in July 1989, opened by the Governor-General of the Commonwealth of Australia and well-attended by participants from all over the country, indicated that, while there was still considerable unevenness among the state policies and provisions, education of the gifted had made great strides over the past two decades. Clearly the policies of the national and state governments had changed in support of gifted education.

Israel

A relatively small nation with a centralized school system, Israel provides an example of policy development through efforts of its Ministry of Education and Culture. With a few exceptions—mainly orthodox independent schools—the Ministry has central responsibility for all primary and secondary schools. The socialist ideology of the government from the establishment of the State of Israel in 1948 "until 1977 stressed social equality and disapproved of the establishment of special programs for the gifted" (Burg, 1992, p. 217). The need for nation-building, for absorbing newcomers from dozens of countries who did not know Hebrew and for providing a basic education for a wide range of academic ability—all took high priority for policy makers and educational planners.

In the late 1960s, a group of university professors offered after-school enrichment classes, first for high school students and then to junior high and elementary pupils. Responding to this initiative and to a changing public opinion regarding able children, the Ministry of Education appointed a study commission in 1970–71 to recommend policies regarding the education of gifted children. The study commission made two major recommendations: (1) that the Ministry of Education create a Department of Gifted Education to initiate new directions and programs and to coordinate activities on behalf of the gifted nationally, and (2) that financial

and logistical support be given to universities to aid them with programs already in operation.

The Ministry's Department for Gifted Children was created in 1973. Considering program possibilities, the Department rejected special schools for socio-political reasons and opted instead for expanding the after-school enrichment centers. By 1981, more than 5,000 students—an estimated 30–40% of the potentially gifted population—was being served by the centers which were funded on a shared-cost basis by parents' tuition, the Ministry of Education and the local sponsoring agency. The centers focus on mathematics and science with computer-based and laboratory experiences plus offerings in art, music, literature, history, philosophy creative writing and journalism. The Department also established experimental pullout classes in Jerusalem and Tel-Aviv to develop special curricula.

The renaming of the department as the Department for Gifted Children and Science Oriented Youth indicated a policy shift on the part of the Ministry to give special attention, in addition to the gifted, to those students who were gifted in science and mathematics. Currently, the Department is responsible:

for all matters relating to gifted pupils, supervising the implementation and operation of all associated programs including the pedagogical, organizational and budgetary aspects. The staff maintains contact with the principals of schools in which programs for the gifted are offered. Regular visits are made to these schools and meetings with pupils and parents. The department staff also coordinates enrichment programs with local educational authorities, professionals and colleges and universities in Israel and abroad. The Department's policy is to develop the gifted pupils' individual ability for themselves as well as their contribution to the society in which they live (Burg, 1992, p. 218).

The Ministry of Education funds identification of the gifted nationwide, administering the same test to all pupils. Those who score at the top then take an additional group test and the top 1–3% (IQs of 140+) are then chosen for the program. Currently, more than 20,000 students are in programs for the gifted—one day per week enrichment pullout classes and afternoon enrichment classes in 25 cities and towns. There are acceleration programs but these are not generally encouraged by the Department. In cooperation with the Committee for the Advancement of Science Education and the Department for Gifted Children, institutions of higher education offer courses in science and mathematics.

In 1990, a three-year residential high school (grades 10–12) for youths gifted and talented in science, mathematics or the arts was established with private funding. Tuition is charged on a sliding scale, depending on family income. The Ministry of Education provides the same level of funding for the Israel Academy for Arts and Science as for other secondary schools. The first year,

124 students from some 68 Israeli communities were admitted. The IASA is considered an experimental school in terms of designing curricula and providing instruction which other schools can adapt.

In the rural northern part of the country, the Department supports a program at a regional college for gifted students from a number of communities who come in one day a week for enrichment opportunities.

As Burg (1992) has pointed out, "the education of the gifted has undergone many changes during its eighteen years of its existence. During that period improvements in programs and provisions were introduced. No doubt additional changes will continue to take place in the future" (p. 221). Throughout, it has been the national Ministry of Education and Culture's policies which have guided and controlled the direction of Israel's programs for the gifted and talented.

Some Asian Nations

The policy of Asian countries varies from government-promulgated policies in support of gifted education to the absence of policy for egalitarian reasons. Roldan (1992) surveyed the status of gifted education in eight Asian nations and reported that the governments of Indonesia, Singapore, Taiwan and the Philippines had "enshrined in law [the belief] that the gifted/talented must be allowed to develop and fully maximize their potentials and that these students have the right to an education that is appropriate for their special abilities and talents" (p. 2). This commitment is embodied in Indonesia's State Policy of 1988, Singapore's 1984 Gifted Education Project, Taiwan's Special Education Law of 1984 and the Philippines' 1987 Constitution. Although Korea has no law, in 1988 official approval was given to the Council of Education Development and Innovation to design such programs.

Because of its egalitarian perceptions of education, the government of Hong Kong has no official policy regarding gifted education. There are some isolated enrichment programs and the Extended Learning Committee of the independent Hong Kong International School has designed some enrichment programs. Extra-curricular science programs as well as summer camps have been set up.

In Japan, major reform programs initiated first by the Allied Occupation Forces after World War II and then by the Japanese government in 1955 established a hierarchical secondary school system. The result has been that gifted education has been under a virtual ban insofar as formal government programs are concerned. Special classes for the gifted are non-existent; special provisions, such as acceleration, are very rare. Such special programs would be perceived as contrary to the prevailing egalitarian philosophy. It has been reported that teachers prefer "hard working" children to gifted children. After-school clubs and classes do exist and these provide enrichment opportunities for all

students who choose to participate, including those who are gifted. The *juko* classes, independent after-school tutoring classes, prepare youngsters for the competitive admissions tests for the highly regarded and extremely selective secondary schools.

Because gifted education occurs within the context of a nation's total schooling effort, a governmental commitment does not necessarily mean that programs will be developed and implemented. For example, Indonesia's Seven-year Plan for Educational Services for the Gifted and Talented in both urban and rural areas was formulated in 1982. The plan was to give special attention to development of programs in science and technology in 1982-86, followed by programs in the humanities and social sciences in 1985-89. Despite Indonesia's official policy that a citizen who is gifted or talented has a right to receive an appropriate education, in practice, special education for the gifted does not enjoy a high priority because of the lack of budget resources for education in general.

Singapore

The Singapore Ministry of Education began implementing its Gifted Education Project in 1984. Anticipating public objection and criticism, the Ministry prepared a background paper for the Singapore Schools Council which presented a rationale, philosophy and need for gifted education. The program began with 100 primary and 100 secondary pupils in eight classes of 25 pupils each. The existing curriculum was used but teaching methods were to differ. Since then, the program has expanded to include four elementary and three secondary schools. The program focuses on the intellectually gifted although the Music Elective and Art Elective Programs aim at catering to the musically and artistically gifted children.

The Singapore Ministry of Education's Gifted Education Unit has designed a curriculum which, while anchored in the regular curriculum, provides for extensive breadth and depth and emphasizes higher level thinking skills while preparing youngsters for "O" and "A" Level examinations. In 1988, the Ministry's Science Enrichment Program included a science camp at the National University of Singapore, a Mentorship Attachment which links scientists to students working on research projects and a Research Congress at which the project findings are shared.

Taiwan (Republic of China)

At the Republic of China's Fourth National Education Conference in 1962, a plan was adopted to provide gifted education in Taiwan (Wu, 1992). The government's attention to the gifted and talented is part of its overall effort to extend educational opportunities to

all children. When compulsory education was extended from six to nine years in 1968, the legislation stipulated that special provisions would be made for both gifted and handicapped children. In Taiwan, the term "gifted" is used to encompass the academically able and "talented" includes children with potential in the fine arts, music, dance or athletics. The 1984 Special Education Law stipulates that programs be provided for the gifted and talented in all these areas.

As Wu has pointed out, the long-term goals of gifted education in Taiwan include "the establishment of programs for academically talented students in all areas of the country in order to meet the national need for well-educated leaders" and, in addition, a "broad program of talent development is envisioned by both the nation's communities and leaders to foster the growth of Chinese culture and a general view of Western culture" (Wu, 1992, p. 280).

Over the past 30 years, there has been a rapid increase in special classes and resource classrooms together with an increase in the number of special class teachers trained for those classes. Self-contained classes and resource room classes both emphasize enrichment. A variety of acceleration procedures—"early entrance, grade-skipping, early graduation, telescoping of grades, exemption from entrance examinations, etc." (Wu, 1992, pp. 279-280)—are also employed.

Acknowledging that "any innovative program needs the encouragement and material support of the government and people to become successful", the Taiwan Ministry of Education employs a variety of strategies including curriculum design, teacher training, resources and research" (Wu, 1992, p. 280).

The Philippines

A commitment to gifted education was written into the 1987 Constitution of the Philippines, ten years after the then-President Marcos in his proclamation opening the Decade of the Filipino Child (1977-87) stated that:

there should be a program of identification for the specially gifted and a program for the development of their special gifts within the formal and non-formal systems of education. Children from the lower income classes or depressed areas should be provided the proper environment with enough challenge and stimulus for the development of their talents (Sutaria, 1983, p. 1).

One of the first important steps in gifted education occurred much earlier when the Philippine Science High School was opened in 1964, following passage of a bill in Congress recognizing the importance of identifying and nurturing the academically talented. There are now several special high schools for science or the arts supported by the Philippines government.

The regional governments vary in the nature and

extent of services actually provided. For example, Metro Manila established Silahis Centers in a half-dozen elementary schools in various districts which provide various acceleration and enrichment opportunities for the gifted/talented. Most of the thirteen regions provide some special classes and special programs, including accelerated programs, mainly in schools in the larger population centers.

The fiscal and political situations in the Philippines have had a serious impact on the support of gifted education. The strongest support for gifted education comes from such non-governmental organizations as TAG Philippines (Talented and Gifted Philippines) and Gifted Philippines, Inc. (GPI).

Eastern European Nations

The political, economic, social and philosophic conditions which came with the break-up of the Soviet Union and the Eastern European Bloc have had a strong impact on gifted education. As Sekowski (1992) has put it: "The political system which has been governing Middle East Europe since the Second World War has not positively influenced the atmosphere around the research on giftedness or on the educational work with gifted persons" (p. 104). Driven by a particular notion of egalitarianism, Sekowski asserts, official doctrine was that the talent would emerge on its own and that special provisions were discordant with the prevailing socialist ideology.

Similarly, Dockal, Laznibatova, and Kovac (1992) observe that: "During the time of the 'socialist build-up' in Czechoslovakia it had not been possible to examine the topic of special talents in children, as school policy was focused on 'averaging out' the population" (p. 177). It was only during the Soviet-American competition for primacy in space in the 1960s that programs for the gifted were openly discussed and established.

Yet, in a 1978 study titled *Paths to excellence and the Soviet school*, Dunstan (1978) tried to dispel common misunderstandings regarding Soviet socialist ideology. His study focuses on high-ability children, shows why they came to receive special attention, examines how they are provided for, and discusses problems of differentiation and selection which many of these forms of provision entail (p. 11). Dunstan described curriculum differentiation in the secondary general school; special schools for the arts, sports and circus, foreign languages, mathematics and physics; mass schools with special profiles; differentiation within mass schools; extracurricular activities in academic subjects and various olympiads. All of these programs and provisions functioned, of course, only with the official sanction and support of the central government. Dunstan concluded that during the two decades of 1958-1976, Soviet secondary education became increasingly differentiated: "The need to compete successfully with the West and to sustain the onward march towards communism in an

epoch of unprecedented scientific and technological advance . . . lent urgency to the quest of identifying young talent and the search for more efficient ways of subsequently exploiting it" (Dunstan, 1978, p. 246). However, these thrusts and programs operated in the midst of ideological controversy.

Sekowski (1992) argues that the political and economic changes presently occurring in Middle East Europe make it difficult, if not impossible, to find common trends amongst the newly independent former Soviet nations. Education in these nations is undergoing significant reform and gifted education is part of this change process.

Brazil

Brazil is a federal republic in which the states are responsible for providing elementary and secondary education and the federal government cooperates technically and financially. In 1987, the Federal Education Council approved a work group report titled *The hour of the gifted: A Federal Education Council proposal* which recommended a broad definition of giftedness, the employment of comprehensive identification procedures, the design of alternative programs and provisions, incentives for universities to promote studies and undertake research on the gifted, and the participation of the family, school and business community in the provision of "opportunities and means to involve and integrate gifted children into the Brazilian society" (Brito da Silva, Genio, & Ancona-Lopez, 1988, p. 18).

The Ministry of Education published some basic directives regarding working with the gifted: (1) With the exception of identified geniuses, gifted children should attend regular classes and be provided with suitable enrichment; (2) In the regular classes, not only should attention be given to nurturing individual talents but also to "the harmonious development of [the gifted child's] personality"; and (3) Based on individual needs, the special treatment should include "a more enriched school curriculum and/or the possibility of accelerated studies . . . , or the two may be combined" (Brita da Silva et al., p. 19). With the adoption of the Federal Education Council proposal and the creation of a Ministry of Education Office of Special Education, it was hoped "that helping gifted children in Brazil [would] acquire new dimensions without neglecting the efforts necessary to universalize elementary education for all Brazilians" (Brito da Silva et al., p. 19).

Because of the federal structure of government, it was left to the states to establish their own strategies and standards although the Ministry of Education advanced some model programs and procedures for guidance. The states have responded to this challenge differently, depending on the general education problems each faces and the nature of the resources available. For example, the Federal District (Brasilia) established guidelines in its Education Plan which resulted in the initiation of

"some activities to identify and specific procedures to work with gifted or talented students" (Brito da Silva et al., p. 20).

Not subject to Ministry of Education or state directives or guidelines is an independent educational complex, the *Objetivo Educational Center*, with preschool, elementary, secondary and college level programs in 23 states, serving more than 150,000 students. Serving mainly students from middle- and upper-middle-class families, this organization has been concerned with gifted students since 1973 and has carried on research and development activities which have been shared with the public sector.

In Conclusion

Programmatic efforts to identify talent potential and nurture it to talented performance are affected by governmental policies. How these efforts are affected depends on a number of factors such as the structures and relationships between governmental levels and the provision of resources to schools. Whether such policies are clearly stated or only implied and whether they are of a directive or discretionary nature, they impact on all aspects of gifted education, promoting and facilitating or impeding or preventing programs.

In the United States, at the state level where responsibility for providing schooling rests, it is through legislation, rules and regulations that policy is expressed, directly or by implication. Rules, regulations or legislation constitute the state's "statement" that may mandate that local school districts create programs for the gifted or support discretionary efforts initiated at the local level, depending on the nature of the state-local education relationships—the kind of funding and accountability, curricular and instructional direction, supervision or monitoring, etc. that the state requires from or provides for its local districts for education and schooling in general. Because of these different relationships between SEAs and LEAs, there is no single model shaping the policies, regulations, rules and guidelines in the 50 states. Nor is there a consistent pattern as to which policy—one that mandates or only permits programs for the gifted, providing greater or lesser specificity, clearer or less clear standards, more or less detailed directives, rules or guidelines—results in gifted programs which are "better", more stable and have greater continuity.

There is a broad range of policies in the illustrative examples of policies in other countries—from strongly endorsing efforts on behalf of the gifted and talented to antagonism toward such endeavors. In the case of the latter, it is often the socio-political context and a particular concept of the egalitarian ethic which creates the hostility toward the gifted and talented. Education and schooling do not take place in a vacuum.

The passage of legislation or the formulation of regulations which express a government's policy occur as part of a complex social, economic, political, philosophical

and educational context. Increasingly, advocates of gifted education—whether they be educators, parents, politicians, community leaders or other interested parties—have come to understand the importance of policies which attempt to identify and provide appropriate experiences for individuals with potential for outstanding achievement in socially valuable areas.

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PART II

Conceptions and Development of Giftedness and Talent

Structural Tendencies and Issues of Research on Giftedness and Talent

KURT A. HELLER

University of Munich, Germany

Introduction

During the last few decades a change has been taking place in the concepts of giftedness and talent as they are featured in research literature. Whereas until ten or fifteen years ago the field was dominated by one-dimensional giftedness concepts and corresponding IQ measurements, a large majority of more recent models are based on multidimensional or multifactorial psychometric concepts of intelligence—e.g., Gardner's (1985) theory of multiple intelligences—on approaches from information theory and cognitive psychology—e.g., Sternberg's (1985) triarchic intelligence model. Other models still include elements from socialization theories, e.g., Mönks' (Mönks et al., 1986) extended Renzulli model. Furthermore, I agree with Sternberg's demand that (1990, p. 96): "We need to think in terms not only of multiple components of giftedness, but (also) of multiple kinds of giftedness".

"Giftedness" is thus defined as the individual cognitive and motivational potential for—as well as social and cultural conditions of—achieving excellent performances in one or more area such as in mathematics, languages, or artistic areas with regard to difficult theoretical vs practical tasks (Heller, 1989, 1992). "Talent" can be defined as a domain-specific gift or ability, e.g., "scientific ability" as the competence for scientific expertise in the fields of psychology, medical sciences, or physics. However, the differentiation suggested by Gagné (1985) between "giftedness" and "talent" is infrequently maintained in the literature. In many languages—as in German—both concepts are used more or less synonymously. For this reason, no semantic differentiation was insisted upon in this handbook between "giftedness" and "talent". When this makes sense in individual cases, the differentiation is explicated in that context. This also holds true for related terms, such as intelligence, creativity, or (high) ability, that are not independent of the theoretical basis in which they are found.

In addition, the definition of giftedness etc. is dependent on the intended use, for example, on the type and tasks of school programs, the aims of enrichment vs

acceleration programs, on empirical investigation goals and theory-based hypotheses, etc. Moreover, the term "giftedness" or "talent" is influenced by social norms and considerations (Tannenbaum, 1983, 1991; see also Sternberg in this handbook, Chapter 11). Last but not least, the definition of giftedness will be determined by the choice of measurement instruments, i.e., by the operationalization of the experimental variables examined (cf. Feldhusen & Jarwan in this handbook, chapter 13).

A differentiation between descriptive and explanatory terms is also relevant when looking at research strategies. Whereas the *descriptive* term is linked to the psychometric paradigm, the *explanatory* term needs an experimental design in the cognitive science paradigm. For example, on the one hand the psychometric intelligence structure theories enrich the ability phenomenology substantially, on the other hand the cognitive psychological (experimental) studies make it possible to explain the mechanism of cognitive processes and their individual sources. This also corresponds to the various identification strategies: status vs process diagnosis (see Part III of this handbook). Both descriptive and explanatory terms are necessary for theoretically and practically efficient conceptualizations and measures.

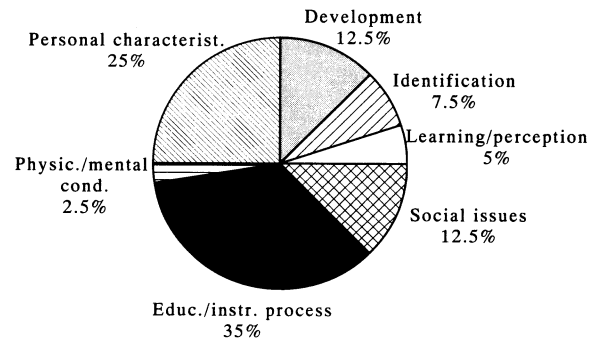


FIGURE 1. Content analysis of the WCGT conference proceedings: Percentages of the main topics 1975-1991.

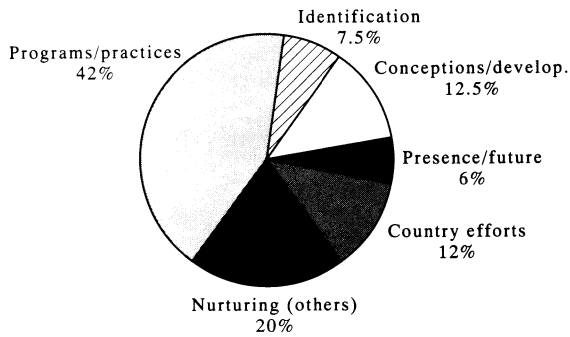


FIGURE 2. Percentages of the main topics of the WCGT conference proceedings (1975-1991) according to the structure of this international handbook.

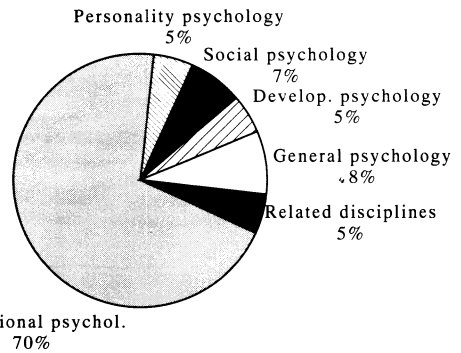


FIGURE 3. Classification of the papers published in the WCGT conference proceedings (1975-1991) according to psychological subdisciplines.

International Trends and Topics of Recent Research on Giftedness and Talent

The state of the art of research on giftedness and talent to be presented here is based on content analyses of (a) the previously published nine volumes of proceedings from the World Council for Gifted and Talented Children (WCGT) and (b) four or six relevant field journals. For more details see Heller and Menacher (1992) and Heller (1993a). Supplementary to this, additional journal analyses and literature searches by Pyryt (1988), Rogers (1989) and Carter and Swanson (1990) are reported.

The conference articles from the WCGT since 1975 are shown in Fig. 1. The first of the biennial WCGT conferences was in 1975. The articles are classified according to seven main topics. It becomes apparent that the categories "Educational/Instructional Processes and Programming" with a median of 35% and "Personal Characteristics of G/T" with a median of 25% have the most entries, relatively speaking. These are followed by the categories "Development" and "Social Issues" with 12.5% each. An additional 7.5% of the published articles are concerned with "Identification" problems, 5% with "Learning and Perception" and only 2.5% with "Physical and Mental Conditions" (median of each calculated from the nine previously published conference proceedings). This picture does not change much if we redefine the categories somewhat. If one prefers to use the structural concept from this handbook, then we find the division as shown in Fig. 2. Once again, we find a clear dominance in the area "Education and Nurturing Problems" (see Fig. 2).

The following analysis results are very informative about the psychological subdisciplines which contributed to the WCGT conference proceedings: Approximately 70% of the contributions stem from Educational Psychology (including Education); 7% of the topics are Social Psychological Problems of giftedness. Develop-

mental Psychological contributions and Individual Differences are each represented in 5% of the contributions and an additional 5% are from related disciplines (e.g., Sociology or Psychiatry); cf. Fig. 3. Thus, there is an emphasis on applied topics in conference proceedings.

This impression is confirmed in the analysis results presented in Fig. 4. The 20% theoretical and only 5% basic research (mainly experimental) contributions can be contrasted with 20% databased (empirical) studies in the sense of applied research as well as 55% more or less related to gifted education in practice (cf. Fig. 4). The WCGT conferences mainly meet practical needs in gifted education. Real research contributions, i.e., those based on hypotheses, make up approximately one quarter of all conference papers. An even smaller percentage of theoretical papers can be added to this. But hardly a third of the contributions would meet the usual scientific standards. This estimation holds true when the category "Theoretical Papers" includes not only "Review and Survey" articles, but also "Opinion Papers".

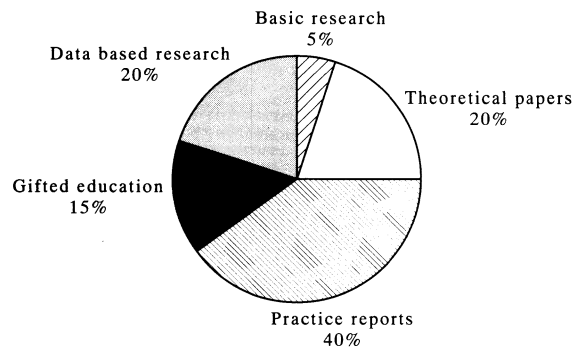


FIGURE 4. Classification of the papers published in the WCGT conference proceedings (1975-1991) according to research vs practice reports.

TABLE 1
Age Groups and Sample Sizes in the Data Based
Contributions to the WCGT Conference Proceedings
(1975–1991)

Age groups	3%	preschool
	13%	primary education
	45%	elementary/secondary education (grades 4–8)
	23%	later secondary education (grades 9–12)
	3%	higher education
	13%	adulthood
Sample sizes	42%	$n =$ under 100
	42%	$n =$ 101–500
	10%	$n =$ 501–1000
	6%	$n =$ 1001 and more

When we analyze the databased studies which make up about 25% of all contributions in the WCGT conference proceedings according to methodological aspects, then we obtain the following information: The most frequently studied group are students from grades 4 to 8 or 12, with mainly small to mid-sized samples (Table 1). With 71%, the interview is clearly the preferred instrument of analysis. Cross-sectional designs were used in 67% of the studies, whereas longitudinal studies are found—as expected—in only 10%. This is probably due to the high demands on such studies (Table 2).

The type of research represented in the proceedings corresponds somewhat with the results from Pyryt (1988), Rogers (1989) and Carter and Swanson (1990), who undertook content analysis of relevant journals. Here, too, the more practically oriented applied research dominated, generally using more simple statistical analysis methods. There is an enormous need to “catch up” in the area of experimental research on giftedness.

This has already been emphasized by the information presented in Figs 3 and 4 above. One rapidly forms the assumption that the research represented by the WCGT conference proceedings is heavily influenced by educational psychologists, educational scientists, and teachers. These individuals are, of course, more interested in solving practical problems of gifted education, programming, and identifying, counseling and guidance problems than in the development of scientific methods for identification and program evaluation or even theoretical questions and developing models.

With regard to a theoretically based identification and nurturance practice as is repeatedly called for by experts (e.g., Gallagher, 1985; Shore, 1986), a greater representation at conferences by researchers from various disciplines is desirable and useful. Before I make a few recommendations about this, the most important journals in the field should be analyzed with regard to their content. According to most recent literature searches by Hany and Hany (1992, p. 237)—source: PsycLit 1986–1991; descriptor “gifted”—the following

journals have the most frequent contributions on giftedness (the total frequencies are in brackets): *Gifted Child Quarterly* (126), *Roeper Review* (119), *Journal for the Education of the Gifted* (88), *Gifted Education International* (22) as well as *Psychology in the Schools* (22) and *Journal of Counseling and Development* (21). In our content analysis, we therefore considered the first four journals supplemented by two others: *Exceptional Children* and the *Journal of Educational Psychology*. These two journals were selected as a “control group”, since they also publish articles about giftedness but do not specialize in this field and also contain articles on other topics. The most recent 10 or 12 volumes were used in the content analysis; we only had the *Roeper Review* volumes from the year 1987 to present available to us. In order to be able to compare the articles published in the journals with those in the conference volumes from the WCGT proceedings, we also used the categories seen in Figs 1 and 2. The most important results are summarized in Figs 5–8. Here the following questions were asked:

(1) Which topics are most frequently dealt with in the giftedness-related journals?

(2) Are there differences between the four journals that are giftedness related and the two journals in the control group?

(3) What types of articles appear in these journals?

(4) Furthermore, these findings are to be compared with the results from the WCGT conference proceedings analysis. The question which interests us the most, is whether the results to be found in the WCGT proceedings on the situation of research in the field of giftedness can be confirmed by this second content analysis of the most important journals in the field.

Independent of the category system used for analyzing the journals, the following picture is found (cf. Figs 5 and 6): The topics “Gifted Education” and “Programs and Nurturing” are most frequently represented in all four giftedness-related journals (between 30% and 60%). The topics “Characteristics of the G/T” are relatively more frequently dealt with in JEG (30%) and GCQ (28%). The corresponding values in RR are (21.5%) and GEI (19%). “Social Issues” is most frequently found in GCQ (13%); “Identification” makes

TABLE 2
Measurement Techniques and Research Designs of the Data
Based Contributions to the WCGT Conference Proceedings
(1975–1991)

Measurement techniques	71%	interview
	5%	observation
	19%	(quasi) experiment with intervention
	5%	(quasi) experiment without intervention
Research designs	23%	single-age group
	67%	cross-sectional
	10%	longitudinal

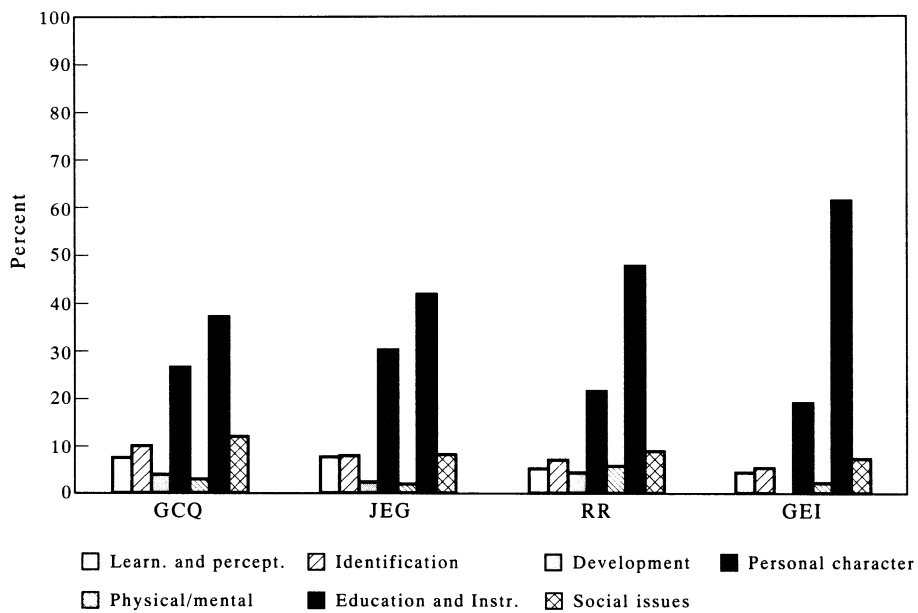


FIGURE 5. Percentages of the main topics in the four analyzed gifted field journals (1980–1991).

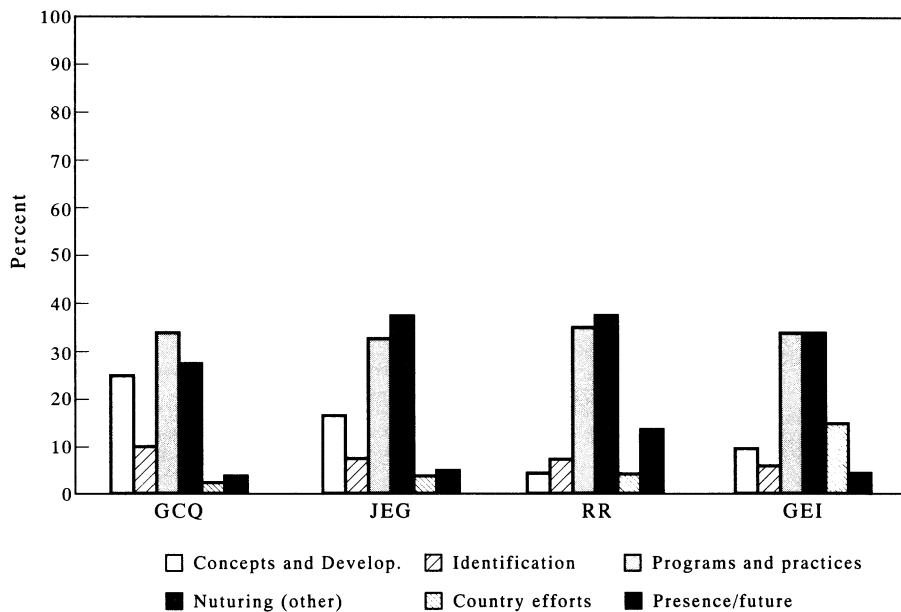


FIGURE 6. Percentages of the main topics in the four analyzed gifted field journals (1980–1991) according to the structure of this international handbook.

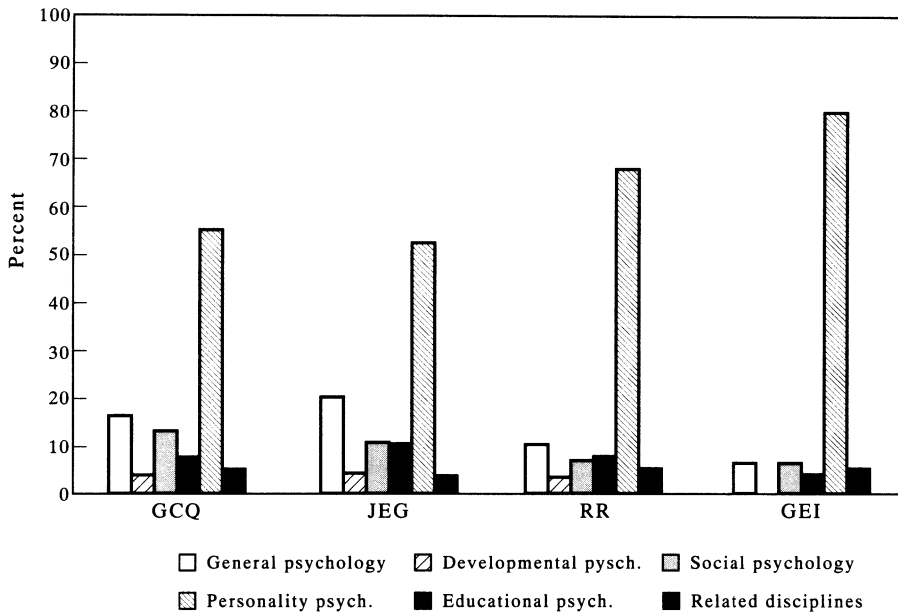


FIGURE 7. Classification of the articles published in the four analyzed gifted field journals (1980–1991) according to psychological subdisciplines.

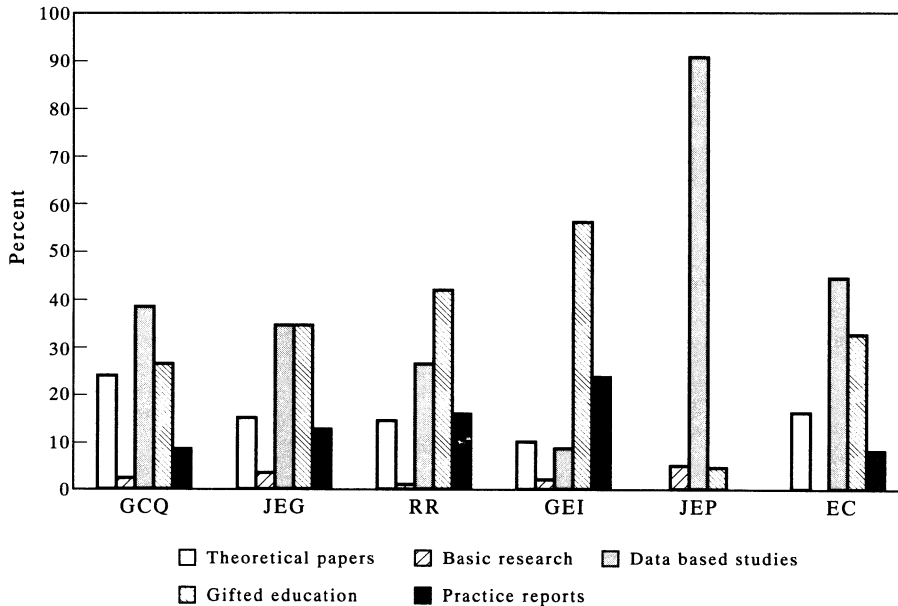


FIGURE 8. Classification of the articles published in all (six) analyzed journals (1980–1991) according to research and practice.

up 7.5% each in GCQ and JEG. The percentages for "Learning and Perception" as well as "Development" are astonishingly low in all journals (Fig. 5). Solely, the broader category "Concepts and Development" obtained higher values in GCQ (27%) and JEG (16%); (Fig. 6). These results generally confirm the findings from Rogers (1989) and Carter and Swanson (1990).

If one compares the individual journal profiles, GCQ and JEG on the one hand, and RR and GEI on the other hand can be joined in more homogeneous subgroups. The obvious emphasis of both RR and GEI is the category "Gifted Education", followed at a clear distance by the topic "Characteristics of the G/T". The profiles of GCQ and JEG show a more balanced content structure. This picture is even clearer when we analyze the contributing psychological subdisciplines (cf. Fig. 7). Indirectly, one can conclude from this that the profile in GCQ and JEG (cf. Pyryt, 1988; Vockell & Conard, 1992) is more strongly research oriented and in GEI and RR more practically oriented.

The journals chosen as control group, EC and JEP in Table 3, have a more balanced content structure as compared with GCQ and JEG even when using the identical categorical system. It should be pointed out, however, that the relationship of giftedness-related articles to the total number of articles is negligibly small in the profiles of the control group journals (percentages in brackets). The number of contributions found by using the descriptor "gifted" in PsycLit 1986–1991 is 14 in JEP, 10 of which are all to be found in the year 1990 (special topics issue). Between 1986 and 1989, and in 1991, absolutely no relevant contributions were published (Hany & Hany, 1992, p. 237).

Thus we again see the need for special journals in the field of giftedness and talent. On the other hand, this specialization of publications makes *interdisciplinary* work more difficult. This is reflected in extremely low quotas of giftedness-related articles in the journal control group (see Table 3, percentages in brackets). In order to recognize the research percentages of the analyzed journals better, the following categorical system was used for evaluation:

- (a) theoretical papers,
- (b) contributions of basic research,
- (c) contributions of applied research,
- (d) papers concerning gifted education,
- (e) practical reports.

The information from Fig. 8 can be summarized as follows:

Reports of databased research are represented by about 40% in GCQ and JEG; the results from RR (27.5%) and GEI (10.5%) show definitely lower median values. This corresponds to a research proportion of approximately one-third of all articles which were published in one of the four journals in the field of giftedness during the last decade. This also corresponds relatively well to the content analysis of the literature on giftedness by Rogers (1989). Rogers considered 2680 citations

during the period from 1975 to 1986 (searches of the ERIC, ECER, PSYC, and Child Development Abstracts; descriptors "gifted" and "creative"). These were evaluated in 15 categories; the results are presented in Table 4.

Our agreement in the analysis of GCQ was even better with the findings of Pyryt (1988), where we found 39.5% of the articles of applied and 3.5% of the articles of basic research whereas Pyryt found 39.7% research articles—abstracted in the ERIC system over an eight-year period—for GCQ. The almost negligible percentage of *basic* research articles in all four analyzed gifted journals also agreed with the values found by Pyryt (1988) with JEG and GCQ (about 3%) achieving the highest values. According to this, multivariate statistical techniques or more complex designs are employed relatively infrequently.

Rogers (1989) as well as Carter and Swanson (1990) came to very similar conclusions; see Tables 5 and 6. We calculated a median of 24% (quasi) experiments in the WCGT conference papers published in the proceedings; see Table 2 above. In contrast, the percentage of the databased research articles in the two journals of the control group are much higher. In the JEP more than 95% of all publications were databased (cf. Fig. 8, above).

Complementary to this, the GEI has the relatively highest percentage of gifted education or practice-related publications, followed by RR. The lowest quota is found in JEP; however, one should not forget the quite low percentage of giftedness related articles in total in this journal.

The content analyses of both the WCGT conference proceedings (1975–1991) and the most important journals in the field of giftedness and talent during the same period showed a number of similar results. The most important can be summarized in three statements.

(1) The main focus of the recent literature in the field of giftedness and talent is on practical problems of *gifted education* and related questions.

Half of the articles published in JEG and GCQ and even two thirds of those published in GEI and RR and those papers published in the WCGT conference proceedings contain information about practical problems of educational and instructional issues, programming, and nurturing the gifted/talented. In contrast, the minimal consideration of basic research questions and those theoretical-innovative considerations related to these is remarkable. There have been repeated warnings in the literature about the disadvantages for both applied research and for improving the practice of gifted education, e.g., from Gallagher (1986), Feldhusen (1989) or Passow (1989). Obviously, not much has changed with regard to this recently. The summary made by Carter and Swanson (1990) at the end of their analysis of the most frequently cited gifted journal articles since the Marland Report holds true without limitation for the results presented above. I quote:

TABLE 3
Percentages of Main Topics in the Journals of the Control Group (JEP, EC)

		<i>Journal of Ed. Psych. (JEP)</i> 1980–1991		<i>Exceptional Children (EC)</i> 1980–1991	
I	Learning and Perception	14.5%	(0.5%)	12.0%	(0.4%)
	Identification of G/T	9.5%	(0.2%)	4.0%	(0.1%)
	Development of G/T	5.0%	(0.1%)	16.0%	(0.5%)
	Personal Characteristics	47.5%	(1.0%)	28.0%	(0.9%)
	Physical/Mental Condition	—	—	8.0%	(0.3%)
	Educ./Instructional Processes and Programming	9.5%	(0.2%)	24.0%	(0.8%)
	Social Context and Influence	14.5%	(0.3%)	8.0%	(0.3%)
II	Conceptions and Development	28.5%	(0.5%)	24.9%	(0.8%)
	Identification of G/T	14.5%	(0.3%)	16.0%	(0.5%)
	Programs/Practices of Nurturing G/T	5.0%	(0.1%)	28.0%	(0.9%)
	Other Components of Nurturing the G/T	47.5%	(1.0%)	20.0%	(0.6%)
	National Efforts, Policies, and Programs, etc.	—	—	4.0%	(0.1%)
	Presence and Future of G/T Education	5.0%	(0.1%)	8.0%	(0.3%)

I = Classification according to the categories in Figure 5.

II = Classification according to the categories in Figure 6.

“One of the most perplexing findings from this study is the infrequent use of psychological theory to study the concept of giftedness or to develop programming for the gifted. Certainly theories on intelligence/cognition (e.g., Davidson & Sternberg, 1984; Flavell, 1977; Shore, 1986, 1987; Sternberg, 1981, 1985) and human development (e.g., Bullinger & Chatillon, 1983; Carter & Ormrod, 1982; Horowitz & O'Brian, 1985; Janos & Robinson, 1985) can contribute much to our understanding and can lead to the improvement of practical concerns that have continued since the Marland Report (e.g., identi-

fication procedures, programming approaches, and curriculum development)” (Carter & Swanson, 1990, p. 122).

New recognitions with regard to the research content are, of course, also dependent on new methodological innovations. We call for not only more multivariate statistical techniques and complex designs, but also longitudinal studies instead of the usual cross-sectional designs. A current overview of longitudinal studies in the field can be found in Subotnik and Arnold (1993); also see chapter 9 in this handbook.

TABLE 4
Category Frequencies and Percentages for Research and Non-Research Based Publications According to Rogers (1989, p. 81)

Category	Research Based Publications		Non-Research Based Publications		Total
	<i>n</i>	%	<i>n</i>	%	
Computers/technology	2	—	37	2	39
Teacher perceptions of students	43	5	115	6	158
Student perceptions of teacher curriculum quality	18	2	327	18	345
Acceleration	8	—	23	1	31
Program spending/planning	32	4	180	10	212
Females/career counseling	25	3	88	5	113
Social/emotional development and family relationships	98	10	253	14	351
Cognitive characteristics	225	29	114	6	339
Identification/testing	157	18	150	8	307
Creativity	33	4	136	8	169
Early childhood	4	—	31	2	35
Program treatment	163	19	217	12	380
Special populations	40	4	40	2	80
Educational strategies	11	1	62	3	73
Teacher/training qualifications	11	1	37	2	48

TABLE 5

Statistical Techniques Used in Gifted Child Quarterly (CGQ) Articles (1980–1987) According to Pyryt (1988, p. 10)

Technique	Frequency
Descriptive Statistics Summary	23
Qualitative	2
Chi-Square	16
Bivariate Correlation	22
Kruskal-Wallis	1
T-Test	21
ANOVA	30
ANCOVA	8
MANOVA	7
MANCOVA	3
Discriminant Analysis	4
Canonical Analysis	6
Multiple Regression Analysis	6
Factor Analysis	6

In addition, the cooperation of researchers and practitioners needs to be increased. Once again, I quote Carter and Swanson (1990, p. 122):

“These efforts should focus on (a) identifying key issues and concepts, (b) synthesizing the literature around those issues and concepts, (c) conducting meaningful, theory based research, and (d) extending and elaborating research findings to both theoretical and practical settings”.

The interaction of theory and practice in the area of nurturance of the gifted was reduced by Julian Stanley (cf. George et al., 1979) to the well-known formula of three Ds: Discovery, Description, and Development. In addition see Mönks and Heller (1993).

(2) Basic and applied research in the field of giftedness and talent should be supported by *interdisciplinary approaches*. This should provide information about the developmental conditions surrounding giftedness and talent and also improved solutions to practical problems, such as identification and nurturance of giftedness inside and outside school.

Interdisciplinary cooperation in the area of research on giftedness is primarily necessary between educational specialists and psychologists, but also within these disciplines, e. g., between the various psychological subdisciplines, as they are presented in Fig. 7. Above and beyond this, other related disciplines are called upon to cooperate, such as neuroscience, genetics and brain research, artificial intelligence or expertise research. As experience in other areas has shown, surprising theoretical insights can be obtained due to the change in perspective and sometimes different methodology in interdisciplinary cooperation. In addition creative solutions to practical problems can be expected. Although the existence of specialized journals seems to be quite justified based on the content analyses (and their resulting in greater research vs practical emphases meeting current interests), one should not lose sight of the

danger of isolation from other related disciplines and journals. The interdisciplinary cooperation is more or less blocked rather than increased by such an approach. Perhaps we should consider how the contributions from other disciplines can be more frequently won for gifted journals. A further possibility is to publish interdisciplinary special issues, etc. In addition, the program of the WCGT conferences should include interdisciplinary symposia or workshops so that the research on giftedness does not become too isolated from important related disciplines, especially from the mainstream of psychological and educational research (cf. Jackson, 1993).

Furthermore, a close relationship with regard to information and experiences should be sought between researchers and practitioners. The demands sketched out here can most easily be met in interdisciplinary research groups. These should include especially qualified and research-oriented practitioners. Of course, alimentation problems could interfere with this idea greatly. A national system like that recommended recently by the American National Research Center on the Gifted and Talented—at the University of Connecticut in Storrs—could be used as a model. Presently we do not know how well organizations, such as those primarily concerned with practical problems of identification and gifted education could deal with this kind of system. I am thinking here of the programs from the *Study of Mathematically Precocious Youth* (SMPY) or the *Center for the Advancement of Academically Talented Youth* (CTY) at the Johns Hopkins University in Baltimore (U.S.A.), the *Talent Identification Program* (TIP) at the Duke University in Durham (U.S.A.), the *Center for Gifted Education* at the University of Calgary (Canada), and the *Center for the Study of Giftedness* at the University of Nijmegen (The Netherlands). They can certainly stimulate the international scene in research on giftedness and talent.

(3) *Cross-cultural studies* emphasize not only the worldwide importance of research on giftedness and talent, but are also important for examining theoretical assumptions of universality or specific cultural influences on the development of giftedness and are thus also necessary.

TABLE 6

Research Design Types for All Citations 1975–1985 According to Rogers (1989, p. 83)

Design	n	%
(Quasi) experimental	46	5
Review of research/meta-analysis studies	81	9
Protocol, content, discourse analysis	29	4
Survey	114	13
Case study	144	17
Correlation/regression/disc. analysis	194	22
Causal-comparative	246	28
Factor analysis studies	16	2
Total	870	100

The degree to which development and socialization theory assumptions for explaining individual differences are actually universally valid, can only be determined by cross-cultural studies. There are already individual psychological approaches examining the relationship of culture or subculture and individual development of abilities (e.g., Haensly, Reynolds, & Nash, 1986; Csikszentmihalyi, 1988). Current studies in giftedness also seem to emphasize cultural influences on the development of creativity (Hany, 1993; Hany & Heller, 1993).

The research on creativity is unsatisfactory both in terms of measurement instruments and in its theoretical basis. This is probably due primarily to incorrect universality assumptions. This refers to the neglecting of domain-specific factors of giftedness and also cultural socialization conditions. In view of current research on creativity (cf. Weisberg, 1986; Simonton, 1988; Sternberg, 1988; Glover et al., 1989; Runco & Albert, 1990; Sternberg & Lubart, 1991), most of the previous training methods for increasing creativity can be considered obsolete. Innovations in creativity research and creativity nurturance as in other areas of gifted education are primarily to be expected (according, for example to Gardner, 1989) from cross-cultural studies and are substantiated by impressive examples (see also Winner & Martino in this handbook, chapter 14).

Psychometric Versus Cognitive Psychological Paradigms: Different Tasks and Functions

The current situation in the research on giftedness and talent is characterized by two contrasting paradigms: the psychometric and the cognitive science paradigm. This is especially apparent with respect to basic research. Both paradigms, however, should be viewed less as competing but rather in terms of how they complement each other. Whereas the psychometric structural theories or correlation studies, for example, greatly enrich the giftedness *phenomenology*, cognitive psychological (experimental) studies are expected to provide information about the mechanisms of cognitive *processes* and their individual causes. In the former case, the *descriptive* function dominates, and in the latter the *explanatory*. Thus, this corresponds to the differentiation in personality research to *nomothetic* (psychometric) versus *idiographic* (cognitive psychological) approaches. For new theoretical recognitions about high ability *and* for practical giftedness models we need both paradigms. This is documented by the various contributions in this handbook. For an overview of the various conceptions and models of giftedness, see the following chapter.

Despite this demand, it should not be overlooked that quantitative differences in the *psychometric* approach have thus far been better confirmed than qualitative differences in the *idiographic* or cognitive psychological approaches, i.e., qualitative differences in the learning and thinking of the gifted versus non-gifted individuals

(Jackson & Butterfield, 1986; Rogers, 1986; Waldmann & Weinert, 1990). Therefore, a scientifically elaborated ideal conception of giftedness is not yet available, although there are promising attempts (see chapter 10 of this volume). Whether or not the status quo can be positively rated is not clear. Still, the historical discussion of genius becomes superfluous when we consider the contemporary state of knowledge.

An additional misconception should be cleared up at this point. In the psychometric approach, not only one-dimensional definitions of giftedness are possible, i.e., the g-factor of intelligence (based on IQ), but also multidimensional conceptions of giftedness. An example of this is Gardner's (1985) Theory of Multiple Intelligences, Gagné's (1985, 1991) Differentiated Model of Giftedness and Talents or the Munich Model of Giftedness (Heller & Hany, 1986; Heller, 1991c; Perleth & Heller, 1993; Perleth, Sierwald, & Heller, 1993). In contrast to the usual practice of a single IQ value being used for identification (see the overview by Rost, 1991, or Tannenbaum, 1992, as well as chapter 1 of this volume), the necessity of a multifactorial or multidimensional or rather typological model of giftedness is recognized here in agreement with the majority of more recent concepts of giftedness. This demand holds not only for the theoretical conceptualization of giftedness but also for practical purposes of identification and education of gifted youth.

On the other hand, the influence of general ability on academic achievement, especially in grade school, should not be underestimated—as shown by Cronbach and Snow (1977), Thorndike (1985) or more recently Rost (1991). In recent studies on school, university or professional success predictions for gifted youth, the usefulness of multidimensional or typological concepts of giftedness could be proven (summarized e.g., in chapter 17 of this volume). At the secondary school age and in adulthood, differential approaches to identification with consideration of measurements of domain-specific demands have been proven to be much superior to single dimensional IQ definitions. The fact that identification of the gifted nevertheless often takes place in adolescence using IQ measures, is probably primarily due to less energy necessary for measurements with traditional IQ tests and not justified by any methodological arguments. The proven superiority of IQ tests over creativity tests cannot be used as an argument against considering creativity characteristics in the identification of the gifted as long as the combination of intelligence *and* creativity predictors leads to a better prognosis of outstanding achievement than an IQ test alone (Hany & Heller, 1991; see also chapter 11 in this volume). Above and beyond this, the usefulness of typological identification approaches must be emphasized with a view toward practical needs in gifted education in current literature (for an overview see chapters 12 and 13 as well as 18 of this volume). There is still no substitute for the psychometric approach for reliable and valid talent searches within the framework of enrichment courses

or for individual academic achievement predictions. This also holds true for developmental psychologically oriented longitudinal studies of giftedness (see chapter 9 of this volume).

However, purely psychometric identification procedures do have a number of obvious limitations. Interindividual differences in giftedness can be measured in this way, but this does not explain *how* they came into being. Such explanatory knowledge can only be obtained by means of cognitive psychological or rather experimental diagnostic strategies. In other words: Status diagnosis (psychometric) needs to be supplemented by process diagnostic (cognitive psychological, experimental) paradigms to provide theoretically and practically satisfactory information about gifted children and adolescents.

According to Facaoaru and Bittner (1987, p. 194), the following analytical units are characteristic for the research subject in the *cognitive psychological* paradigm:

Individual and developmental or age-related test achievement differences are not explained by global structural units or common achievement factors as within differential intelligence theories—i.e. by verbal or quantitative abilities—but rather through elementary process units such as information processing components. It is assumed that the so-called basic parameters of intelligence make up the individual thought processes. In Sternberg's component analysis, the speed of information processing, information selection and storage, the accessibility of available knowledge, etc. are taken into consideration. Corresponding taxonomies of cognitive components have been presented, for example, by Carroll (1976, 1981), Sternberg (1977, 1979, 1982, 1986), Rose (1980).

Whereas traditional intelligence theories within the *psychometric* paradigms study mental structures, the approaches to research of the gifted in the *cognitive psychological* paradigm study the mental components upon which the cognitive activities are based. The focus here is on the internal cognitive conditions and mechanisms as well as changes in the internal structure of knowledge, problem solving processes and thinking strategies, metacognitive competencies, etc.

The task division principle is typical of such component analyses. The well-known—and well-structured—intelligence test items are artificially divided into elementary components before they are again presented serially (Sternberg, 1977, 1986; Klix, 1983; van der Meer, 1985). As an alternative, test items can be employed together with successively presented information which is relevant for solving the problems (cf. Davidson & Sternberg, 1984; Davidson, 1986).

"In contrast to the traditional psychometric approaches where solely the number of test items

solved within a certain time period is counted up, within sequential information processing approaches, the speed (time necessary for each individual step in the solution process) and also the exactness (number of errors) and the course that problem solving takes (value of the independently produced intermediate solutions) are recorded. The individual steps are either recorded in writing or automatically using a computer simulation" (Facaoaru & Bittner, 1987, p. 195; free translation from German).

Waldmann and Weinert (1990), whose literature search provides a good overview of the current stand of research on thought processes of the gifted, expect the differential thought psychology to contribute heavily in the cognitive psychological paradigm to the development of theories in this context. A basic problem, however, is the extreme (inter- and intraindividual) variability of behavior in the gifted. A double risk results from this: unjustified generalizations versus inflationary model development, e.g., for explaining the problem solving behavior of gifted individuals. Waldmann and Weinert consider the development of a "theoretically well-founded, even if always provisional taxonomy of tasks and problem classes" to be an important task for future research from the general as well as differential psychological aspect. This cannot, however, be equated with a taxonomy of cognitive processes in problem solving. The enormous number of empirically identified cognitive processes makes it difficult to isolate task-invariant and non-domain-specific achievement predictors as was the long dominant research tradition. Waldmann and Weinert (1990, p. 179) believe that the flexibility of processes in problem solving is very great and that compensatory effects between various cognitive determinants are the rule rather than the exception.

"A basic problem of the psychometric approach was that similar and invariant ability patterns are postulated as independent of the giftedness quality (if one does not consider the theoretical variation of the differentiation hypothesis for the gifted). It is, however, certainly clear in the research tradition of the cognitive paradigm that higher thought processes play a decisive role in the explanation of exceptional abilities. One has to, therefore, cast doubt on the assumption that the research of giftedness is simply a specific variation of population-oriented differential cognitive psychology or whether it is not a search for specific structure and process characteristics of learning and achievement behavior in the gifted" (loc. cit.; free translation from German).

This again approaches the question of *qualitative* differences in the gifted vs non-gifted.

In an analogous fashion, more recent creativity research (e.g., Facaoaru, 1985) has been able to prove that both divergent and convergent thought processes are necessary for solving complex difficult problems—for example, in natural sciences and tech-

nology—in a creative way. This means that only the simultaneous employment of both divergent and convergent processes connected with adequate domain-specific knowledge increases problem-solving productivity (cf. Weisberg, 1986; Heller, 1991b, 1993b; Facaoaru, 1992). In addition to higher intelligence and the ability to use knowledge flexibly, Waldmann and Weinert (1990) claim that impulsive, fluid styles of thinking together with persistence and high intrinsic achievement motivation favor creative problem solving in demanding, challenging situations. In fact, more recent studies, primarily in the area of natural sciences, technological and mathematical giftedness, have been able to isolate a number of problem solving characteristics in the gifted that can be interpreted as *qualitatively* different from those in average individuals. For example, we can refer here to the experiments from Klix (1983) and van der Meer (1985) or Sternberg (1977, 1985, 1991). Linked to such cognitive psychological studies is the expectation that not only theoretically relevant explanatory knowledge will result from them, but also important information for the practice of raising and educating gifted individuals and nurturing the necessary knowledge of change.

Expert–Novice Paradigm, Cross-Cultural and Other Approaches in the Field of Giftedness Research

From a developmental psychological or instructional psychological perspective, it is especially interesting to see how the relatively general abilities and thinking competencies establish themselves. The learning processes necessary for this stretch over many years and are effected by many various internal (cognitive and motivational) and external (socialization and situational or context) variables. Because of these and possible compensatory effects, long-term predictions of outstanding achievement are difficult in early childhood (see chapters 15 and 27 in this volume).

In addition, the relative importance of *general* intellectual potential for explaining achievement variance decreases with age, and elaborated domain-specific knowledge bases for explaining expertise increase in importance. Long-term *individual* achievement predictions in childhood and adolescence with a certain degree of reliability are thus limited, i.e., to comparable situations. Modern knowledge psychology in the *expert–novice paradigm* is especially interested in those learning and knowledge acquisition processes which make it possible to achieve outstandingly in the sense of expertise. Accordingly, nurturance approaches for gifted students are thus directed less at ability constructs or predictors of giftedness in a narrower sense, and more at *learning* competencies. Some representatives of knowledge psychology (e.g., Gruber & Mandl, 1992) even suggest that one should not speak of the gifted but rather of experts, i.e., exchange expertise for the concept of giftedness. This would not

only take frequently neglected criteria problems from traditional intelligence research into consideration better than previously, but also approach more closely a social psychological definition of giftedness (e.g., Tannenbaum, 1983). On the other hand, a number of educational problems in the nurturance of giftedness, especially for so-called underachievers and gifted handicapped persons (cf. chapters 37 to 41 in this volume) would be mostly neglected in this approach. As useful as expertise research would appear to be in many cases, in other instances of fostering giftedness deficits become apparent.

New recognitions can be expected from expertise research, i.e., the comparison of beginners or novices with more experienced or expert individuals. This will primarily be found in the area of knowledge acquisition in *complex* domains which should compensate for a disadvantage of many ability-oriented (psychometric) studies. It is well-known that external or ecological validity is a major problem in measurements in the trait or factor approach. Expertise research could, thus, contribute to the description and analysis of domain-specific competencies in “natural”, complex demanding situations. At the same time, an attempt could be made to relate more closely various positions of learning and thought process research positions. Through the focus of learning theory questions about the *acquisition* of expertise and cognitive psychological *application* aspects on problem solving, they complement each other with regard to research on giftedness.

Empirical studies on the relationship of expertise and giftedness have been primarily carried out in the areas of music, sports and chess. For example, Gruber, Renkl, Schneider, and Kuhn (1992) examined the development of expertise in children and adolescents in a three-and-half year longitudinal study. In addition to the analysis of developmental courses in adolescent experts and novices in chess, predictors of various degrees of performance development were to be determined. Domain-specific short-term memory was measured. In addition, intelligence test values and results of biographical data were evaluated. The degree of expertise was defined by external criteria.

“The domain-specific memory performance from the first measurement was found to be a good predictor of unfavorable expertise development. It was well-suited to the identification of those who were identified during the first measurement as experts whose development would progress at a slow rate. It is probable that dispositional factors, such as memory capacity or intelligence, are responsible for the unfavorable expertise development. For the ‘entrance’ into an expert career, no person-specific predictors could be determined. In subjects who were novices at the first measurement and became experts, this was probably due to external experiences (e.g., entrance into a chess club based on corresponding peer relationships). . .

The superiority of practice-related variables versus

dispositional variables can be interpreted in two ways: On the one hand, it is possibly the expression of a *compensation* through practice comprehensible, which lets the expertise development appear to be independent of disposition when a certain degree of expertise has been achieved. On the other hand, one can express some doubt about the *validity* of measuring dispositional factors" (Gruber et al., 1992, p. 67; free translation from German).

The latter interpretation probably holds especially true for complex tasks or areas. For the initial explanation, which can utilize corresponding results of validity studies on school success predictions (Heller, Rosemann, & Steffens, 1978; Heller, 1984, 1991a), one should not overlook the confounding of cognitive learning abilities with learning activities. As a whole, representatives from expertise research seem to tend to underestimate the role of intellectual abilities in knowledge acquisition. The attempt is frequently made to support this with inadequately domain-specific intelligence test results. On the other hand, believers in the psychometric concepts of giftedness may be in danger of underestimating non-intellectual and situational prerequisites for learning. In this way, both paradigms can complement each other. An extensive valuation of the expertise approach as well as a detailed presentation of various methodological problems can be found in chapter 16 of this handbook.

With few exceptions (e.g. Amabile, 1983; Tannenbaum, 1983, 1991), *social psychological* aspects have been greatly neglected in the conceptualization of giftedness. This theoretical deficit is related to the psychometric research tradition where status diagnostically determined test scores (e.g., IQ scores) are considered to be—relative to corresponding (age) groups—invariant measures across the life span. Modern cognitive component approaches are also affected by this individualistic misinterpretation according to Waldmann and Weinert (1990). Cross-cultural cognitive psychological research provides, however, enough proof for the interaction hypothesis. According to this, personality characteristics as well as giftedness continually need to be seen as a product of interaction between individual factors and social-cultural determinants.

Attempts to describe such interaction processes need to include not only cognitive and non-cognitive (motivational) competencies, but also individuals' social abilities. These make it possible for a person to activate a potential gift in concrete social situations—particularly in the family, school and peer group (see chapters 4 and 5 in this volume). On the other hand, these activities are influenced by the quality of the learning environment. The development of corresponding systemic models of giftedness should be a rewarding research task. From a practical standpoint, the newly developed pentagonal model from Sternberg (chapter 11 in this volume) is of particular interest.

Cross-cultural studies cannot only provide important

information about social and cultural influences on the development of giftedness as well as nurturing and restraining socialization factors about gifted children and adolescents. Cross-cultural studies are also indispensable for examining the universality assumptions of many theories.

Cross-cultural research approaches to giftedness research can be expected to provide information about various cultural influences on individual developmental and educational processes (cf. Eckensberger & Krewer, 1990). This goal is to be achieved by specific research strategies making it defined not by its object but by its method (Petzold, 1992). Three comparative forms are relevant (a) cross-national, (b) cross-cultural, and (c) cross-societal. In the present context, cross-cultural studies are of interest. The systematic comparison of psychological variables or results obtained in various cultural conditions should help to identify culturally caused behavioral differences in individual development. This is a main problem in empirical cross-cultural research. Based on such research designs, universality assumptions of relevant developmental, educational and/or learning/instructional theories can be examined. This is something that Wilhelm Wundt emphasized at the turn of the century in his ethnological psychology.

This is also the approach taken by modern so-called *etic* (from *phonetic*) approaches in cross-cultural research on the universality of human behavior characteristics (universalism hypothesis). In contrast to this, the so-called *emic* approach (derived from *phonemic*) tries to determine cultural socialization influences within particular cultures (culture-relativism hypothesis). Corresponding culture-specific and valid measurement instruments which are also culture-fair make it difficult to really compare cultures. Thus, in more recent ecological psychological models (e.g., Berry, 1980), an attempt was made to overcome the dichotomy between "emic" and "etic" in an integrative conception (cf. Petzold, 1992, pp. 311–312).

Comparative cultural studies can provide new recognitions about social-cultural conditions in the development and nurturance of gifted children and adolescents because they force us to change our perspective. This could increase the variety and variance of nurturing ideas. This is not only of practical use, but tolerance and understanding of other cultures can be increased by cross-cultural research cooperation (Gardner, 1989).

To avoid or remove undesirable differences in the development of giftedness, both from the competence and performance points of view, a corresponding knowledge of change is necessary. This grows from the explanatory knowledge as it is obtained in experimental or quasi-experimental studies. For understanding sex-related and other giftedness and achievement differences, it is insufficient to carry out quasi-experiments in the social sciences, so that *interdisciplinary* research approaches can mediate furthering knowledge including neuroscientific and

biological research methods (see chapters 6, 7, and 40 in this volume).

Desiderata in the Research on Giftedness and Talent

The research on giftedness includes not only basic scientific research, but also technological and practice-oriented questions, i.e., tasks of applied giftedness research. In this context, possibilities for improvement related to the identification and practical nurturance of gifted children and adolescents increase in importance, reflected in the content structure of this handbook.

The applied research of the gifted is more or less based on reliable recognitions from basic research, e.g., from the area of experimental psychology. These are, however, still inadequate or provide, in part, non-uniform or contradictory results corresponding to the theoretical explanations. With regard to the "pressure to act" that practical research often feels from practitioners, a dilemma often arises: On the one hand, they should attempt to solve practical problems in a scientific and serious manner; on the other hand, this is impossible without adequate basic research and is hard due to the complexity of many practical fields. This often makes it necessary to compromise in applied research—also in the area of giftedness—while scientific methodological standards dare not be substantially impinged upon.

The model shown in Fig. 9 should clarify important relationships in research on the gifted and practical necessities of gifted education. Inasmuch as one considers formal nurturance of the gifted to be a function of individual personality development, a relationship exists, as shown in the model, between giftedness research and practical tasks in the identification and nurturance of the gifted, including evaluation of identification and nurturance measures.

A few exemplary research desiderata from the perspective of basic vs applied research are provided in the following (Heller, 1993a).

Deficiencies in the Field of Basic Research

—Lack of combined approaches of general and differential psychological perspectives for developing specific structure and process models for experimental designs in order to explain achieving excellence, expertise, etc.

—Few analyses of the development of metacognition, general vs specific knowledge bases etc.

—Little study of developmental courses of the highly gifted during the second half of the life span.

—Few system-theoretical analyses of individual and social components in the socialization process.

—Almost no cross-cultural studies in the field of high ability in order to verify or falsify theories, i.e., for testing hypotheses of universality.

—Lack of (quasi-)experimental studies aimed at causal

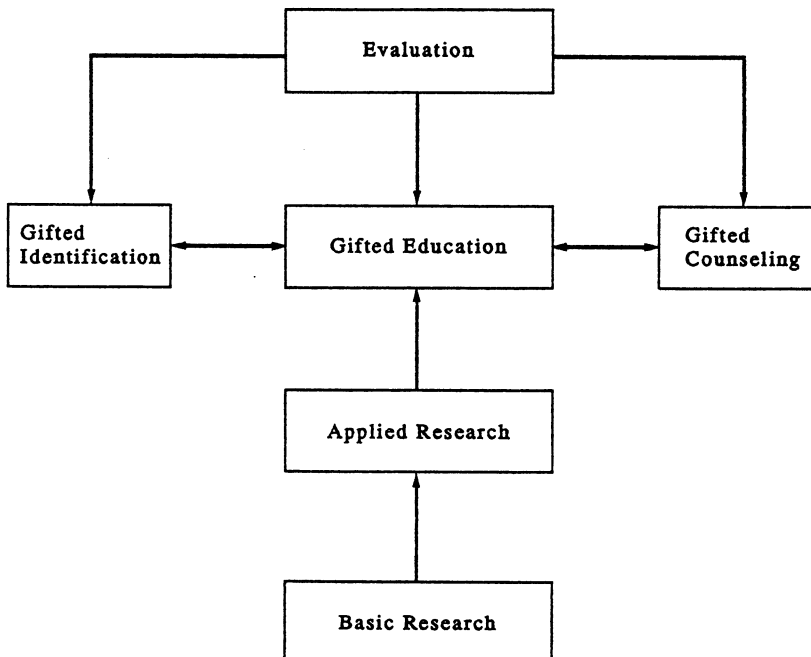


FIGURE 9. Relationship between giftedness research and practical tasks of gifted education.

analyses, e.g., of gender-specific differences, especially in the fields of mathematics, sciences and technology.

Deficiencies in the Field of Applied Research

—Very few multidimensional approaches and sequential strategies in the diagnosis of highly gifted and talented children and adolescents.

—Little process diagnosis (complementary to the so-called “status diagnosis”) in the field of high ability.

—Lack of intervention (and prevention) programs for balancing out gender-specific differences in competence and, above all, in performance, especially in the fields of mathematics, “hard” sciences and technology.

—No metacognitive and general problem-solving development programs as well as domain-specific knowledge-based programs for highly gifted students.

—Lack of evaluation of school programs and extra-curricular (enrichment vs acceleration) courses for the gifted and talented youth.

—Lack of expert systems for school psychologists, school counselors and study advisers in connection with problems related to high ability.

This list is incomplete and could go on forever, as one sees from the topics in this handbook. Among others the following research topics seem important to me with regard to *gifted education*.

Desiderata in the Research on Gifted Education

—Development of instruction concepts of talent didactics; didactic possibilities of differential, i.e., talent-oriented, instruction regarding cognitive instruction/learning contents.

—Curricular development for special academic courses, special classes or even special high schools for certain acceleration groups and for enrichment courses with extracurricular support of the gifted, including their evaluation (cf. Scriven, 1980, 1983; Wottawa & Thierau, 1990; Brandtstädter, 1991; Buchanan & Feldhusen, 1991).

—Longitudinal studies of the gifted including analyses of the life environment over a whole life span.

—Study of leisure-time activities of talented adolescents and their influence on personality development.

—Career problems of talented girls and women; especially in the fields of mathematics, natural sciences and technology.

—Analyses of metacognition, causal attribution (achievement motivation) styles, action control, the self-concept of talented adolescents, including sex-specific differences and problems, e.g., regarding situation orientation vs action orientation (Kuhl, 1981, 1987), self evaluation of heuristic abilities (Dörner et al., 1983).

Problems in *gifted identification* and *gifted counseling* have to be considered together. In consideration of

high risk groups, e.g., disabled talented girls or children of minority groups, the difficulties of differentiation in instruction and education require special attention. Despite a number of useful attempts over the past few years to identify and support talented children and adolescents, there is a lack of convincing evidence of the validity of many techniques, especially those which experts judge as innovative. Here, requirement-oriented diagnosis and support concepts (cf. Heller, 1984) could be useful, especially when they are linked to recent results of applied problem-solving research and knowledge psychology. On the other hand, possibilities of psychometric identification, e.g., in the aptitude testing paradigm, have by no means been exhausted (cf. Trost, 1986). There is often a considerable discrepancy between theoretical (multidimensional) identification and stimulation strategies (see Rost, 1991; Hany & Heller, 1991; Mönks, 1991). Independent of such controversies, the following topics for improving identification and support can be regarded as urgent (Heller, 1992).

Desiderata in the Research on Gifted Identification and Counseling

—Advisory aids for talent-orientated education, especially at preschool and primary school age.

—Advisory concepts for talented students, their parents and teachers.

—Early identification and support of the talented disabled.

—Identification and support of gifted girls (especially in the fields of mathematics, natural sciences and technology).

—Identification and support of gifted underachievers.

—Construction of process diagnostic identification instruments and their validation.

—Construction of domain-specific counseling tests for talented adolescents.

—Academic stimulation of creativity, in general and also in specific areas.

—General vs domain-specific thought training programs.

—Work training programs (e.g., for gifted underachievers).

—Quasi-experimental intervention studies for counseling and supporting gifted children and adolescents.

Evaluation

The *evaluation* of gifted education as well as of gifted identification and counseling takes on two functions, which are expressed in summative and formative evaluations in the sense of Scriven (1967). The *summative* evaluation is directed at measurements of effects (e.g., the effects of various gifted education programs or intervention effects), the feasibility of the corresponding measures is evaluated.

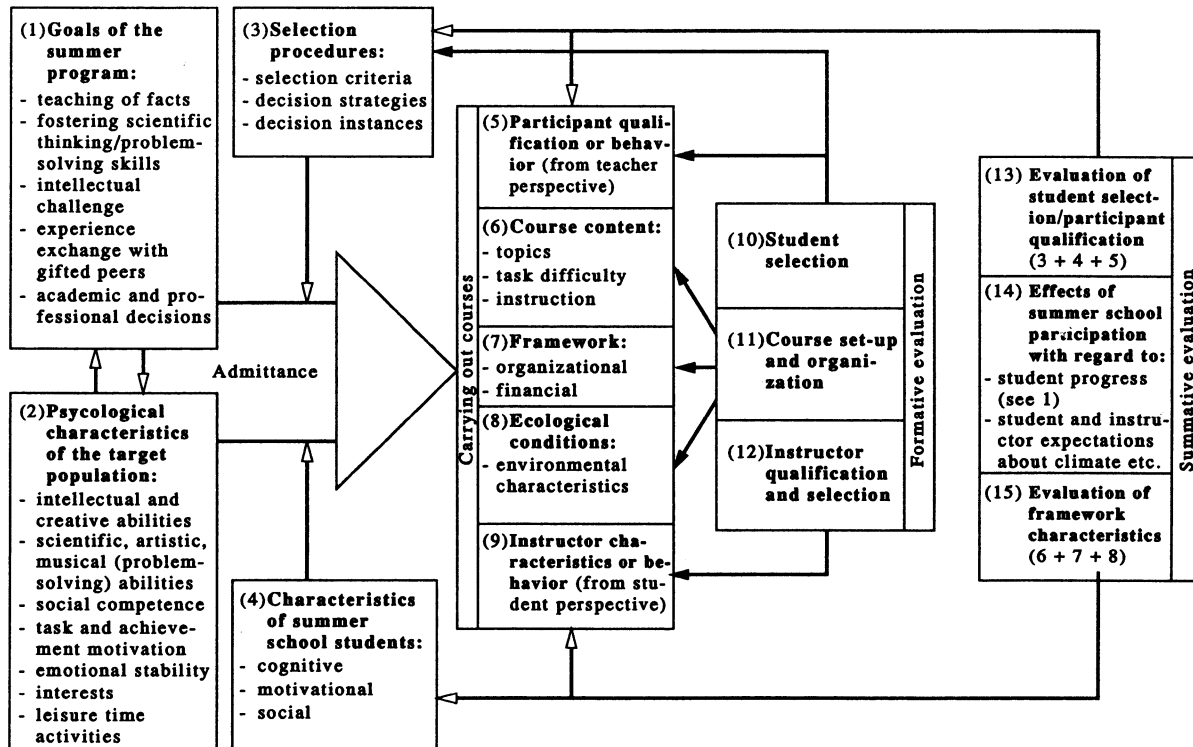


FIGURE 10. Evaluation model for a nationwide summer gifted program.

The *formative* evaluation is more or less directed at the optimization of nurturance and counseling measures, in the sense of action research. Since during the model project, the feedback of relevant evaluation results is given and effects the treatment, dysfunctions that may occur can be recognized, systematic errors eliminated and thus an attempt made to improve the treatment. Corresponding summative evaluation data at the end of the (quasi-) experiments can, however, no longer be interpreted as “independent” judgments. As long as the (formative) evaluation is intended to optimize the treatment, this is no disadvantage. If, however, two or more treatment concepts or models are to be compared with regard to their various advantages or disadvantages, only an independent summative evaluation (without a formative evaluation) can provide objective results. Thus, both forms of evaluation complement each other with regard to their various functions and can frequently be combined. This not only allows a *scientific* evaluation of treatment results but participants can be provided with important support during the trial phase by formative evaluation.

In the area of gifted education and also in the area of gifted identification and counseling, evaluation studies with scientific standards are still relatively rare. Also see Buchanan and Feldhusen (1991) and Callahan in chapter 34 of this handbook. Till now there has been an emphasis on case studies, essay reports or data (collected by those involved in the treatment themselves) which can hardly provide objective judgments. The model shown in Fig. 10 of the evaluation of a nationwide Summer Gifted Program (Summer School in Germany) exemplifies important elements of *scientific* model evaluation.

Research on Giftedness and Responsibility

Finally, the relationship between research on giftedness and the individual vs social responsibility will be discussed from several points of view. The following five aspects are to be especially emphasized here:

(1) Contributions from research on giftedness to improving practical considerations in the identification and nurturing of the development of gifted children and adolescents. Related questions are the prevention of individual behavioral problems, social conflicts, inappropriate upbringing and educational practices, encouraging counseling and intervention for maintaining or developing learning environments appropriate to various types of giftedness. The tasks described here belong to *applied research* on giftedness.

(2) The efficiency of applied research depends on the quality of *basic research* which can be seen in other scientific areas as well. This relationship holds true for research on giftedness and thus also for practical nurturance of giftedness. We can name as examples here innovative approaches from cognitive psychology or research on expertise. These have both provided

important impulses for applied areas such as problem-solving research or practical knowledge acquisition.

(3) The recognition that the development of competence and knowledge acquisition takes place in social-cultural contexts has consequences for the research on giftedness. Theoretically conceived universalities and methodological demands for validity need to be examined in *cross-cultural research*. Above and beyond this, cross-cultural and/or cross-national cooperative research projects serve not only to exchange information and experiences, but also can be expected to provide the flexibility necessary through the change in perspectives. The contribution to peacekeeping efforts is only marginally noted here.

(4) The development of a group of *elites* in the sense of elite achievers is a legitimate democratic desire. This makes for a double responsibility: to the individual and to society. The *society* has a duty to provide every young person with adequate developmental and educational opportunities. This is anchored in most democratic constitutions. This also has a double meaning: Equalizing of chances as a social component and equal opportunity as an individual component. The nation or the society needs to make sure that equal developmental chances are available to every young individual, i.e., also to the gifted. This postulate includes the necessity of equalizing opportunity in single instances and also the co-responsibility of socialization agents (especially parents and teachers). An *individual responsibility* grows out of the social responsibility for individually nurturing educational and upbringing opportunities. This is a responsibility to actually use the academic opportunities or nurturing socialization offers. This individual responsibility is first related to the responsibility of each person with regard to his/her own personality development (developmental psychologists refer to this as “developmental tasks” in the sense of Havighurst, 1952), at the same time, however, the individual’s responsibility to society is also meant here. This is the individual’s responsibility to make an appropriate contribution to the social well-being. There is an expectation that the gifted will generally be able to contribute more than weaker or handicapped individuals. This includes contributions to securing a social net or “human resources” in highly developed social systems.

(5) Finally a *mutual responsibility of society and the research community* exists. This does not question the freedom of researchers to choose their own topics and methods, but their responsibility to a society which—directly or indirectly—subsidizes their research must be emphasized. This basic demand is no less important in the research of giftedness which is in danger of isolation (and not only from scientific community). On the other hand, researchers in the field of giftedness have the same right as other qualified researchers to demand adequate research conditions, in order to scientifically research those areas considered desirable or necessary both from the point of view of basic research and in the practice of nurturing the gifted.

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Constructs and Models Pertaining to Exceptional Human Abilities

FRANÇOYS GAGNÉ

Université du Québec à Montréal, Québec, Canada

Children and adults who manifest exceptional abilities and obtain superior performances in any field of human activity are designated by a large variety of labels. Terms found in the language of experts and lay persons alike include “gifted”, “talented”, “able”, “genius”, “prodigy”, “precocious”, “excellent”, “expert”, “competent” and “proficient”. Because of their centrality in the literature, the present chapter will focus on the constructs of giftedness and talent.

Definitions of giftedness (and talent) abound in the literature; rare is the textbook without a chapter devoted to a review of existing definitions followed by a new proposal by its author. Indeed, an entire book (Sternberg and Davidson, 1986) was published to bring together many of the more popular definitions and models of the 1980s. So numerous are the definitions that Stankowski (1978, cited in Davis & Rimm, 1985) found it necessary to extract a more synthetic view through a classification system in five categories: (a) *after the fact* definitions focusing on adult prominent accomplishments, (b) *IQ* definitions specifying a particular threshold score, (c) *talent* definitions emphasizing outstanding performance in specific artistic and/or academic fields, (d) *percentage* definitions varying from a generous 20% or more to a strict 3% or less and (e) *creativity* definitions stressing original and productive accomplishments in a particular field. These categories are by no means exclusive; many of the better known definitions and models of the last twenty or thirty years would belong to more than one of the above categories. Stankowski's system emphasizes the two general components implicitly or explicitly present in most definitions and models: (a) a “what is” statement pertaining to the core nature of the construct, its central or prototypical elements and (b) a “to whom” or “how many” statement about the size of the population targeted by the label. These two statements correspond to the usual distinction, in logic, between the *comprehension* of a concept and its *extension*; these two components will be examined separately in the following pages.

The Constituents of Giftedness and Talent

As a first step in this discussion of the concepts of giftedness and talent, here follows a chronological sample of definitions and models which have been cited with somewhat more frequency in the gifted literature of the last three decades.

Survey of Recent Definitions and Models

Among the numerous definitions published during the 1950s, two have withstood the test of time and appear regularly in historical surveys of the gifted movement. First, Witty (1958) considered as gifted any child “whose performance in a potentially valuable line of human activity is consistently remarkable” (p. 62). Witty's list of “lines” was fairly extensive and went well beyond the traditional high IQ and academic excellence. DeHaan & Havighurst (1957) proposed a definition which was somewhat similar to Witty's, but specified six domains of excellence: intellectual ability, creative thinking, scientific ability, social leadership, mechanical skills and talents in the fine arts. Tannenbaum noted that both definitions did not value strictly “skills that are rewarded for social service of some kind (. . .) but included abilities that are personally gratifying to their possessors and that provide uncommon pleasure to others” (1983, p. 64).

Inspired by the work of Guilford (1956) and his Structure of Intellect, Taylor (1967) developed his Multiple Talent approach as a means to promote the development of various creative abilities in the classroom. His pool of six talents, some of them far different from those recognized at the time, were labeled: Academic, Productive thinking, Communicating, Forecasting, Decision-making and Planning. He described them as follows: “the set of talents included one non-thinking way of reproducing and thereby acquiring knowledge, plus five thinking ways of actively processing and working with knowledge in order to acquire it” (1986, p. 316). This model became the backbone for a teaching program called Talents Unlimited (Schlichter,

1986). Taylor subsequently (1986) added three more talents: Implementing, Human relations and Discerning opportunities.

Probably the most often cited definition appeared in the U.S. Commissioner of Education's 1972 report to the Congress of the United States, commonly called the Marland Report.

Gifted and talented children are those identified by professionally qualified persons who by virtue of outstanding abilities, are capable of high performance. These are children who require differentiated educational programs and/or services beyond those normally provided by the regular school program in order to realize their contribution to self and society. Children capable of high performance include those with demonstrated achievement and/or potential ability in any of the following areas, singly or in combination: (1) general intellectual ability, (2) specific academic aptitude, (3) creative or productive thinking, (4) leadership ability, (5) visual and performing arts, (6) psychomotor ability. It can be assumed that utilization of these criteria for identification of the gifted and talented will encompass a minimum of 3–5% of the school population (Marland, 1972, p. 5).

The above definition was slightly modified a few years later by the United States Office of Education (see Davis & Rimm, 1985), mainly by deleting the sixth category (psychomotor ability). Renzulli (1979) criticized this definition, specifically the absence of non-intellective (motivational) factors, the non-parallel nature of the six categories and failure by its authors to provide guidance against misinterpretation and misuse by practitioners. Reviewing the literature on the determinants of adult eminence in various professional fields, Renzulli brought to the fore what he claimed to be three recurring causal antecedents of exceptional productive performance; these became the constituent elements of his conception of giftedness. He synthesized his definition as follows.

Giftedness consists of an interaction among three basic clusters of human traits—these clusters being above average general abilities, high levels of task commitment and high levels of creativity. Gifted and talented children are those possessing or capable of developing this composite set of traits and applying them to any potential valuable area of human performance. Children who manifest, or who are capable of developing, an interaction among the three clusters require a wide variety of educational opportunities and services that are not ordinarily provided through regular instructional programs (1979, p. 23).

Over the years, Renzulli has kept his definition intact, defending it vigorously (see Renzulli & Owen, 1983; Renzulli, 1988, 1990) against various criticisms (e.g., Borland, 1989; Gagné, 1985; Gross, 1993; Jarrell & Borland, 1990; Jellen, 1985; Kontos et al., 1983a, 1983b).

Tannenbaum (1983) proposed a somewhat different definition. "Keeping in mind that developed talent exists only in adults, a proposed definition of giftedness in children is that it denotes their potential for becoming critically acclaimed performers or exemplary producers of ideas in spheres of activity that enhance the moral, physical, emotional, social, intellectual, or esthetic life of humanity" (1983, p. 86). Tannenbaum identified five factors that serve to link promise with adult fulfillment: "(a) superior general intelligence, (b) exceptional special aptitudes, (c) nonintellective facilitators, (d) environmental influences and (e) chance, or luck. The five factors combine in a rare blend to produce great performance or productivity" (1986, p. 34). Tannenbaum also subdivided developed talents into four categories: (a) *scarcity* talents comprising those exceptionally inventive people who are the architects of major breakthroughs in their field (e.g., science, medicine, social science and so forth), (b) *surplus* talents (mostly in the arts) that contribute to the beauty of our social environment, (c) *quota* talents, which refer essentially to specialized high-level skills—including the traditional professions—needed to provide goods and services and (d) *anomalous* talents which include practical domains of excellence (e.g., cooking, gardening), amusing ones (e.g., trapeze artist, memory expert, speed reader), "extinct" abilities (e.g., orator, stone cutter) and even socially disapproved skills (e.g., demagoguery, machiavellianism).

One of the more popular taxonomies of abilities introduced during the last decade is Gardner's (1983) theory of multiple intelligences. Each of Gardner's intelligences was chosen because it represented a culturally valuable and relatively autonomous set of skills for problem-solving, each with an identifiable basis in the human nervous system. He looked for signs of their existence in eight areas, presented here in decreasing order of importance: potential isolation by brain damage, manifestation in idiots savants or prodigies, an identifiable core set of operations, a distinctive developmental history, an evolutionary history, support from experimental psychological tasks, support from psychometric findings and susceptibility to encoding in a symbol system. Gardner identified in this way seven distinct "intelligences": the linguistic, the musical, the logical-mathematical, the spatial, the bodily-kinesthetic, as well as two personal intelligences: the intrapersonal and the interpersonal. To each of these intelligences corresponds a particular type of giftedness.

In contrast with Renzulli, Feldhusen has regularly made significant and even major modifications to his conception of giftedness. First, he proposed "that four major psychological components comprise giftedness: (1) superior talent and/or ability, (2) a high degree of motivation, (3) unique self-concept and perceptual characteristics, and (4) high-level creative capacities. Talents and abilities are diverse, ranging from the academic and artistic to the social and vocational" (1985a, p. 180). This model was soon significantly modified as follows: "Our composite conception of giftedness then includes (a)

general intellectual ability, (b) positive self-concept, (c) achievement motivation, and (d) talent . . . in focusing on these four aspects we are asserting that they constitute 'principal components'." (1986, p. 112). Feldhusen (1992) modified his position again recently. He presented a much more complex model, which assumes genetically determined abilities that emerge precociously. These are nurtured through the impact of community, family and school experiences, as well as emerging motivation and learning styles and create a functional knowledge base and metacognitive and creative skills. This last trio of elements finally produces various talents. He defined talent as "a complex of aptitudes or intelligences, learned skills and knowledge and motivations—attitudes—dispositions, that predispose an individual to successes in an occupation, vocation, profession, art, or business" (p. 5) and giftedness as "a complex of intelligence(s), aptitudes, talents, skills, expertise, motivations and creativity that lead the individual to productive performance in areas or domains or disciplines valued by the culture and time" (p. 5). Unfortunately, these two definitions overlap so much that giftedness and talent become almost synonymous. If giftedness is "a complex of talents", does it mean that talents are constituent elements of giftedness? If both include intelligences, aptitudes, skills and motivation, where is the difference? If there is no apparent difference, why take the trouble to produce two distinct definitions? Feldhusen's text does not answer these questions.

Sternberg, for his part, based his concept of giftedness on his triarchic theory of intelligence (1985) which brings together three subtheories, as follows.

The componential subtheory specifies the mental mechanisms responsible for the planning, execution and evaluation of intelligent behavior. The experiential subtheory further constrains this definition by regarding as most relevant to the demonstration of intelligence behavior involving either adjustment to novelty or automatization of information processing, or both. The contextual subtheory defines intelligent behavior as that involving purposive adaptation to, selection of, and shaping of real-world environments relevant to one's life (1986, p. 240).

Sternberg argued that giftedness could take many forms, corresponding to different combinations of the abilities typical of each of the elements of his theory. In his view, "the triarchic theory implies a notion of intellectual giftedness that is quite a bit broader than usual conceptions, event those that take into account creativity and motivation as well as intelligence" (p. 242). Davidson (1986) defined giftedness as insight ability, a complex of three distinct psychological processes borrowed from Sternberg's componential subtheory: selective encoding, selective combination and selective comparison. She found that measures of performance on insight problems discriminated clearly between intellectually bright and average children.

Finally, having described and discussed most of the above definitions and models, Borland (1989) proposed his own, which he deemed more functional or practical in the context of schooling. "For the purposes of education, gifted children are those students in a given school or school district who are exceptional by virtue of markedly greater than average potential or ability in some area of human activity generally considered to be the province of the educational system and whose exceptionality engenders special-educational needs that are not being met adequately by the regular core curriculum" (pp. 32–33).

The above citations and comments demonstrate that definitions and models of giftedness can incorporate a large variety of ingredients or components and that there is little consensus in the field. One common denominator of these definitions and models is their use of the concept of abilities as a central theme. For some authors, giftedness corresponds strictly to intellectual abilities (e.g., Sternberg, Davidson). Occasionally, these authors will mention that their definition concerns "intellectual giftedness" (e.g., Sternberg) implicitly acknowledging that other types of giftedness are possible; but, most of the time, these definitions contain no such qualification of the concept of giftedness. Some definitions, however, clearly include a variety of other abilities: leadership aptitude, physical abilities, artistic abilities (e.g., Witty, DeHaan and Havighurst, Marland, and Tannenbaum through his four types of talents). Even though he calls his various native abilities "intelligences", Gardner's taxonomy belongs in this second group, since he acknowledged that exact terminology was not a major issue in his taxonomy. He commented: "Call them all 'talents' if you wish; or call them all 'intelligences'" (Walters & Gardner, 1986, p. 175). Some definitions include human characteristics which are clearly outside the domain of abilities (e.g., Renzulli's task commitment, Feldhusen's self-concept, Tannenbaum's nonintellectual facilitators and chance factors). Some scholars reserve the label of "true" giftedness to adult accomplishments (e.g., Tannenbaum), judging children to manifest only "potential" giftedness. Some appear to reserve the term giftedness to a very small number of exceptionally superior performers or producers of knowledge (e.g., Tannenbaum's description of the adult gifted as "outstanding contributors to the arts, sciences, letters and general well-being of fellow humans": 1986, p. 33); others clearly mention a somewhat larger percentage of the population (e.g., Marland's 3% to 5%). In fact, most proponents of models and definitions do not specify the extension of their concept of giftedness or talent. Some definitions include the mention of special educational needs (e.g., Marland, Renzulli, Borland), while most do not. In a few definitions (e.g., Renzulli, Tannenbaum, Witty), giftedness is mostly associated with "socially valued" areas of human endeavor. Finally, most of these definitions focus on giftedness, without specifying how it differs, if it does, from talent. For instance, Marland clearly considers both terms to be synonymous—as do

most scholars in the field (Gagné, 1985). Tannenbaum appears to consider giftedness as a potential which actualizes itself in “developed talents”. Still, his definition implies that giftedness in adults corresponds to developed talent, a clear nondifferentiation between the two concepts. Taylor alone uses the label talent for his group of abilities; but he does not specify how these abilities are related to the concept of giftedness. Concerning the nature of the two central constructs of giftedness and talent, Gagné (1985, 1991) proposed a model which attempts to differentiate what types of abilities could be associated with each of them.

Gagné’s Differentiated Model of Giftedness and Talent

Gagné’s model associates giftedness with natural or non-systematically developed human abilities, called aptitudes and talent with systematically developed abilities or skills which constitute expertise in a particular field of human activity. More formally, “*Giftedness* corresponds to competence that is distinctly above average in one or more domains of human aptitude. *Talent* corresponds to performance that is distinctly above average in one or more fields of human activity” (1991, p. 66). The model specifies that the emergence of a particular talent results from the application of one or more aptitudes to the mastery of knowledge and skills in that particular field, mediated by the support of intrapersonal (e.g., motivation, self-confidence) and environmental (e.g., family, school, community) *catalysts*, as well as through systematic learning and extensive practice (see Figure 1).

APTITUDES

Aptitudes are “natural” human abilities; they have their origin in the genetic structures of the human organism; they appear and develop more or less spontaneously and are present in every human being, albeit with a large range of degrees, thus giving rise to individual differences. They can be observed in very young children in the absence of any systematic training or practice. When exercise and practice are controlled, they explain a major proportion of individual differences in talented performances. They are the main explanatory factor for the exceptional precociousness of children in school, of young musicians or chess players, of athletes who attain adult expertise at a very tender age. There has to be a genetic basis to each of these natural abilities for them to be defined as “gifts” or aptitudes; it is more than just having acquired some particular knowledge or skill which will make possible the acquisition of further knowledge. The main behavioral index for a high degree of a particular aptitude is easy and rapid learning of the knowledge and skills governed by that aptitude. Even though aptitudes have a significant genetic component, their growth is by no means controlled solely by maturational processes; environmental stimulation plays an equally important role through daily use and informal training (e.g., physical conditioning, problem-solving exercises in school, crosswords, creativity workshops, voluntary social work and so forth).

The model identifies five aptitude domains: intellectual, creative, socio-affective, sensorimotor and others. Intellectual aptitudes are by far the better known and more extensively studied. They could be subdivided into a few or many subcategories, depending on the

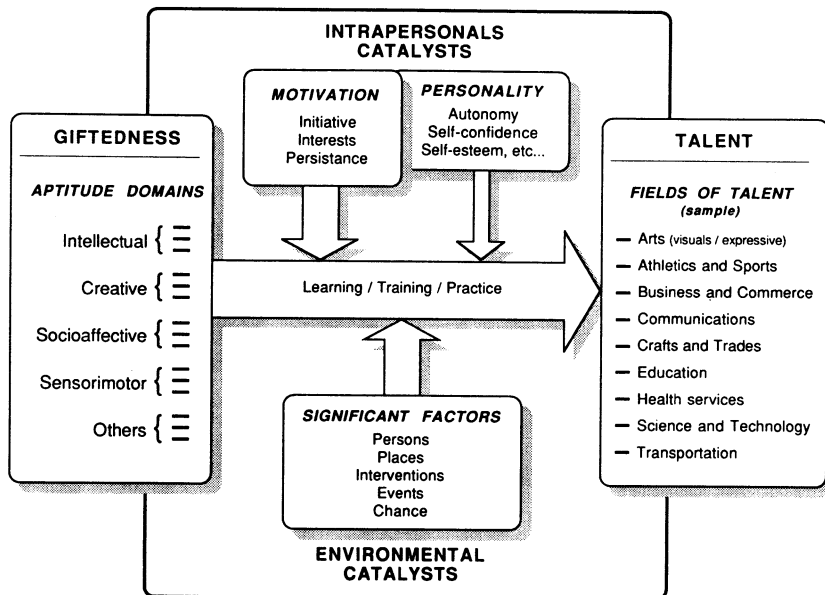


FIGURE 1. Gagné’s differentiated model of giftedness and talent.

theoretical system adopted. The identification of a separate category for creative abilities may not be equally well received by all scholars, some judging creativity to be little more than the exercise of intellectual abilities confronted with a problem-solving situation (Weisberg, 1988), others judging that there are as many creative abilities as there are fields in which original ideas can manifest themselves, at least qualitatively (e.g., Perkins, 1981; Runco, 1987). The category was maintained because there is a fairly large community of scholars who are convinced that there exists "an ability to respond *adaptively* to the needs for new approaches and new products. It is essentially the ability to bring something new into existence purposefully" (Barron, 1988, p. 80). Because it is presented as one aptitude category among others, creativity is given a more modest role in Gagné's model than in some others. Gagné (1985) points out that creativity is not a key ingredient of talented performance in many fields (e.g., athletics, musical interpretation, business administration, teaching, nursing and so forth). This position becomes a major point of divergence between Gagné's model and Renzulli's definition in which creativity is described as an essential component of giftedness. Similarly, Tannenbaum clearly distinguishes "consumers" of knowledge from "producers" of knowledge, only these last being judged "truly gifted" (1983, p. 86). He also points out that we may regard giftedness as "extraordinary promise for productivity or performance in areas of work that are publicly prized; it is not a facility for consuming knowledge in abundance or at a rapid pace" (p. 89). In direct opposition with this statement, if there is one characteristic that could be considered common to all domains of aptitude in Gagné's model, thus to all gifted persons, it is their facility and rapidity in acquiring new knowledge and skills and in generalizing this new knowledge to adjacent areas of the domain.

Socio-affective aptitudes have been explored much less; the mapping of subcategories in this very large domain is still quite deficient. A non-exhaustive list surely includes abilities useful in social intercourse, empathy or the ability to perceive the points of view and feelings of others, social influence (e.g., leadership), manipulation and so forth. Research (see Janos & Robinson 1985) suggests a clear distinction between social intelligence, corresponding to knowledge about adaptive social behavior, and social behavior itself. It appears that intellectually gifted children demonstrate precociousness in social intelligence, but not necessarily precocious behavioral abilities in their relationships with peers and adults. Sensorimotor aptitudes take many forms. On the sensory side are all the abilities related to each of the five senses: the visual acuity of the marksman, the sound discrimination of the musician, the odor recognition of the perfume maker, the taste differentiation of the wine specialist and so forth. On the motor side there is speed, endurance, strength, reflexes, dexterity, balance, etc. The last category, "others", acts as an "expansion port" for less recognized and studied

natural abilities (e.g., extra-sensory perception, gift of healing). Except for the "others" category, there is incontrovertible evidence concerning the heritability of the above aptitude categories (Gardner, 1983; Plomin, 1986, 1989). Scarr (1981) stated:

Not only my work but research by many others also supports the modest conclusion that we are different from one another on both genetic and environmental bases—not only in intellectual ability but also in personality, cognitive style, gestural and postural communication, linguistic style and probably all other measurable characteristics. I am hard pressed to think of any aspect of human behavior for which genetic as well as environmental differences will not explain part of the variability (pp. 526–527).

Plomin (1989) similarly commented:

The first message of behavioral genetic research is that genetic influence on individual differences in behavioral development is usually significant and often substantial. Genetic influence is so ubiquitous and pervasive in behavior that a shift in emphasis is warranted: Ask not what is heritable, ask what is not heritable (p. 108).

INTRAPERSONAL CATALYSTS

The model distinguishes two types of catalysts: intrapersonal and environmental. Intrapersonal catalysts include human characteristics which are outside the domain of abilities. The most visible of these catalysts, as observed by Renzulli, is motivation. But, Renzulli's task commitment is only one of the three recognized consequences of motivation on behavior; motives *initiate* or activate behavior, they *direct* and guide it and they *maintain* it in the presence of obstacles until satisfaction of the need. At least as important as task commitment for the development of talent is the directional energy, variously called curiosity, inquisitiveness, specific interests, or intrinsic motivation (Deci & Ryan, 1985). Not much appears to be known about the origins of interests (Schiefele, 1991); but recent research suggests that vocational interests have a genetic component (see Plomin, 1986). The third aspect of motivational energy, initiative, has not been the object of much study. There also appears to be no research concerning relationships between these three types of effects of motives on behavior. For instance, is it possible for some individuals to show high interest in some area without the accompanying persistence to pursue that interest with the commitment and doggedness that others would apply?

Many other human characteristics, besides motivation, have been associated in the literature with the presence of intellectual aptitudes and academic talents in children and adults. To name but a few, there are self-confidence, self-esteem, autonomy, locus of

control, as well as moral judgment, emotional maturity and general mental health (Janos & Robinson, 1985). Again, increasing evidence (Plomin, 1989; Bouchard et al., 1990; Neubauer & Neubauer, 1990) suggests that personality factors do not escape being under partial genetic influence. But, there are some reservations concerning the causal significance of these personality characteristics. First, most of the research has focused on comparisons between intellectually gifted (high IQ) children or adolescents and average age-peers; much less is known in other aptitude domains. Second, it is quite clear (see Roedell et al., 1980) that the observed differences do not explain a very large percentage of the total variance between groups; *within* group differences remain very important. Finally, the causal direction of influence is not always clear. For instance, does self-confidence cause talent, by supporting the individual during his process of skill development, or is it an effect brought about by the satisfaction of having achieved competence in a field of talent?

ENVIRONMENTAL CATALYSTS

Environmental catalysts can be subdivided into five distinct categories: (a) significant persons, (b) significant physical environments, (c) significant interventions, (d) significant events and (e) chance. The role of significant persons is one of the best documented sources of impact on talent development. The literature is replete with studies about the role of parents, siblings, teachers, trainers, public figures playing the role of identification models and so forth. This role was particularly emphasized in Bloom's (1985) study of national leaders in six talent fields: concert pianists and sculptors in the arts, mathematicians and research neurologists in the cognitive domain, olympic swimmers and tennis players in the psychomotor domain. It also comes out clearly in interviews with eminent scholars who obtained the prestigious MacArthur award in the form of "no strings attached" five-year grants (Cox et al., 1985). Physical environments are usually taken for granted, without realizing their significant role. For instance, children in rural areas or in developing countries often have less access to environmental resources for talent development. Even geographical features can play a significant role: there are few talented downhill skiers from the tropics or Netherlands, or talented sailors from landlocked countries.

The category of significant interventions covers community resources. Many of them do not harbor the label "gifted or talented program" (e.g., summer camps, math or science clubs, Saturday art courses, the international baccalaureate curriculum, selective high schools), but in fact respond in some degree to enrichment needs felt by gifted and talented youngsters. Programs can be classified along three main dimensions: content, setting, density. *Content* refers to the program's activities, hopefully related to the type of ability being nurtured: aca-

demically subjects, artistic activities, athletics, leadership training, etc. *Setting* refers to the insertion of enrichment programs in the regular classroom as compared to various forms of part-time or full-time ability grouping. *Density* refers to the presence or absence of accelerated progression (e.g., early entrance, grade skipping, radical acceleration); it is to be distinguished from curriculum compacting (Reis, Burns, & Renzulli, 1992) whereby the more rapid learning remains within the boundaries of the year's curriculum; accelerative alternatives may be introduced to fill the learning space created by the compacting. The fourth category, significant events, is related to specific moments in the life of individuals which have a lasting impact on their vocational decisions, or on the choice of a non-vocational investment in a captivating leisure activity or in some form of community service. This category has been borrowed from Walters and Gardner's (1986) "crystallizing experiences", which they define as follows.

A crystallizing experience, then, is the overt reaction of an individual to some quality or feature of a domain; the reaction yields an immediate but also a long-term change in that individual's concept of the domain, his performance in it and his view of himself. . . . Only retrospectively, after the individual's behavior in the postcrystallizing period has been observed, is it possible to single out an experience as having crystallized ensuing activities (p. 309).

Finally, chance as an environmental catalyst plays a role which is probably much more critical than is usually recognized in the literature, if not in personal testimonies. In fact, only Tannenbaum (1983) has examined in some detail the role of chance factors. He mainly presents Austin's (1978) hierarchical "quatuor" of chance factors: (a) the stroke of good luck falling upon a passive recipient, (b) the increased likelihood of being struck with good fortune through constant active exploration of the environment (the Kettering principle), (c) the luck of being the right person at the right time at the right place, but having the sagacity to grasp the significance of an unforeseen event (the Pasteur principle) and (d) the luck of those with "altamirage," defined by Austin as a facility for becoming lucky through a distinctive and uncommon lifestyle (the Disraeli principle).

TALENTS

No category system could do justice to the immense variety of talents manifested by children and adults in all walks of life. They do not only include the more traditionally mentioned fields of academia (humanities, social sciences, health sciences, physical sciences, mathematics) and those of the arts (drama, visual arts, music, dance, etc.), but also fields which are regarded as less elitist, like athletics and sports, technology, crafts, popular entertainment, business and administration and so forth. The classification systems of fields of talent

created for the Strong Vocational Interest Inventory (SVII) is one of the most comprehensive (Campbell, 1977). It is based on Holland's RIASEC system of six basic personality types (Realistic, Investigative, Artistic, Social, Enterprising, Conventional), to which are associated 23 basic interest configurations, like agriculture and mechanics (R), science and medicine (I), music and writing (A), teaching and social service (S), merchandizing and public speaking (E) and office practices (C). The RIASEC system serves also to label dozens of more specific occupations, professional as well as technical. The SVII's structure of fields is a more basic way of organizing talents than Tannenbaum's fourfold system (scarcity, surplus, quota and anomalous) mentioned earlier; in this last case the principle of classification is only indirectly related to the nature or content of the talent. Moreover, Tannenbaum's categories are not mutually exclusive, since scarcity talents are but the more creative and innovative expressions of quota talents.

The talent component of Gagné's model is totally compatible with Csikszentmihalyi's (1988) distinction between "domains" of knowledge and "fields" of human endeavor. His domains correspond to self-sufficient areas of knowledge (e.g., physics, literature, music, sculpture, engineering, history) embedded in a particular culture at a given time. The field corresponds to the social organization of the domain; it designates all the individuals who have attained definite competence or expertise in the domain, including those who have achieved clear eminence; among other things these people guide the evolution of the domain by acting as judges of the creativity and originality of their peers' productions.

LEARNING, TRAINING AND PRACTICE

This component of the model illustrates more than the others the longitudinal dimension of talent development. The growth of aptitudes and talents can be accounted for by four developmental processes: (a) maturation, (b) daily use in problem-solving situations, (c) informal training and practice and (d) formal training in a particular field of activity. The first two processes directly contribute only to the development of aptitudes. The third process can foster the development of both aptitudes and talents; its role in the development of aptitudes has already been emphasized. In the case of talent development, it is quite common to observe individuals learning by themselves to play a musical instrument or to master a craft or a sport, some of them achieving respectable levels of proficiency and expertise. Moreover, the administrative practice in some schools and colleges to offer credit by examination demonstrates that many individuals can develop their academic talents outside formal educational environments. Systematic and formal training is the usual way

to develop talents in any field, especially when aspiring to high level proficiency. Granted that many pupils can go through primary school and even high school without much studying; but the higher one goes up the educational ladder, the more effort will be needed to succeed. The apparent facility with which very talented persons perform their skills, be they scientists, artists, craftsmen or athletes, can easily make us forget the hundreds and thousands of hours which were necessary to build progressively that level of talent. And the higher the talent, the longer the investment in time and effort. This confirms eloquently Edison's famous comment about genius being 1% inspiration and 99% perspiration!

INTERACTIONS AMONG COMPONENTS

Each component of the model can have an impact on any of the others and it can be shown that these relationships are bidirectional. It would not be hard to find in the research literature support for each of these relationships. For instance, the link between intellectual aptitudes and academic interests, namely that more able students are more intrinsically motivated toward learning activities and school subjects, is well documented (Deci, Vallerand, Pelletier, & Ryan, 1991). Conversely, there is frequent mention—yet little research—that some interests emerge from a satisfying exercise of one's aptitudes in a particular field of talent. As Bloom said: "We believe an individual tends to like those activities which he believes he has done or can do successfully" (1976, p. 78). Concerning relationships between intrapersonal and environmental catalysts, it is recognized that parents (or teachers) will tend to be more attracted and give more support to youngsters who manifest intense interest and motivation in their field of talent. Again, the inverse causal relationship is equally plausible: support by parents can have an impact on the motivation and persistence of people actively pursuing excellence in a particular field of talent, as Bloom's (1985) study mentioned above has clearly shown. Most pairings could in the same way be documented with appropriate empirical studies.

Other forms of relationships between the components can be mentioned only briefly here (see Gagné, 1991, for more detail). First, relationships between aptitudes and talents are co-univocal; it means that a given aptitude can contribute to the development of many different talents; conversely, any talent can draw its underlying abilities from more than one aptitude domain. Second, in direct opposition to Renzulli's three-ring conception of giftedness, Gagné maintains that no aptitude can be considered a prerequisite for the emergence of every talented behavior. For instance, above average intellectual abilities are not essential to attain a fairly high level of excellence in many fields of talent (e.g., athletics, crafts, arts); yet, they might be required for

emergence among the most exemplary performers in a field. Similarly, creative abilities do not always play a central role. As Gagné (1991) argued:

What about celebrated athletes, whose accomplishments make international headlines; musicians of international repute; teachers or professors who have positively influenced their students; and many others who have attained a certain prominence, if not absolute renown, by means of interpretive performances or other skills, and not principally through creative aptitudes? (pp. 69–70).

Third, by definition, a talented person is also gifted, but a gifted person might not be talented, as evidenced by underachieving gifted youngsters. Finally, two persons can call upon different components to attain an identical level of talent. Some youngsters can cruise along in high school without any studying, little motivation and minimal parental support, if they have very high intellectual abilities. Friends in the same class might achieve at the same level, but they would have to make up for a lower level of native intellectual abilities with greater motivation, harder work and/or more intensive environmental support.

GAGNÉ'S MODEL IN HISTORICAL PERSPECTIVE

A close examination of the definitions sampled at the beginning of the chapter clearly shows that Gagné's model is not radically different from many of them. In fact, it is foreshadowed in many expressions used by their authors, especially the distinction between potentialities and their eventual confirmation in "developed" or fully-fledged abilities and skills. Marland's "those with demonstrated achievement and/or potential ability", Renzulli's "those possessing or capable of developing this composite set of traits and applying them to any potential valuable area of human performance", or Tannenbaum's "their potential for becoming critically acclaimed performers or exemplary producers" represent clear examples of such a distinction. It is also encountered in most discussions of the characteristics of gifted and talented persons. For instance, Renzulli (1979) criticized Marland's categories as follows:

Two of the six categories (specific academic aptitudes and visual and performing arts) call attention to fields of human endeavor or general performance areas in which talents and abilities are manifested. The remaining four categories are more nearly processes that can be bought [*sic*] to bear on performance areas" (1979, p. 7).

In this text Renzulli was in fact arguing for a differentiation between two of Gagné's fields of talents and four of his aptitude domains: general intellectual ability (intellectual aptitudes), creative and productive thinking (creative aptitudes), leadership ability (part

of his socio-affective domain) and psychomotor ability (part of his sensorimotor domain). Scholars have thus been struggling for some time with this duality of notions. One major hurdle to a more general acceptance of a distinction between natural and developed abilities before the 1980s was the "political incorrectness" of acknowledging the existence of "natural" abilities which had a genetic origin and, consequently, the partial hereditary foundation of observed individual differences among children and adults. In other words, the reigning environmentalism of the 1960s and 1970s totally refused to accept the existence of inequalities that could not be corrected by *any* form of social intervention. The weight of the evidence finally succeeded in bringing about a more objective view of the respective roles of nature and nurture in the development of human abilities, predispositions and traits.

Comments

It is time to examine some of the discrepancies signaled earlier between the definitions and models sampled. These will be discussed on logical grounds as well as in the light of Gagné's differentiated model of giftedness and talent.

GIFTEDNESS, TALENT AND ADULT ACHIEVEMENT

Some definitions and models of giftedness state, either explicitly or implicitly, that "true" giftedness is restricted to adult achievements; this corresponds to Stankowski's first category mentioned earlier. This tendency appears not only in Tannenbaum's "keeping in mind that developed talent exists only in adults", but also in the fact that most examples of gifted behavior describe the extraordinary accomplishments of historical figures in science (Einstein, Freud), arts (Mozart, Picasso), or the humanities (Kant, Gandhi). The impression one gets is that children manifest only "potential giftedness". Tannenbaum (1986) even says it explicitly in the following passages: "Children who are identified as potentially gifted" (p. 33), "because it excludes too many children who may grow up to be gifted" (p. 33) and "factors that link promise with adult fulfillment" (p.34). "Potential giftedness" is totally irreconcilable with Gagné's model. In the model, potential *is* giftedness in the sense that aptitudes, even though measured as performances on tests of (intellectual, creative, social, or physical) abilities, represent existing natural abilities which are called upon by an individual aspiring to master the skills of a particular field of talent. In fact, giftedness is *potential talent*, whether it is observed in children or adults. As defined by Gagné, giftedness can be observed in very young children, as well as in adolescents and adults, as long as the

term refers to the natural, partly inborn, abilities of individuals.

Talent itself can appear at a very early age, as confirmed by various forms of precociousness in school learning, arts and athletics. But, the developed skills of the talented usually manifest themselves from adolescence onward. Consequently, following Gagné's differentiated model, the adult accomplishments of eminent figures in any field should be labeled talents insofar as the products of their developed skills are the reason for their eminence; these individuals would represent instances of exceptional talent. Their giftedness would be implicitly recognized through their talents. Unfortunately, the label talent is rarely used in the case of extraordinary accomplishments. One possible reason might be an implicit hierarchy between the two terms in the mind of some scholars: giftedness would correspond to a superior level of abilities. Some have explicitly proposed such a distinction: Robeck (1968) applied the word talented to individuals with IQs in the 130–145 range, while IQs ranging from 145 to 160 received the label gifted. Similarly, when laypersons were asked to describe the difference they perceived between being gifted and being talented, some argued that giftedness was more exceptional, less common than talent (Gagné, Motard, & Bélanger, 1991). It is hard to assess how widespread this implicit, almost unconscious, vertical distinction is; but it can substantially affect the understanding and acceptance of Gagné's differentiated model.

GIFTEDNESS, TALENT AND INTELLIGENCE

By proposing five general domains of giftedness, Gagné's model radically differs from all models and definitions which restrict giftedness to cognitive abilities (Stankowski's second category). Such restricted definitions abound, going back to Terman's in the 1920s. Two have already been described: Sternberg's triarchic theory and Davidson's insight "subtheory"; two more appeared in Sternberg and Davidson's (1986) book. Jackson and Butterfield (1986) proposed an apparently large and encompassing definition of gifted performance: "A gifted child is one who demonstrates excellent performance on any task of practical value or theoretical interest" (p. 155), adding that they saw "no reason to exclude from our definition skills that are predominantly physical, artistic, or interpersonal" (p. 155). But, they went on to explain these performances strictly in terms of cognitive constructs: cognitive efficiency, knowledge base, strategy use and metacognition. Borkowski and Peck (1986) described a very similar explanatory model of gifted behavior, based on the Campione–Brown model of intelligence (Campione & Brown, 1978). It posits two hierarchical levels of intellectual processing, namely an elementary *architectural* level of perceptual efficiency and a higher *executive* level calling upon a knowledge base, a set

of strategies for learning and problem solving and a metacognitive component.

All these strictly cognitive models of giftedness would be totally compatible with Gagné's model if they specified that they attempt to circumscribe *intellectual* giftedness. Unfortunately, it is not always clear that their concept of giftedness allows for other forms of natural abilities besides intelligence. As soon as one accepts to associate giftedness with natural abilities, it should follow "naturally" to recognize that these abilities extend well beyond the cognitive domain. If we disregard their name, Gardner's seven "intelligences" correspond to such a list of natural abilities, the more so when taking into account their eight selection criteria. It can be seen that they are closely related to Gagné's aptitude domains. Gardner's linguistic, spatial and logical-mathematical intelligences would all become subcategories of Gagné's intellectual aptitudes domain; the musical and bodily-kinesthetic intelligences would fall in his sensorimotor domain; the two personal intelligences (intra/inter) would become subcategories within his socio-affective domain. In short, if intellectual giftedness is but one form of giftedness, then the general concept of giftedness must be defined in such a way as to include all manifestations of giftedness in all domains of human behavior. A reduction of giftedness to superior intelligence is identical to a reduction of human abilities to intellectual ones, as so many scholars have done in psychology and education (e.g., Lohman, 1989; Horn, 1976; Guilford, 1985). One wonders if this "cognocentrism" might not be an indirect form of elitism: could non-intellectual abilities be overshadowed, sometimes even ignored, because they are *felt*—more than judged—to be less noble than intellectual ones?

GIFTEDNESS, TALENT AND JURISDICTIONS

According to Davis and Rimm (1985), the United States Office of Education decided to remove psychomotor ability from the list of performance domains because "artistic psychomotor talents (for example, dancing, mime) could be included under performing arts, and athletically gifted students are already very well provided for" (p. 11). This was an unfortunate decision from the point of view of the defining process. General definitions of concepts should never be limited or influenced by practical or political considerations. Definitions and applications are two distinct operations. Program conceptors could well decide to consider and implement only certain aspects of a broadly defined concept; there is no need for a procrustean modification of the definition to make it fit a particular context. In a similar fashion, Borland (1989) specified that gifted children had to demonstrate their superior ability "in some area of human activity generally considered to be the province of the educational system" (p. 33). To be completely fair, it must be pointed out that

Borland qualified his definition by stating at the outset “for the purposes of education”. Still, it would have been preferable first to define the full concept of giftedness, then to specify which subpopulation would be considered in a particular context. For example, it is quite easy to specify that a given program addresses the special needs of the subgroup of mathematically talented youths, as Julian Stanley did in the Study of Mathematically Precocious Youth (Stanley et al., 1974); there is no need to restrictively define the talented as those who manifest mathematical abilities.

Borland’s restricted definition evolved from his criticism of “disjunctive multitrait” definitions of giftedness (e.g., Gagné, Gardner, Marland, Witty), which he found difficult to operationalize because they generated numerous subgroups of gifted children. “One need only imagine the complexity of the identification and programming plan that would have to be put into effect in a school district” (1989, p. 12). This argument raises at least two objections. First, the complexity of a problem should never be an argument to abstain from addressing it; most problems our technological societies now face are very complex indeed (e.g., environmental issues, international trade accords, civil wars and other disputes between nations); should we decide not to address them for such a reason? Second, some schoolboards have succeeded in offering a large variety of services that cater to the needs of diverse groups of gifted and talented youngsters: special high school programs in science, literature, foreign languages, etc.; programs or special schools in fine arts, drama, dancing; music conservatories; special schedules for those active in athletics; and so forth. The diversity in available responses is there; schoolboards can draw from a long list of efficient and successful programs (see Juntune, 1986). In short, disjunctive multitrait definitions need not be an obstacle to effective programming; on the contrary, they open the door to more adequate and specific responses to the particular educational needs of the diverse subcategories *within* the population of gifted and talented children and youths.

GIFTEDNESS, TALENT AND PERSONALITY

Many scholars introduce in their definitions “non-ability” or personality factors; recall Renzulli’s task commitment, Tannenbaum’s nonintellective facilitators, Feldhusen’s self-concept and achievement motivation. These characteristics are referred to in the scientific literature by various labels: tendencies, predispositions, traits, temperaments, drives, motives, etc. Should such elements be part of a definition of giftedness or talent? *Definitions* of concepts focus essentially on their constituent elements; *descriptions* of concepts and constructs can include more peripheric information. If we accept that the core of the giftedness concept is natural abilities, then we must exclude all non-ability

characteristics. Indeed, intellectual giftedness will be assigned as a label if a person demonstrates—through an IQ test or any appropriate measure of intellectual functioning—intellectual competence which is markedly above average; no other criterion is necessary for the label to be correctly ascribed. It follows that any underachieving pupil who obtains an IQ of 130 or more should be considered gifted, even if that pupil displays no school motivation whatsoever, low self-esteem, a total absence of confidence and autonomy, etc. The IQ alone is sufficient evidence of intellectual giftedness. Similarly, if adults are assessed as to their physical condition and show superior strength, or endurance on a treadmill, or flexibility, they should be recognized as physically gifted, even if they had never practiced any sport or athletic activity, showed no interest whatsoever in such pursuits and suffered from major personal and/or social inadaptations. The superior natural ability *is* giftedness and nothing else is needed for the label to be appropriate.

Is the situation different in the case of talents? Not at all; the same distinction holds between definitions of talent as opposed to descriptions of talented persons. If we accept that talent corresponds to “performance that is distinctly above average in one or more fields of human activity” (Gagné, 1991, p. 66), then only the constituent elements of that performance, namely the developed abilities and skills, belong in the definition itself. Talent in piano playing is nothing but a level of performance that is distinctly above average; academic talent is nothing but a level of achievement that is distinctly above average; talent in swimming is nothing but a level of performance that is distinctly above average; and so forth. No doubt that talented persons in a given field exhibit some personal characteristics that differentiate them somewhat—on average—from those who are less talented in that field; hundreds of such comparative studies have shown statistically significant differences on a large inventory of personality constructs (see Janos & Robinson, 1985). But, these characteristics are not *constituents* of the talented performance; they may act as contributors, facilitators or catalysts in the development of talent, or appear and develop as a result of the talented performance. Talent development requires the support of these facilitators, probably the more so if the person aspires to a very high level of talented performance, but they are not components of the talent itself. Among the elements in Gagné’s model, only aptitudes come close to being constituents of talents, insofar as the developed skills result from the systematic training and exercise of natural abilities in a specific and restricted context. The musician’s dexterity on the keyboard, the neurosurgeon’s dexterity when operating, the dexterity of the potter or that of the graphic artist, all have their origin in a more general psychomotor aptitude. There is a proximity of nature between aptitudes and talents which is not found between catalysts and talents. Still, there remains a difference in kind between natural abilities and developed skills, a difference clear enough

to become the foundation of the distinction between gifts and talents in Gagné's model.

The description of Gagné's aptitudes and catalysts as contributors to talent development resembles Tannenbaum's presentation of the components of his star model as "five psychological and social linkages between promise and fulfillment" (1986, p. 34). If they act as linkages (Gagné's catalysts?), then none of them should be a constituent element of either "promise" (Gagné's aptitudes?) or "fulfillment" (Gagné's talents?). In fact, two of them—general intellectual ability and special abilities—are clearly described by Tannenbaum as intellectual aptitudes (general vs specific). The logical problem is that they cannot be at the same time constituents of the "promise" and linkages between promise and fulfillment. Apart from this problem in the structural organization of its components, Tannenbaum's model presents many close similarities with Gagné's differentiated model of giftedness and talent.

GIFTEDNESS, TALENT AND SPECIAL EDUCATIONAL NEEDS

Marland's definition specifies that gifted children "require differentiated educational programs and/or services beyond those normally provided by the regular school program"; both Renzulli's and Borland's definitions also include a very similar remark about gifted children's special educational needs and the imperfect response of the regular curriculum. This type of information should not be included in a definition of giftedness and talent for the same reason that personality factors were excluded: special educational needs are not constituent elements of either giftedness or talent. Moreover, this characteristic applies only to children. Such exclusion is not meant in any way to negate or attenuate their relevance and importance in the context of providing for the maximal development of each child's aptitudes and personality. It simply means that such needs should be introduced as part of descriptions of gifted children, but outside the definition of the concepts of giftedness and talent.

GIFTEDNESS, TALENT AND VALUES

Some definitions, mostly the disjunctive multitrait ones, call upon a value system to specify what types of superior performances will be labeled gifted or talented. For instance, Witty (1958) spoke of "potentially valuable lines of human activity", while Jackson and Butterfield (1986) used the much broader expression "any task of practical value or theoretical interest". Tannenbaum (1983) was probably the most explicit. First, he circumscribed giftedness to "spheres of activity that enhance the moral, physical, emotional, social, intellectual, or aesthetic life of humanity". Then, he introduced the four

categories of talents already described (scarcity, surplus, quota and anomalous). It is a very hierarchical system, with scarcity and surplus talents—judged equally valuable—at the top and anomalous talents at the bottom. When confronted with the definition, this taxonomy raises a few questions. For instance, if gifted (talented?) adults must become "critically acclaimed performers or exemplary producers of ideas", will these labels be restricted to those few exceptional individuals who are recognized as members of the scarcity and surplus categories? What becomes then of the talented in the two other categories? Will they be considered "just" talented, but not gifted, thus confirming our earlier hypothesis about a possible hierarchical relationship between the two terms? Moreover, if giftedness must appear in "spheres that enhance the moral . . . life of humanity", what happens to "anomalous" talents, which include "socially disapproved skills such as wily interpersonal behavior and demagoguery" (1986, p. 25). Are these to be labeled talents but not gifts? Values also creep up in less explicit ways. As mentioned earlier, scholars who choose all their examples in certain fields of human endeavor, usually the sciences, the arts and the humanities—the noble ones—are indirectly creating a hierarchy between these more desirable or highly valued talents and other less desirable ones (e.g., technology, popular arts, athletics and sports, business and administration).

The preceding discussion brings forth some of the problems generated by the introduction of values in the definition of gifts and talents. First, there is a logical problem similar to the one mentioned above in relation with jurisdictions, namely a confusion between definitions and applications. It was said that definitions should not be modified to take into account practical or political problems; what should be done is to select those aspects of the definition which are applicable to a particular context. The problem here is identical. The value system should not appear as part of the definition of gifts and talents, but be brought up instead when discussing which particular gifts and talents should be fostered and nurtured by the schools or the community. Modifying the definition to make it congruent with the values of a particular culture or societal subgroup is analogous to censure. Second, the value systems usually proposed definitely have an elitist flavor, inasmuch that they introduce a ranking of talents more congruent with the values of a certain intellectual elite, with science and arts near the top of the scale and everything else at a lower level (as is the case with Tannenbaum's quota and anomalous talents). These hierarchies only give lip service to more popular talents, like rock music, athletics and sports, crafts and trades, home activities (cooking, gardening, renovating, interior decorating, sewing and so forth). Why do scholars rarely describe the talents of popular singing stars, athletes in sports, talented landscape gardeners, chefs, teachers and so forth? Why analyze the lives of music composers much more frequently than those of talented performers? Why mention only the doctors who invent new techniques or

do research and never those who excel in diagnosing, in performing surgery, or in their socioaffective rapport with patients? Why never give examples of successful entrepreneurs, effective administrators, proficient salespersons and so forth? Why put aside the excellence of a top notch auto mechanic, a superior electrician, or a very talented social worker? A more "democratic" approach to the categorization of talent fields would undoubtedly allow many more individuals to feel that they deserve the label "talented", that it is not the exclusive preserve of a small group of more prestigious fields or subfields of human activity.

Finally, the inclusion of a value system automatically implies the exclusion of "socially reprehensible" gifts or talents. Does it mean that the sexual abilities of a Don Giovanni or a geisha, the social abilities of a Machiavelli or a con artist, the intellectual abilities of a Mafia leader or a successful drug dealer cannot be labeled gifts or talents? Negating their existence does not prevent them existing by any means. They can even be the object of much praise and respect in certain subcultures. There exist many areas of the underworld in which individual differences in ability can manifest themselves: pickpockets, counterfeit artists, robbers, swindlers, assassins, etc. The dexterity of a very talented pickpocket is no less a superior human ability than that of a talented neurosurgeon! Both should be considered equally talented in their respective fields. Similarly, how can we not acknowledge the superior intellectual and social abilities of dictators like Hitler, Stalin, Fidel Castro, Mobutu Sese Seko and so many others who succeeded in maintaining for years their power over their fellow citizens. Talent is a distinctly superior performance no matter what the field of activity is. Giftedness is superior natural abilities whichever way they will be developed, in the same way that a knife remains a knife whether it is used to cut bread or maim people. A value system is most useful to help us decide which talents we will promote and foster, but not to define their nature and extension to domains and fields of human activity.

In summary, it has been shown that the concepts of giftedness and talent can be clearly differentiated by grouping under the term giftedness the large diversity of natural abilities or aptitudes (intellectual, creative, socioaffective, sensorimotor, others) that humans from every culture manifest to varying degrees; the concept of talent encompasses for his part the complexes of developed skills that characterize the hundreds of areas of human activity in such larger fields as technology, crafts, science, arts, social service, athletics, business and so forth. It has been argued that the comprehension of both concepts is restricted to these two types of abilities. Definitions should thus *exclude* reference to any other descriptive characteristics, whether they be personality traits, special educational needs or particular values. These do not belong to the definitions of the concepts, but to more general descriptions of gifted and talented persons.

The Extension of Giftedness and Talent

The extension of a concept can be understood in two different ways. The more common meaning refers to the demarcation between the central constituents of a concept and other more peripheral elements which appear to be closer to the central constituents of another concept. This first meaning has already been addressed "extensively" in the preceding pages. The second meaning ensues from the *normative* nature of the concepts of giftedness and talent, which is given concrete expression by the words "distinctly above average" in Gagné's definitions of both concepts. Still, this expression is not very precise because of its qualitative vocabulary; its quantitative operationalization directly addresses the problem of the *prevalence* of gifted and talented individuals within the general population. In other words, it corresponds to a search for the *lower bound threshold* between those who do not qualify to be labeled as gifted or talented and those who do.

This is one of the most important questions in the field of gifted education. Not only is it among the first questions asked by media people and laypersons, but it also has a major practical impact through its role in the identification process: it determines the size of the subgroup who will benefit from any enrichment activities offered in the school. Strangely, in contrast with its presence among the main interrogations of the population, the question of prevalence has been among the least discussed by specialists in the field. Indeed, only Marland's definition among those described at the beginning of this chapter specified a prevalence estimate. Gagné (in press) observed that it is rarely discussed in textbooks; usually, one finds mention of the two most frequent cutoff scores: an IQ of 130 for intellectual giftedness and a percentile of 95 for academic achievement, both placing prevalence at 2% to 5%, like Marland did. Sometimes, much more "generous" thresholds are proposed. For instance, Renzulli (1986) stated that the Talent Pools of his Revolving Door Identification Model should include at least 15% to 20% of an average school's population. In the United States of America, state norms follow the more restrictive tendency of a 5% ceiling (Mitchell, 1988).

If explicit positions are rare on the subject of prevalence, implicit ones abound, mainly through the identification procedures adopted by program planners, school administrators and researchers. Laypersons also have their own opinions on the subject. In the only existing survey on the prevalence estimates of laypersons, Gagné et al. (in press) asked a heterogeneous sample of adults to quantify their perceptions of prevalence; one half of the sample was queried about "gifted" individuals, while the other half received the "talented" version of the question. Estimates ranged from 1% to 99% in both cases, with respective means of 19% and 36% for the gifted and talented versions, but with very large standard deviations of 18% and 30%. Three things stand out from these results: (a) there is a large diversity of opinions

among laypersons in terms of their perceived prevalence of gifted and talented individuals, (b) a majority of these popular estimates are higher than even the most generous values advanced by professionals and (c) there is a very significant discrepancy between estimates for gifted as compared to talented persons.

The Problem of the Threshold

The main obstacle to a more specific and consensual position on the subject of prevalence is undoubtedly the arbitrariness of any cutoff point placed on a continuous score distribution to mark the "end" of normal abilities and the "beginning" of gifted or talented performance. As Gagné (in press) comments:

To be sure nobody questions the talent of the top 1% in a population nor the fact that being just a bit above average—below the upper third for instance—is not sufficient to be recognized as gifted or talented. But, between these clear marks lies a large grey zone of disputable performances; the more strict or selective one will be, the higher the threshold will be placed.

How can this threshold be targeted more precisely within that large grey zone? Could additional criteria help pinpoint with more precision the threshold's position, for instance special educational needs or observed performance in an enrichment program? Such an approach brings forth the same logical problem already mentioned in connection with the comprehension of the concepts: scholars relying on such criteria would no longer be assessing the prevalence of gifted or talented persons per se, but of "gifted or talented persons with special educational needs", or "gifted and talented persons who benefit from special enrichment activities". Even if there was no such logical hurdle, other problems would restrict the usefulness of these additional criteria. For instance, the criterion of special enrichment needs, seen from the viewpoint of the potential beneficiaries, is not perfectly correlated with the level of intellectual (or other) abilities: personal observations and testimonies from program coordinators indicate that many children and adolescents who test in the top 5% of the population would consider themselves perfectly satisfied with the regular school curriculum. Moreover, a significant proportion of high IQ adolescents deliberately choose *not* to participate in local enrichment programs. The motives are diversified: it might be that their friends are not participating, or that their intellectual curiosity is not very high, or that they are put off by the heavier work load, or whatever. Similarly, playing with the contents of an enrichment intervention can significantly modify the percentage of those who would benefit from it. For instance, grade skipping is undoubtedly applicable to

a smaller percentage of pupils than the offer of a parallel curriculum in five years instead of six; because of its suddenness, the grade skipping would represent a greater challenge than the same gain of one year spread over the six years or so of elementary schooling.

These criticisms do not mean that such criteria are useless; on the contrary, they can be quite helpful in determining how many gifted and talented children would benefit from particular resources. Unfortunately, little research has been done on this particular subject. In fact, only one study was found that addressed this question empirically, comparing two "levels" of gifted children in terms of their performance in an enrichment program. Reis and Renzulli (1982) selected two groups of elementary school pupils to participate in enrichment activities; members of the first group scored in the top 5% on standardized tests of intelligence and achievement, while those in the second group scored from 10 to 15 percentile points below the top 5%. At the end of the program, judges independently assessed student products through a double-blind procedure. No significant difference in the quality of the products was observed between the two groups. The authors used these results as a case for a broadened conception of giftedness. Such thought provoking studies should be replicated with other forms of enrichment activities. Still, its results remain open to at least one alternative interpretation. Since the program's activities consisted of Type III personal projects, it could be argued that all children chose a project more in accordance with their personal cognitive strengths, strengths not differentially assessed by the more global selection criteria. If this was the case, the study would rather support a diversification of assessment measures than a lowering of the threshold on more global identification instruments. Even in the absence of an alternative interpretation of the results, this study should not lead to the broadened conception of giftedness proposed by its authors: the logical hurdle remains. The results should simply indicate that that particular program of enrichment activities was not specific to intellectually gifted children, as restrictively defined in that particular American state. Otherwise, the extension of the giftedness and talent concepts would become overly dependent on the fluctuating results of studies similar to the one described above. It seems preferable to adopt a definition that is as logically sound as possible and then examine empirically to what extent various enrichment activities specifically benefit the population so defined.

The above discussion demonstrates that there is no simple empirical solution to the problem of threshold; it suggests that the narrowing of the grey zone should be addressed logically. Since the problem has been presented as a search for a *lower bound* threshold, then the cutoff point must be placed as close as possible to the mean. The lowest point for an "above average category" corresponds to a score just beyond the limits of the confidence interval of an average score, in other

words a score reliably above average. For instance, IQ tests and standardized achievement tests, which are probably the most reliable among the instruments used to identify gifted and talented children, have 95% confidence intervals ranging from one third to one half of a standard deviation (see Sattler, 1988). On the other hand, the concepts of giftedness and talent designate a subpopulation with characteristics that are distinctly different from those of average ability children and adults. So, using as a criterion the “beginning” of the above average category would unduly dilute the meaning of both concepts. This is why the adverb “distinctly” is important in Gagné’s definitions. A convenient point which would satisfy these considerations is the +1 standard deviation, at the same time close enough to the mean to encompass a fair group of children or adults, namely approximately 15% of the population and far enough from the mean to save the normatively selective meaning of both concepts. Considering finally the omnipresence of measurement errors and the fact that these should not penalize the subjects, a *threshold zone* similar to a confidence interval should be used instead of a cutoff point. It follows from these remarks that an appropriate threshold zone between the gifted or talented and the general population could be described as “the top 15–20% of the population”.

One possible barrier to a more general acceptance of such a low threshold for giftedness and talent might be the reluctance of many professionals to lump together the more “commonly” gifted at the lower end of the range with those few who show exceptional precocity. If it was more generally recognized that there are levels *within* the population of gifted and talented persons, then it might be easier to accept a more generous lower bound threshold than the 3–5% modal cutoff. It is not that levels have never been proposed in the past (see Robeck, 1968) or even recently (see Chapter 25 by Miraca Gross in this handbook). It is more a problem of lack of consensus within the field concerning the number of levels to introduce, their position on a continuous score distribution, as well as the labels to attribute to each of them. Because the establishment of levels within the gifted/talented population is subject to the same problems discussed above with regard to the lower bound threshold, the solution proposed here builds on that lower bound threshold, simply extending the series of standard deviations toward the extreme of the normal distribution. The quantitative categories described in Table 1 include a specific threshold zone between each level. Beyond the +4 S.D. threshold, the prevalence becomes so small (1 in 50,000) that no further divisions are necessary. The general terms “gifted” or “talented” would describe the whole range; when referring to the lower level exclusively, the term “basically” gifted/talented would be used. There would be numerous advantages to using such quantitative subcategories within the gifted/talented population. They would increase the precision in the sampling of subjects for research or service purposes; they would bring a

TABLE 1

Subcategories within the gifted/talented population

Label	S.D.	IQ equiv.	%	ratio	
Basically	+ 1	± 112/115	15–20%	1 in	5 or 6
Moderately	+ 2	± 125/130	2–4%	1 in	35 (± 10)
Highly	+ 3	± 140/145	.001–.003%	1 in	600 (± 300)
Extremely	+ 4	± 155/160	± .00002%	1 in	500 000 (± 10 000)

more efficient targeting of enrichment activities aimed at specific subpopulations; they would also greatly facilitate comparisons between studies and put in better perspective differences in their results.

The Problem of Definitions

Even when the question of the threshold is finally solved in a satisfactory way, a few other problems need to be addressed in order to assess with greater precision the prevalence of the gifted and talented population. Probably the most important of them is the definition of the giftedness and talent constructs, a subject already discussed in the first part of this chapter. It should be evident that there is a lower bound threshold for *each* form of giftedness or talent. What then happens when one takes into account a large variety of abilities, natural ones in the case of giftedness and developed ones in the case of talent? How large can the population of gifted individuals become when the intellectually gifted, the creatively gifted, the socioaffectively gifted and the physically gifted are all counted? No doubt that the prevalence estimate would become even larger when subcategories are considered. For instance, how many could be labeled *intellectually* gifted if various forms of moderately correlated specific cognitive abilities were separately assessed: verbal intelligence, spatial intelligence, logical-mathematical intelligence, practical intelligence (Sternberg & Wagner, 1986) and so forth? Similarly, how many would deserve the label “socioaffectively gifted” if not only leadership abilities, but also empathy, adaptativeness and self-regulatory abilities (Zimmerman & Schunk, 1989) were independently assessed? If similar distinctions were made concerning fields and subfields of talent, the prevalence of the talented would also increase dramatically. As stated by Gagné (in press):

Could a majority of the population be considered gifted or talented in *at least one* of the numerous domains or fields in which abilities manifest themselves? The adverse proposition would be that a small minority of the population controls all forms of excellence, that all talents are in the hands of a small group of “jacks-of-all-trades”, of “good at everything” individuals. The plausibility of this adverse proposition is dependent on the level of the correlations between measures of abilities: the lower they are, the larger the population of gifted and talented persons will be.

A few empirical studies (see DeHaan & Havighurst, 1957; Feldman & Bratton, 1980; Hainsworth, 1978, cited in Tannenbaum, 1983) have addressed this question and shown clearly that as the criteria for gifted behavior are diversified, the percentage of those who deserve the label grows accordingly. Anastasi (1988) described a study in which army personnel were assigned to various occupational specialties, using a thirteen-test classification battery with subscores in various aptitude areas. Eighty percent of them got a score above the mean in their best aptitude area. Anastasi concluded: "This apparent impossibility, in which nearly everyone could be above average, can be attained by capitalizing on the fact that nearly everyone excels in *some* aptitude" (p. 193). Finally, Gagné (in press) analyzed a large data bank collected as part of the validation of a series of peer nomination forms for the screening of gifted and talented pupils. The pool of forty abilities from which different groups of twelve were chosen to make up experimental forms was inspired by his differentiated model of giftedness and talent. Each of the 2500 participating pupils in grades 4 to 6 received a score on a 100-point scale for nineteen different abilities, covering school subjects, technology, crafts, arts, physical abilities and social abilities. The three best (top 12% on average) in each of the eighty-eight groups were singled out for each ability domain. It was found that just over 50% of the pupils on average in each classroom were judged by their peers to excel in at least one ability domain. Similar results were obtained by analyzing teacher choices made on the same forms.

In summary, it is no longer defensible to maintain, as Marland did in his definition, that only 3% to 5% of the school population can be considered gifted or talented. It is possible to keep such a restrictive threshold in any given domain or field and still see the prevalence of the gifted and talented grow rapidly as more and more areas of excellence are taken into account. It must be again emphasized that the fact that a majority of the population can be labeled gifted or talented in no way dilutes the restrictive meaning of these concepts: in any one ability domain, the 15–20% threshold still applies.

The Problem of the Group Reference

The last problem examined here is the choice of an appropriate reference group for the various categories of gifts and talents. Why not simply use the general population? This simple solution is unacceptable for many reasons. For instance, most fields of talent bring together less than 10% of the population, which would make all their members automatically talented if compared to the entire population. Sometimes this point of view appears in everyday language: if someone in a small neighborhood participates in a marathon, however long it takes that person to complete it, he/she will

instantly become the neighborhood athlete, because the implicit comparison group will be all dwellers in the neighborhood, instead of the subgroup of joggers, or the even smaller group of marathon participants. Similarly, most persons who have never learned a particular skill will tend to perceive as talented anyone who has mastered that skill reasonably well. Still, the entire population could be a more appropriate basis of comparison for aptitudes than for talents. Indeed, while the developed skills of a talent area are found only in a relatively small subgroup of the population, aptitudes are characteristic of every human being. Except for a few individuals who have profound intellectual, emotional or physical handicaps, everyone is at least minimally apt to operate in the intellectual, creative, socioaffective or sensorimotor domains. For this reason, aptitudes must use the entire population as the basic reference group.

But, human aptitudes have also a developmental component; as mentioned earlier, they develop through maturation, everyday use and more systematic practice and training. Consequently, age must be taken into account in assessing the level of a given aptitude; otherwise only extremely precocious children would stand a chance to be labeled (intellectually, physically, etc.) gifted if compared to all age groups. It must be pointed out that the age parameter does not affect the prevalence estimates; it only distributes the 15–20% equally among age groups. Sex is an obvious choice as a second parameter for the differentiation of aptitudes; its impact is clear in some psychomotor aspects of the physical domain, notably strength and speed, so much so that most athletic disciplines segregate the sexes. There are also confirmed differences in some cognitive abilities (Deaux, 1985), but these have never been judged large enough to justify any differential standardization of measures according to sex. Ethnic or cultural membership might serve as a third parameter, if major differences in aptitudes could be shown. The over-representation of African Americans in many professional sports and athletic disciplines or of Jews and Asians in North American universities would suggest that such differences exist. These need not have a genetic origin; the impact of the environment on the development of aptitudes can produce significant intercultural disparities. As with sexual differences in cognitive abilities, ethnic or cultural differences in aptitudes have not been judged significant enough to justify separate standards of comparison.

The problem of the reference group is somewhat more complex in the case of talents. First, if talent corresponds to a performance which is "distinctly above average in a field of human activity", then members of a particular field must serve as the basic comparison group. As mentioned above, this statement somewhat contradicts the spontaneous reaction of laypersons, but is essential to prevent against inflated estimates of the prevalence of talented persons. The next question is the definition of membership. In most cases, the demarcation is relatively easy to make. Usually, trades, crafts

and professions have some form of certification that confirms membership in the field (e.g., chemists, electricians, teachers, comedians, computer programmers). Subdividing these fields into more specific subgroups (e.g., science teachers, math teachers, English teachers) will not affect prevalence estimates. A problem arises when the subgroups are related to levels of performance within a field. For instance, should a professional pianist be compared to all pianists, including those who have barely mastered the most basic skills in the field, to those who have obtained an academic diploma, or even those few who are actively pursuing a career as professional pianists? These three alternatives can be invoked to specify a particular population: the entire population of pianists, the qualified pianists and the professional pianists. But, it seems more appropriate to adopt a membership definition analogous to that of the lower bound threshold mentioned earlier, then use the labels proposed in Table 1 to qualify higher levels of talent. Such a definition is less likely to trigger accusations of elitism. With this lower bound definition of fields, the upper 15–20% of all persons having mastered at least basic skills in piano would be labeled talented in that field; among them progressively smaller subgroups of moderately, highly and extremely talented individuals would be identified. Similarly, in the case of the neighborhood marathoner mentioned above, the appropriate reference group would be all those who have chosen running as an athletic discipline, with the top 15–20% forming the basically talented group. Within that group, subgroups of moderately, highly and extremely talented individuals could be identified using the appropriate ratios proposed. No doubt that those who complete a marathon, whatever time it takes them, would be among the talented in that field. Their talent would also implicitly confirm their physical giftedness.

This proposal will probably not modify the well-ingrained custom of within-subgroup comparisons in most fields, according to which only the best within the subgroup are recognized as talented. For instance, most people actively interested in the field of music would describe as “truly” talented only those professional pianists who have won prizes in major competitions, are at least nationally renowned as soloists, or are members of well-known orchestras. Similarly, most ice hockey fans would restrict the label to only a minority of the 500 or so players in the National Hockey League, forgetting that all of them are at least *highly* if not *extremely* talented, having risen to the top from a pool of hundreds of thousands of youngsters who played in junior leagues but never realized their dream of becoming a player in the NHL. The same tendency exists in schools. The educational system is one of few fields through which most children have to pass, at least in industrialized countries. Some leave after primary school, others during or after high school, while a few go on to college and fewer still get a graduate degree. All students who obtain a college degree should be considered academically talented, simply because of the

small percentage of such people. In fact, almost all of them were probably among the two or three best in their group while in elementary school. Still, from the point of view of college students and professors, only the more performing are usually perceived as talented. This tendency to evaluate excellence from the top down instead of from the bottom up is very unfortunate insofar as it gives an overly elitist flavor to the word talented.

Should a field include only those active in it? The answer has to be positive, otherwise it would be unduly inflated with all those who have at one time or another tried to master the skills of the field, then stopped practicing because of failure, insufficient rate of progression, or competition from more interesting or absorbing activities. Is age a relevant parameter to circumscribe a field of activity? In many cases the question is not relevant since membership in the field presupposes adulthood (e.g., trades and professions); but in other cases (e.g., most artistic and athletic fields) excellence can manifest itself at an early age, normatively speaking. For the same reason given in the case of aptitudes, namely the recognition of precociousness, age must be taken into consideration when assessing the presence of basic, moderate, high or extreme talent. In other words, precociousness should be synonymous with giftedness *and* talent. Age is also important because some fields of talent have a developmental ceiling: they become almost obsolete after adolescence. The most conspicuous case in point is academic talent. It is no longer a relevant field of activity beyond early adulthood; indeed, as students leave the educational system academic talent becomes progressively superseded by the presence or absence of talent in the chosen career.

In sum, different bases of comparison have been proposed for giftedness and talent. Will the wider base for giftedness generate more gifted people than talented people? In itself, this criterion should not have much influence, since the wider base is offset by a smaller number of categories and subcategories. But, the structure of the model implies that there should be theoretically more gifted individuals than talented ones, since the absence of appropriate intrapersonal or environmental catalysts may hinder the transformation of gifts into talents. On the other hand, because gifts and talents are defined normatively, as the upper 15–20% of some particular reference group, then equivalent proportions are artificially created for both groups. This could mean that among those judged talented some would fall below the threshold zone of the relevant aptitude(s).

Conclusion

During the last two or three decades, the multiplicity of definitions of giftedness and talent has testified to the creativity of scholars intent on putting on markers

in a field in full growth and bubbling with new ideas. The time seems ripe now for a meeting of minds among scholars and professionals concerning the nature of the two major constructs: giftedness and talent. Such an agreement would confirm that the field is now progressing toward a new level of conceptual maturity. Gagné's differentiated model of giftedness and talent could serve as an initial proposal to be discussed, amplified, and/or modified. Not only is it the only existing model to offer a clear operational distinction between gifts and talents, but there are also signs that it has aroused widespread interest (Borland, 1989; Feldhusen, 1985b; Sattler, 1988). The above discussion already suggests ways in which Gagné's definitions could be modified to take into account the preceding discussion on the extension of the concepts. Here is how they could be rephrased.

Giftedness corresponds to a level of competence in the non-systematically developed abilities of at least one aptitude domain that places subjects among the upper 15–20% of their age peers.

Talent corresponds to a level of performance in the systematically developed skills of at least one field of human activity that places subjects among the upper 15–20% of the same age active members of the field.

Beyond the definitions themselves, agreement should be sought on a series of subsidiary questions, like the nature and categories of aptitudes, the relevance of the various mediating structures presented as catalysts by Gagné, the nature and "cartography" of fields of talent, the talent areas to be prioritized by the educational system, the levels—and their labels—to introduce *within* the gifted/talented population and so forth. Such an effort, if successful, would create a basic conceptual framework to be shared by most scholars. It would become a common node, progressively enriched and expanded, from which would radiate the various research questions and concerns. No doubt that it would help in creating closer ties and more intensive collaboration between scholars and professionals, not only at the local or national level, but also internationally.

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Developmental Theories and Giftedness

FRANZ J. MÖNKS

University of Nijmegen, The Netherlands

EMANUEL J. MASON

University of Kentucky, Lexington, Kentucky, U.S.A.

Introduction

For generations psychologists have been debating whether development of an individual is determined more by organic or environmental factors. This nature-nurture issue is not only a concern for developmental psychology (Vernon, 1979). Education and socialization depend largely on theories and findings of developmental psychology. If proponents of the nature position predominate at a given time, human development is regarded as a process of maturation. If, however, the advocates of nurture are prevailing, the emphasis is on learning. Nowadays most developmental and educational psychologists hold a position somewhere between the two extremes.

The primary question in developmental research on the gifted is no longer whether nature or nurture is the most basic, but rather what kind of interaction between the two occurs, and how does this influence development. In other words, what results from the interaction of specific individual traits and experiences in a given social and cultural environment. Human development is generally regarded as a process of interaction between individual characteristics and environmental opportunities.

In this chapter, the authors describe and discuss prevailing developmental theories. In addition, the diversity of definitions of giftedness will be outlined. It will become evident that some versions of the nature vs nurture controversy remain. Existing and ongoing research demonstrates that only longitudinal studies can provide evidence about the relative contribution of nature and nurture to the development of gifted individuals. Finally, instructional and educational provisions will be discussed from a developmental perspective. In the present chapter, the authors treat the terms gifted, highly able, and talented synonymously.

Developmental Theories

The concept of development includes a complexity of processes and their organization. This complexity is

constructed from conceptual and empirical elements. A theory of development depends on the accentuation of aspects of this complexity. Theories are most meaningful when they enable description, explanation and prediction of diverse phenomena (Mason & Bramble, 1989). It has been suggested that the usefulness of a theory of giftedness should be established in terms of what it implies about the nature of the gifted child, education and programs for the gifted, its structure and framework, and the criteria of good theory (e.g., logical consistency, parsimony, etc.) (Cohen, 1988). According to Marx (1963), a distinction is necessary between four different modes of theory construction. They are arranged from relatively more conceptual to relatively more empirical.

Deductive theory refers to any logically or deductively arranged cluster of concepts. The empirical data are explained from a conceptual structure. Such a formally organized theory can give direction to research but findings contribute little to produce a new or better theory.

Functional theory refers to the interaction of empirical findings and conceptualization. Empirical and conceptual activities are emphasized and have equal status in theory construction.

Inductive theory refers to the kind of theory that is essentially a summary of empirical data; it contains a minimum of deductive logic. Essentially it is the contrary of a deductive theory.

Model is a term for any conceptual analog that can be used for empirical research. Such an analog is often of a mathematical or physical nature. A model that directs the process of finding an answer or solution is called a heuristic. The result of such a process can be a hypothesis and as such contribute to a better conceptualization. Models often have a descriptive or explanatory function. Such a model accentuates the most important aspects. For example, the machine or deficit model has often been used to explain the human aging (i.e., the functioning of a machine decreases over time, parts of the machine getting old, which affects the functioning of the system). This increasingly

disfunctioning model serves as an analogy for the human aging process. Thus, a model has value as a heuristic or tool. A model is not subject to the same kinds of rigorous demands for verification and falsification as a theory (Cook & Campbell, 1979).

Developmental theories can be grouped by their different perspectives. Divergent orientations will be presented to show the variety of explanations for human development.

Biologically Oriented Theories

In this context development is viewed as synonymous with evolution. Human development is mainly seen as growth and maturation of the organism, as unfolding of predispositions: i.e., heredity and temperament. In this view development is biologically determined. The environment plays a relatively unimportant role providing only the necessary ground for the growth of predispositions, comparable with a plant which needs favorable environmental conditions for its growth. Actually, development is a continuation of the genesis of the embryo.

Terman believed to his "dying day" that intelligence is a genetically determined trait that is stable over the life of an individual (Minton, 1988, p. 199). However, by the time he was 77, his own empirical genetic studies, the longest developmental investigation ever attempted, convinced him that many of his 1500 subjects had never made use of their superior ability. He concluded that factors other than intelligence, such as personality and environment, determine in an essential way whether or not an individual reaches "life success" (Terman, 1954). Nowadays, however, there are no serious proponents of this kind of theory.

Milieu-Oriented Theories

Learning and sociologically oriented theories belong to this group. The influence of the environment on the development of a person has a central position in these theories. Human development is seen as an ongoing social learning process.

Learning theories, although not identical, have a common feature that learning is viewed as a relatively stable change in the person's *disposition*. Disposition may be described as the potential to behave. Therefore, development means increase of potential to perform and to behave. Walking has to be learned, as does being with people, and thinking systematically. The potential to perform higher order activities is not the result of spontaneous organismic growth, but is the outcome of learning appropriate techniques. Therefore, the child learns to demonstrate milieu-specific behavior patterns.

It is important to search for the mechanisms that govern the acquisition and modification of behavior, but it is unknown whether this approach "actually looks for mechanisms of acquisition and modification or whether

it merely applies the preconceived notion that the growth of all behavior is caused by conditioning and thereby overlooks the actual mechanisms governing acquisition and modification" (Langer, 1969, p. 85). Evidently much of our behavior is learned and its acquisition, such as with language learning, often depends on our social environment. But these theories neglect the inborn abilities and the diversity of human characteristics. A single environment with specific learning opportunities is not the same for every developing individual exposed to it. One child may profit optimally while another is not at all affected.

Psychodynamic Theories

Psychodynamic theories and learning theories both portray the environment as having a strong impact on human development. They differ in that the socio-affective component of personality and its development is considered to be fundamental in psychodynamic theories but is not central in theories of learning. The socio-affective component essentially determines the dynamics of the developmental processes.

Within the psychodynamic group, the most prominent theory is the psychoanalytic. According to this view the child is born with two fundamental forms of biological energy: libido and aggression. These two conflicting yet complementary classes of instincts are operative from birth. Libido or Eros is constructive, positive and life seeking. Aggression or death instinct is destructive and life disturbing. The child is born with an id structure that is energized by libido and aggression. The id provides the child the energy to satisfy his or her passions, but the environment inhibits this process. The id structure is transformed by its interactions with the environment into an ego structure. The superego emerges under the influence of the social environment, especially the parents, to control the behavior of the ego and the demands of the id.

Psychodynamic theory is primarily a theory of socio-affective development. A problem with this theory is empirical validation of the id, ego and superego, and the stages of sexual development (which are not covered in this chapter). Findings are obtained by the clinical therapeutic method. The data are therefore confounded with the therapist's interpretation. "Thus, not only are the data not reliable, but it is also not always certain which theoretical assertions they are relevant to" (Langer, 1969, p. 49).

Erikson (1964) broadened the Freudian perspective. He introduced a relationship between psychological, educational, and cultural factors. Erikson took a life-span perspective and developed a framework of eight distinct stages. Developing individuals pass through those stages at specific periods in their lives. Each stage represents a conflict that must be resolved successfully for the person to be psychologically healthy. This approach stimulated research, especially in the infancy

and adolescent periods. However, questions remain about whether psychodynamic theory really can be considered as a scientific theory (i.e., is it falsifiable, testable, and can it be revised?).

Interactionist Theory

The theories discussed so far are rather limited because each emphasizes a single dimension. A synthesis of the various aspects is necessary. The interactionist theory used by the great majority of Western psychologists and educators provides such a synthesis. The German psychologist William Stern (1871–1938) was the first to propose such a theory and called it the *theory of convergence*. In his view human development is a process in which personality and environmental factors converge (Stern, 1916). Yet, Stern never directly participated in the controversy concerning nature vs nurture.

The former socialist countries favored the environmental theory. Human development was seen primarily as a mirror of the environment. According to Vygotsky, cognitive development is not a “natural” process, but is determined by culture (see Van Parreren, 1983). Therefore, Vygotsky’s position was that it is not necessary, as Piaget argued, to connect instruction in school with stages of development, but rather with the “zone of proximal development”, in other words, stimulate the child to do tasks that are just above his or her ability.

Like Langer, some authors view Werner and Piaget as proponents of maturation. The human being is viewed as an active agent and development as merely a self-constructive process. Development occurs from within. Werner characterized development as an orthogenetic process that is “directed towards increasing differentiation, centralization, and hierarchic integration of the child’s mental organization” (Langer, 1969, p. 9). On the other hand, Piaget (1967) characterized development as an equilibration process (i.e., development proceeds from relative disequilibrium to increasing equilibrium). The child will always function to achieve equilibrium. In doing so, the child changes and develops. Langer characterizes Werner and Piaget as *organic lamp* theorists. It is true that these theorists emphasize maturation of the organism as a central agent of development. However, development only then takes place when the child *interacts* with his environment.

Therefore, Piaget (1896–1980) can be regarded mainly as an interaction theorist. However, he emphasized only cognitive functioning and the related issue of moral development. According to Piaget, development is a continuation of embryogenesis. Development occurs in a sequence of stages which, when reached, permit the child to perform a higher level of cognitive operations. The development of a higher stage depends on *maturation, experience, and social transmission*. Education and language play roles in social transmission. The most central factor, however, is the spontaneous activity of the child, because this activity brings the child through

interaction between maturation and social environment to new forms of *adaptation*. This means the child is increasingly able to react adequately to the demands of the reality.

Piaget called the process of adaptation of the organism *assimilation*. If the organism has to adapt to new elements of the environment, the process is called *accommodation*. This last form of adaptation requires a new attitude in the individual, creativity of mental operations. As a process of establishing equilibrium, accommodation brings the child to a higher cognitive level and the child establishes a higher structure for thinking. Structure refers to the scheme developed by the individual to achieve equilibrium between the tendencies of assimilation and accommodation. The result is a new process of accommodation that is necessary to establish a new or higher kind of operation that will disturb the existing equilibrium. The process of actively breaking through the existing equilibrium to establish a higher structure of thinking is called equilibration by Piaget. This active form of achieving a new equilibrium is a kind of *self-regulation*.

Interaction refers to mutual or reciprocal action or influence between a person and other people, objects, processes, or other elements of the environment. This includes the notion that the acting and reacting individual shapes the environment (e.g., with family, friends, classmates, social class). On the other hand, the individual influences the environment through experiences. In short, the individual both is a product and a producer of the environment. The biological concept of *adaptation* introduced by Piaget has to be extended to emphasize the more active role of the individual. Sociologists use the term *emancipation*, to mean self-actualization, becoming an independent person, and detachment from inappropriate bondings.

It is evident that psychological development consists of more than cognitive development as emphasized by Piaget. Psychological development includes cognitive as well as social and personality aspects. Furthermore, it is a dynamic and life-long process; the interaction between the nature of the individual and the environment determines the motives that emerge and the kinds of behavior patterns that will become manifest. In short, psychological development is the result of interaction between the individual and his or her environment.

As was emphasized earlier, conceptualizations of psychological development influence research directions and educational and psychological practice. All the theories briefly summarized here have influenced theory and concepts of giftedness and will continue to do so. Knowledge of developmental theories is necessary to understand what “is behind” a definition.

Definitions of Giftedness

Defining giftedness is a task fraught with difficulty. A definition should give a formal and concise description

of the meaning of a concept or a construct. Giftedness or the synonyms high ability and talent can assume different meanings. Frequently these meanings are tainted by an emotionalism that seems to engulf the concept of giftedness. For example, in German the word for giftedness can be *Begabung* or *Hochbegabung*. The connotation of *Hochbegabung* can be value laden, associating giftedness with elitism. A similar situation exists in French (*doués* or *surdoués*). Such a connotation evokes emotional reactions and negative feelings that have hampered progress in programming for the gifted worldwide (Williams & Mitchell, 1989).

Further, a concise definition is almost impossible because the context in which the definition is made may refer to a process, key elements of giftedness, provisions for the gifted, or education of the gifted. In addition, it is not easy to separate theoretical and practical concepts, because one's theory of giftedness determines research and educational approaches. Finally, practical concerns seem more involved in definitions than in developmental theories.

According to Hany (1987), there are more than a hundred definitions of giftedness (and its synonyms). These definitions can be clustered in four distinctive groups. The first two of them refer to psychological constructs, a third focuses on achievement and accomplishment, and the fourth takes an environmental view. In the following section these four main groups of definitions of giftedness are presented.

Trait-oriented Definitions

The most prominent representative of the trait-oriented approach is Lewis M. Terman (1877–1956) who popularized the concept of IQ and played a prominent role in the history of social science and public policy. Terman believed that intelligence as revealed by intelligence tests is genetically determined and therefore stable over time. His belief in *biological determinism* was so strong that he only came to the conclusion in 1947 that "intellect and achievement are far from perfectly correlated" (Terman & Oden, 1947, p. 352). The new ideas that environmental and personality factors are significant determinants of "the extent to which a subject had made use of his superior ability" (Terman & Oden, 1947, p. 349) were most clearly spelled out in Terman's address at the University of California at Berkeley (Terman, 1954).

Another central issue of Terman's work was the idea that he had a *mission* as a psychologist to contribute to the shaping of American society. He advocated a society that was a *meritocracy*. More precisely, individual differences in ability should be reflected in the hierarchical structure of the society: the most responsible positions should be held by the most capable individuals (that is, those with the highest IQ scores). A meritocratic social structure based on the results of mental tests that identify native intelligence at school age is an unrealistic ideal,

not only because high intelligence is not isomorphic with high achievement, but human beings develop in a dynamic way and through interaction with the environment.

Terman's view of intelligence as a unitary inherited trait reappeared in modified form in Marland's well-known definition of giftedness proposed in 1972.

Gifted and talented children are those identified by professionally qualified persons who by virtue of outstanding abilities are capable of high performance. These are children who require differentiated educational programs and services beyond those normally provided by a regular school program in order to realize their contribution to self and society. Children capable of high performance include those with demonstrated achievement and/or potential ability in any of the following areas:

- (1) General intellectual ability;
- (2) Specific academic aptitude;
- (3) Creative or productive thinking;
- (4) Leadership ability;
- (5) Visual and performing arts;
- (6) Psychomotor ability (Davis & Rimm, 1985, p. 10).

There are at least two new elements in this definition: the definition goes beyond intelligence to other areas of high ability, and abilities as well as achievement are criteria for identification. However, the definition excludes non-cognitive factors (e.g., motivation) as well as clear operationalization of the different forms of giftedness.

Some time ago when Gardner (1983) proposed his theory of multiple intelligences, he argued "that individuals have a number of domains of potential intellectual competence which they are in the position to develop, if they are normal and if the appropriate stimulating factors are available" (p. 284). Furthermore, there are conditions and criteria which have to be taken into account to identify a specific kind of intelligence. Criteria of an intelligence are, for example, potential isolation by brain damage, support from experimental psychological tasks or support from psychometric findings. Gardner identified several intelligences related to a specific domain of potential (e.g., linguistic, musical, logical-mathematical, spatial and bodily-kinesthetic intelligence).

The description of multiple intelligences or traits is primarily based on anecdotal findings rather than empirical results. The important extension beyond Terman's approach is that giftedness results from inborn abilities in interaction with an appropriately supportive environment. The other point is that this definition goes beyond the opinion that giftedness is based on a single inherited trait. The main assumption of the multiple intelligences approach is that interindividual differences in test scores are determined by mental abilities that can be measured psychometrically. This approach at best describes the results but not the processes which form the basis for the results achieved.

The trait-oriented approach has led to and enriched empirical research. It has enabled extension knowledge concerning characteristics and conditions for the development of giftedness and has led to better understanding of the processes of achievement of gifted people. This can ultimately lead to means for better instruction of the gifted and nurturance of their talents.

Cognitive Component Models

Cognitive definitions focus on thought processes, memory and related skills. For example, Piaget was less interested in the outcome of a test than in the process of responding. Therefore, he emphasized clinical methods in which a single or small group of children were observed and interviewed while they were performing tasks rather than large-scale research in his approach. In his theory of knowledge, better known as genetic epistemology, Piaget preferred to investigate how children get and use what they know.

Proponents of the cognitive information processing approach have recently invested considerable effort in the direction suggested by Piaget's work. "The cognitive components approach is task analytic and attempts to directly identify the information processing components of performance on tasks that have been generally used to assess mental abilities" (Pellegrino & Glaser, 1979, p. 188).

Sternberg is an important proponent of this approach (Sternberg, 1985; Sternberg & Davidson, 1987). A central concept in Sternberg's experiential subtheory of intelligence is insight and response to novelty in task performance. Within this view a distinction is made between "three separate but related psychological processes" (Sternberg, 1985, p. 80): (1) *selective encoding*, i.e., sifting out relevant from irrelevant information; (2) *selective combination*, i.e., "combining what might originally seem to be isolated pieces of information into a unified whole that may or may not resemble its parts" (Sternberg, 1985, p. 80); (3) *selective comparison*, i.e., relating new information to that which was acquired in the past.

Insightful performance demonstrated as problem-solving skills or as knowledge-acquisition components are indicators of giftedness. The better these skills are, the more intellectually gifted a person appears to be. Moreover, according to the loci of information processing, Sternberg makes a distinction between three kinds of giftedness: analytic, synthetic, and practical abilities (Sternberg & Lubart, 1991). The forthcoming *Sternberg Triarchic Abilities Test* will contain seven subscores for the different kinds of abilities and processing, namely analytic, synthetic, automatization, practical *abilities* and verbal, quantitative, figural *processing*. Sternberg hopes that such a test with different age levels (from kindergarten to adulthood) and a broad scope of abilities and processes will measure giftedness much better than a single IQ-test.

Another approach that is promising but not yet fully

developed is that of R uppell (R uppell, Hinnersmann, & Wiegand, 1986). He proposes a complex model of information processing to explain thinking processes of gifted people that he summarizes with the slogan "QI instead of IQ". QI means Quality of Information processing. R uppel et al. (1986) argue that complex creative problem-solving goes far beyond the normal level of thinking and recalling; this kind of problem-solving requires extraordinary thinking skills and insight. A problem with the complex approach of R uppell and his associates, however, is that the concepts are changing and that the experimental approach in the laboratory does not reflect reality. Moreover, the complex test situation is difficult to analyze because of the multidimensional processes which occur during experimentation.

Thus far, the cognitive component approach is more theoretical or at best in a beginning stage of empirical verification. The existing models need to be tested thoroughly to become useful for development of applications. Until now, this approach has contributed little to the definition of giftedness, the identification of gifted individuals, and programs for the gifted. However, on the basis of current activity and interest in the field, it appears that as this approach matures, it will lead to useful definitions of giftedness based on mental processes.

Achievement-oriented Models

Even Terman, the most rigidly trait-oriented author, was convinced by his own empirical data that high intelligence was only a necessary but not a sufficient condition for highly able behavior. As a result he considered *achievement* as the observable output of giftedness. As early as 1916, the noted German psychologist William Stern considered high intelligence as a necessary but not sufficient condition for outstanding achievement. He considered personality traits like motivation and environmentally appropriate conditions important (Stern, 1916). However, his arguments were more supported by intuition than empirical evidence.

The most influential author in the achievement orientation category is Renzulli. His article "What makes giftedness?" (Renzulli, 1978) has had a long lasting impact on the field. A thorough literature review revealed that there are at least three traits or factors involved in gifted achievement: (1) above average ability, (2) task commitment, and (3) creativity. These three clusters of variables are brought together in Renzulli's "three-ring conception". According to him highly productive people can be characterized by these three clusters of traits. Recently, the research base of the three-ring conception was attacked by Jarell and Borland (1990) who argued that the research they reviewed does not support this conception. Moreover, the research is either irrelevant or contradictory to the triad.

The article by Jarell and Borland provided Renzulli

(1990) an opportunity to react in a constructive and convincing way. Most important, Jarell and Borland did not examine the most recent theory and research on the three-ring conception. Furthermore, the intention of Renzulli's conception is threefold: "(a) to call attention to the developmental nature of behaviors such as creativity and task commitment, (b) to highlight the dynamic interaction among behaviors that is necessary in order for gifted behaviors to emerge, and (c) to provide enough flexibility in selection procedures . . ." (Renzulli, 1990, p. 325). Giftedness has to be seen as a manifestation "of human potential that can be developed in certain people, at certain times, and under certain circumstances" (p. 324). Renzulli's overall intention in his approach is to be able to identify *and* to nurture giftedness appropriately. The multicomponent conceptualization of giftedness can be regarded as one of the better definitions.

However, a definition that strongly or exclusively emphasizes personality traits neglecting the interactive nature of human development does little justice to the dynamic interplay of developmental processes. A multidimensional approach, including personality and social components as determining factors, seems to be an appropriate framework. The following modification was made by Mönks working from a developmental psychology perspective in his Triadic Interdependence Model of Giftedness (see Mönks, 1992a, p. 191). This model consists of one personality triad and one environmental triad. Task commitment was replaced by *motivation* which includes task commitment, risk taking, future time perspective, anticipation and planning. Furthermore, the rather liberal above average ability criterion was replaced by *high intellectual abilities* because gifted behaviors are manifestations of potential which ranks in the upper 5–10%, rather than the upper 15–25% as Renzulli suggested. The new triad includes the main social areas in which the child and adolescent grow: *family, school and peer group*. Emergence and development of gifted potential depend to a great extent on a supportive environment. Intellectual peers or developmental equals are significant people who are needed for healthy social and psychological development. All children need peers to interact with and from whom to learn, and so it is with the gifted.

Authors working with an achievement oriented model make a distinction between potential and realized capacities. In serving the needs of underachievers it is important to know the potential of a person and how much of that potential has been realized. Knowledge of the discrepancy between potential and realized abilities provides opportunity for intervention. The advantage of achievement oriented models is not only in the interconnection of identification and education, but also that attention is paid to the processes involved in achievement and the recognition that there are other factors than intelligence scores that influence the realization of innate human potential.

Socio-cultural/Psychosocial Oriented Models

As was indicated earlier, the social microenvironment (family, school, and peers) has an impact on human development. The Triadic Interdependence Model of Giftedness can be characterized as a partially psychosocial model because it includes the micro- but not the macroenvironment. However, it is evident that the macroenvironment has also an impact on the development of each individual. The *Zeitgeist*, the economic situation, the political orientation, and the culturally dominant values and beliefs all have influence on human development and therefore on the development of the gifted. To a certain extent this orientation is the opposite of "ontogenetic stability". Extreme social learning theorists would even argue that gifted behaviors are entirely learned.

According to Tannenbaum (1983), outstanding achievements are determined equally by the following five factors: (1) general ability, (2) special ability, (3) nonintellective factors, (4) environmental factors, and (5) chance factors. Tannenbaum arranged these factors in the shape of a star, and thus the name *star definition* (see Tannenbaum, 1983, p. 87; Feldman, 1992). Society determines who is regarded as gifted. From the societal perspective, a distinction can be made between "scarce talents", "surplus talents", "quota talents", and "anomalous talents". A society always has criteria for the attribution of what is talented and gifted in terms of outstanding achievement.

Giftedness is not seen as a priority in the schooling of children in all societies. Policymakers determine whether and to what extent educational programs are provided for gifted individuals. Thus, emphasis on a socio-cultural (political) perspective implies that giftedness is defined and determined in the context of the existence of concern, and the availability of provision, for the highly able.

Definitions of, and perspectives on, giftedness give direction to research and practice. The interconnection and interdependence of the individual and society affect both the gifted and the nongifted. The detrimental effects of not serving the special needs of gifted individuals will affect society at large. Programs for the gifted are not special in the sense that they advocate giving to each individual what is appropriate for him or her.

Research on the Development of Gifted Children

A casual review of the literature suggests that definitions of giftedness are more influential than the theories on the research of gifted development. This may be the result of a practical and educationally-oriented grounding of the definitions. For this reason, research presented here is organized more along definitional than theoretical lines.

Trait-oriented Research

Although early interest in the trait of intelligence could be attributed to the work of Sir Francis Galton, Karl Pearson, Alfred Binet, and others, the beginning of formal scientific research in giftedness has frequently been credited to Terman for his development of a technically sound method of assessment of intelligence and his longitudinal studies of the trait. In these studies, Terman postulated that individuals developed within the limits of their genetically preordained abilities (Cravens, 1992; Grindler, 1990). Terman initiated and performed the longest developmental investigation in duration ever attempted. This longitudinal study, involving more than 1500 children and adolescents from 5 to 16 years of age, started in the 1920s, and is still ongoing. The group was selected based on an IQ score of 135 or higher as determined by the Stanford-Binet Test.

Because of the influence of Terman's contributions, much of the research on giftedness has taken a trait-oriented approach emphasizing intelligence testing, and other psychometric approaches to identification of intelligence as a general static trait that determines gifted capacity (e.g., Macmann, Plasket, Barnett, & Siler, 1991). However, more recent analyses have challenged the assumption that high IQ scores and general intelligence are: (1) genetically determined, and (2) necessarily required for, or reflective of, gifted performance (O'Connor & Hermelin, 1988; Silver & Clampit, 1990).

The trait-oriented view prevails in research looking for the multiple traits of the gifted child. In studies of the performance of gifted children, an IQ test is frequently used to identify the gifted sample. Such studies have investigated a wide range of traits of gifted populations in addition to performance and achievement. For example, the Shigaki and Wolf (1980) investigation of children's syllogistic reasoning; Carter's (1985) studies of Piagetian task performance; research by Derevensky and Coleman (1989) and Henderson, Gold and Clark (1984) on gifted children's fears and daydreaming, and various studies of personality and socialization (e.g., Altman, 1983; Keller, 1992; Luftig & Nichols, 1991; and Olschewsky, Kulieke, & Krasney, 1988).

In recent years, research that questions the validity of using IQ test scores for identifying present and future gifted performance in specific academic and skill areas has been increasing. Along with this focus away from the general trait conception of giftedness represented by the IQ score, interest has been directed to identification of giftedness in groups that had previously not been considered gifted such as handicapped, underprivileged, and ethnically divergent minority groups (Sekowski, 1992). This new interest in giftedness among nontraditional populations is leading to a broadening of criteria for identification. For example, Schack and Starko (1990) reported that teachers emphasized creativity, learning speed and ease, curiosity, and initiative in seeking one's own learning experiences as essential for academic giftedness, but more experienced teachers also emphasized

the IQ score. A trait model that emphasizes multiple intelligences like Gardner's is becoming more compatible with research evidence than the single trait models relying on IQ scores for identification of giftedness.

Cognitive Component Models

Much recent literature that comes under the influence of cognitive definitions seems to represent the trait of giftedness functionally rather than by intelligence test score. For example, numerous investigations of giftedness in mathematics emphasize mathematics performance as the criterion (e.g., Benbow & Minor, 1990; Davis & Benbow, 1990; Benbow & Arjmand, 1990). Facaoaru and Bittner (1987) have advocated diagnostic procedures for identifying the gifted using techniques and concepts from cognitive research such as procedural thought processing, spatial abilities, and problem solving. The analysis of thought processes determined by verbal comments recorded during problem solving has proven useful in identifying how gifted students learn (Shore, Coleman, & Moss, 1992). In a more extreme position, Mason (1992) has presented research advocating the identification of giftedness on the basis of analysis of task performance and cognitive skills. This focus on functionality and mental processing is a reflection of the increased interest in the cognitive orientation in recent years.

A factor leading to the increase of cognitive research in giftedness is the growth of the information sciences and computer technology. These advances in technology have been particularly influential on research in cognitive psychology (Beer, 1990; Thorndike, 1984). The new technology has greatly increased the ability to present complex stimulus and problem solving situations. It also renders the study of constructs like response time more plausible and accurate than was previously possible. In addition, computers have provided a model for human information processing (Ellis & Hunt, 1989). Cognitive psychology has focused on the study of such subjects as the nature of expert thinking, the formation of a construct, and elements and structures of productive mental processing. This approach is reflected in studies showing that mathematically gifted students were able to express verbal statements of quantity and relationship mathematically more readily than their peers or college students taking mathematics courses (Dark & Benbow, 1990), and that verbally gifted students excel in different cognitive tasks than mathematically gifted students (Benbow & Minor, 1990). Further, by focusing on mental processing, Borland (1989) found divergent thinking was associated with a "strict percept-strict concept" cognitive style. In addition, Carter (1986) reported that teaching students higher level thinking skills led to greater success among gifted students in learning the concepts and reasoning but not in leading the gifted students to reach higher developmental levels of thought. In addition, research emerging from a

cognitive orientation is beginning to shed light on the complex relationship between the brain, high level performance and ability, and biological, psychological, and social status (Clark, 1986; Petersen, Crockett, & Graber, 1990).

Achievement-oriented Models

Achievement-oriented research on the gifted tends suggest rather consistently that children who are identified as gifted at a young age tend to continue to be identified as having high ability and accomplishment later in life (Mönks, 1992b; Milner & Elrod, 1986; Benbow, 1992). For example, accelerated readers seem to maintain an edge over other students, but the difference is less as they get older. Further, in Western cultures boys are more likely to sustain gifted performance and interest in science and mathematics than girls. In addition, experience with the contents of the educational curriculum prior to studying it (e.g., through involvement with preschool or after school programs, hobbies, etc.), family characteristics such as parents educational attainment level, and attitudes toward education, students' interests and attitudes towards learning, and access to experiences all seem to contribute to one's being identified as gifted.

The importance of special programming for the academic development of the gifted has been shown. For example, Brown and Rogan (1983) have addressed the effects of maintaining gifted children in rigid reading programs design for a particular grade level. According to these authors, these children can become frustrated about independent reading because they already have skills above what they are being taught. This can lead to disillusionment and poor study habits and the paradox of poor levels of achievement by gifted students (Boyd, 1990).

Socio-cultural/Psychosocial Oriented Models

Socio-cultural and psychosocial models emphasize the effects of environmental influences on the development of giftedness. Research in this area has focused on the family and home environment of gifted children (e.g., Colangelo & Dettmann, 1983; Cornell, Callahan, & Lloyd, 1991; Cornell & Grossberg, 1987; Prom, Johnson, & Wallace, 1987; Green, Fine, & Tolleson, 1988). This research suggests that the family and home environment play an important role in the development of the gifted. For example, the research suggests that the home environment affects emotional adjustment, achievement satisfaction, and academic success with a tendency for the most cohesive, child-centered, and functional family environments to produce the most successful students. On the other hand, giftedness in creative expression seemed to be greater from the less child-centered and tenser family situations. Similar

findings for scholastic performance with low income minority families have been reported (Prom, Jackson, Johnson, & Wallace, 1987). Other researchers (e.g., Klein & Cantor, 1976) have found lower self-esteem levels in gifted children in kindergarten to fourth grade. It has been suggested from this finding that the gifted child was more sensitive to the environment and had greater need for approval from family and friends than his or her less able peers. This social sensitivity was supported by a study of gifted and learning disabled children which reported the gifted were more able to identify and label prosocial behavior (Abelman, 1991).

Peer relations and cultural influences also seem to play a significant role in gifted development. For example, subtle cultural values may have been influential in producing the findings of Luftig and Nichols (1991) that gifted boys tended to be the most popular students while gifted girls least popular in a group of fourth through eighth graders. Young gifted students have also been found to show a tendency toward choosing older (Janos, Marwood, & Robinson, 1985) and more popular (Schneider & Daniels, 1992) students and leaders to be their playmates and friends. In general, the social psychological literature seems to provide substantial support for the kind of model proposed by Mönks (1992a) which integrates Renzulli's three-part model with the family, peer, and school environments.

As was pointed out earlier in this chapter, cultural environment can determine whether or not a child is exposed to opportunities for the giftedness (Lowenstein, 1979; Merenheimo, 1991). Female students are often not selected to participate in gifted programs in societies in which male dominance is well established in the educational system (Ayles, 1992). In addition, research findings have suggested that children who come from different cultural backgrounds than the majority of their peers may experience reduced opportunity to become identified as gifted despite evidence that such children give a fairly good account of themselves when they are chosen to participate in gifted programs (Cooley, Cornell, & Lee, 1991; Baldwin, 1987; Robinson, Bradley, & Stanley, 1990; Smith, LeRose, & Clasen, 1991).

General Trends in the Research Literature

Certain general trends can be discerned in the research literature. First, research in this field tends toward descriptive and case study methodology rather than more complex designs and sophisticated statistical analysis (Carter & Swanson, 1990). As noted by Gallagher (1986), practical needs and realistic solutions seem more influential in the contents of the research literature than high level theories of the sort proposed by Erikson (1963), Piaget (1967), or Bandura (1986). Further, when theory-oriented research is done, it does not seem to have immediate or widespread influence on practice. Finally, as suggested by Horowitz and O'Brien (1986),

the developmental perspective should be given more attention in the research on giftedness. Better understanding of the processes of development to include learning, cognitive mechanisms, emotion and temperament, and social and environmental factors through the life span will lead to more effective identification and provision for the gifted.

Provisions Based on Developmental Psychology

A considerable portion of the research literature deals with how to teach gifted students (e.g., Horowitz & O'Brien, 1986; Milgram, 1980; Reis & Renzulli, 1989; Slavin, 1987; Swiatek & Benbow, 1991; Vaughn, Feldhusen, & Asher, 1991; Wang & Walberg, 1983; Whitlock & DuCette, 1989). As this literature would suggest, many forms of instructional practice exist to serve the special needs of gifted children. These approaches can include some form of ability grouping (between- or within-class), cooperative learning, or pull-out programs. A further distinction can be made between homogeneous and heterogeneous grouping. However, the content of the program rather than instructional practice is most important. Certain instructional practices enable gifted children to learn at their own pace and level of ability. On the other hand, the content of the program enriches and motivates students who are highly able. Close examination of the research indicates that the various programs do tend to have positive influence on achievement, creativity or critical thinking (see Buchanan & Feldhusen, 1991). However, there is no clear indication of what is the most effective means of serving the academic needs of gifted students. To be able to identify the best practice requires comparison of all practices. This kind of research is both rare and difficult to do. Another conclusion that might be drawn from the literature is that academic arrangements designed to provide differentiated learning experiences for students of different ability levels are more effective than traditional undifferentiated approaches. It is also clear that the educational effectiveness of a particular instructional practice depends on the personalities of both teacher and student, and on social and developmental factors. Certain methods are most beneficial in certain environments for particular students. Further, what is beneficial in grade 3 need not continue to be beneficial in later grades.

The most beneficial educational approach, however, is the approach that fits the developmental needs of the individual child. As was already said, Vygotsky did not regard cognitive development as a process of nature (see Van Parreren, 1983), thus suggesting that education and instruction need not be fitted to a particular developmental level or stage, as Piaget argued. Vygotsky's position is that instruction creates development (to a certain extent), because learning and development take place within the zone of proximal development. Tasks within the zone of proximal development are too

difficult for the child to do alone. These tasks become possible with guidance and assistance from adults or older children.

An opposing developmental position has been defended and elaborated upon by Maria Montessori, a person who played a leading role in the school reform movement in Europe. This movement greatly influenced schools to become institutions where children were accepted and treated as individuals. The reform movement started in the early 1920s. Child-centered education was felt to be most beneficial for the healthy development of children.

Maria Montessori (1870–1952) grew up as an only child in a family with a father who believed in traditional values and role patterns. She aspired to a technical career but a daughter in a “male profession” was beyond her father's conservative value system, and he could not accept his daughter's choice of study. Maria Montessori was a mathematical prodigy, and at the age of 26 became the first woman physician in Italy's history. Although not a trained pediatrician, she became famous as an expert in children's illnesses.

After 1901, Maria Montessori studied anthropology, psychology and pedagogy at the university to be better prepared for the education of children. Her educational philosophy advocated first educating the senses and feelings and then educating the mind. Additionally, her system included observation of the child to provide for its needs. This core of principles formed the basis of a program that became a worldwide tool for innovative practices. Programs like the one established by Helen Parkhurst (Dalton Schools) were modeled after Montessori. Montessori's inherent interest in programs for gifted education is not so well known because she originally intended to serve the special needs of retarded and extremely poor children.

Montessori's Contribution to Gifted Education

Little systematic research on the effectiveness of Montessori education has been done. This is true for other educational approaches as well. Any meaningful evaluation of the Montessori system should be mindful of the specific objectives and key concepts of Montessori's approach. Concepts like independence, self-composure, love of learning, and tendency to lose oneself in one's work are essential in a Montessori education.

A central component of the Montessori theory is the concept of *sensitive periods*, or genetically determined developmental periods during which the child is especially eager and able to master specific tasks, similar to critical periods. During these periods the child works with a high level of interest to improve these abilities. However, “if the child is prevented from enjoying these experiences at the very time when nature has planned for him to do so, the special sensitivity which draws him to them will vanish, with a disturbing effect on

development . . ." (Montessori as cited in Crain, 1980, p. 56). According to Montessori, the critical sensitive periods in early childhood are for order, details, the use of hands, and for walking.

The role of parent and teacher can be described as "facilitator". To be successful in this role, parents must be aware of the specific developmental needs of the child, not only during early childhood but throughout the child's developmental period. Therefore, *ongoing careful observation* is necessary to give to the child needed experiences.

Other central concepts of Montessori education are *prepared learning environment* and *freedom of choice*. The proper environment will contain materials and means that correspond to the inner needs of children. Observation of the child enables the parent and teacher to make the right choices of supportive materials for the individual's development. Freedom of choice is the opposite of teacher dictated learning. Once the child makes a choice to do something, however, he/she must complete it. The provision of stimulation and control in the classroom are of course legitimate measures for teachers and are not in contradiction with freedom for the learner.

The Montessori elementary school with its mixed age groups (normally more than one age group is found in a class) provides possibilities for independent as well as cooperative learning. Ability grouping is a normal instructional practice in the Montessori school. According to Maria Montessori the age graded class should no longer be in existence (Holtstiege, 1991). A school must provide the possibility for an individual to progress at his or her own pace and level of learning. This principle is at the core of all gifted education.

Maria Montessori emphasized what she called *cosmic education*, an educational practice that has been improved in recent years throughout the world. It is substantially similar to environmental education (education to save natural resources, respect the environment, and oppose pollution). Montessori introduced the idea of a "cosmic task" for each child in the kindergarten, to care for a plant in order to increase a sense of responsibility for the environment. Cosmic education continues to be central to the curriculum into the higher grade levels.

The Montessori school encourages children to become independent learners and productive thinkers, and to love learning. Forms that this independence can take are revealed by a 10-year-old very able child who moved to another city with his parents. He wrote a postcard to his teacher saying, "I thank you for never teaching me anything" (personal communication from a teacher). Another 5-year-old Montessori child when asked, "Who taught you to read?" answered, "Nobody, I just read the book to see if I could read." A regular school child answered the same question with, "My teacher" (Crain, 1980, p. 68).

A curriculum based on Montessori education principles provides for *qualitative differentiation*. That is,

children are allowed to proceed at their own pace according to their own interests and needs. A differentiated curriculum is a prerequisite for appropriate and effective gifted education. Evaluation of the Montessori approach should include examination of test performance as well as independence, originality and productivity, and self-composure. Analysis of the Montessori system with regard to the elements beneficial for gifted education would be useful and helpful to the field. We agree with Crain's statement that, "Montessori demonstrated, as much or more than anyone else, how the developmental philosophies of Rousseau, Gesell, Piaget, and others can be put into effective practice. She showed how it is possible to follow children's spontaneous tendencies and to provide materials that will permit them to learn on their own" (p. 72).

Summary

Theories of development contribute to our understanding of the gifted. These theories provide different perspectives on the constitutional, environmental, psychological, and biologically determined characteristics and tendencies affecting gifted performance. They also give structure to social and political elements in the environment, and determine the opportunities for recognition of giftedness. Developmentally oriented definitions of giftedness have broadened from the foundations laid by Terman and other early workers. Cognitive research is becoming more influential. Research in the development of the gifted seems more influenced by practical than theoretical concerns. Although she worked more than half a century ago with handicapped children, Maria Montessori provided a fairly complete model for education of the gifted.

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Genetic Influence on Cognitive Ability

LEE A. THOMPSON

Department of Psychology, Case Western Reserve University, Cleveland, Ohio, U.S.A.

ROBERT PLOMIN

Center for Developmental and Health Genetics, Pennsylvania State University, Pennsylvania, U.S.A.

Introduction

A handbook on giftedness and talent would not be complete without consideration of genetic influence. This chapter focuses on genetic research on one type of talent, general cognitive ability, because more is known about the genetics of this dimension than any other in the social and behavioral sciences. By general cognitive ability, we refer technically to "g" which is an unrotated first principal component of diverse tests of cognitive abilities. Because IQ scores from general intelligence tests are reasonable indices of "g," we could have used the terms intelligence or IQ scores but we prefer general cognitive ability which is less loaded with unwanted connotations. Although general cognitive ability is important, so are specific cognitive abilities such as verbal, spatial, and memory abilities. However, less is known about the genetics of specific cognitive abilities (Plomin, 1988).

In this chapter, we review research on the genetics of general cognitive ability that converges on the conclusion that this dimension of behavior shows considerable genetic influence. We describe a recent study which is the first to show that genetic factors are important, not only for the normal range of variation in cognitive ability, but also for high cognitive ability. Genetic research on this basic question of the impact of genetics on cognitive ability also raises interesting issues about the environment. In addition, genetic research on cognitive ability has begun to go beyond the basic nature-nurture question concerning the relative effects of genetic and environmental influences to ask more sophisticated questions such as developmental and multivariate questions. The most exciting recent advance is that the power of molecular genetic techniques is beginning to be harnessed in order to identify specific genes responsible for genetic influence on cognitive ability.

Genetics and Ability

Before launching this overview of genetic research on cognitive ability, it may be useful to ask why genetics has

been neglected in contemporary discussions of giftedness and talent. For example, most recent books on high ability (e.g., Feldman, 1986; Howe, 1990; Simonton, 1990) pay scant attention to genetics (cf. Storfer, 1990). Indeed, genetics is not mentioned in most of the chapters in this volume. This is ironic because one of the earliest scientific books about ability is also the first book about human genetics. A year before Mendel's seminal paper on the laws of heredity, Francis Galton (1865) published a two-article series on hereditary genius that he expanded into the book *Hereditary Genius: An Inquiry into its Laws and Consequences* (Galton, 1869).

Why is genetic influence neglected? Recent discussions of this issue in relation to the behavioral sciences suggest several possible reasons (Goldsmith, in press; Rowe & Waldman, in press; Rutter, Silberg, & Simonoff, in press). A rudimentary problem is the failure to distinguish between the development of differences among individuals and the development of an individual. Genetic research does not address the development of a single individual. Nor does it address the origins of species-wide developmental themes such as the use of language in the human species. Rather, its focus is on variations (individual differences) on these themes, for example, why some children are delayed in their use of language and why some individuals are more verbally fluent or have larger vocabularies than others.

An historical happenstance also contributes to the neglect of genetics: Behaviorism in the behavioral sciences set the study of behavior apart from the other life sciences. The legacy of behaviorism was to make behavioral scientists uncomfortable with biology. Behaviorism led to environmentalism, especially in the United States. Environmentalism dominated the behavioral sciences for so long that some behavioral scientists still find it difficult to accept a more balanced view that recognizes genetic as well as environmental influences on individual differences in behavioral development.

In our experience, the major source of concern about finding genetic influence in behavioral development

is the mistaken notion that if a trait is influenced genetically it cannot be affected environmentally. This notion is wrong for at least three reasons. First, to recognize genetic influence does not imply that a trait is entirely due to genetic influence. Rarely does heritability exceed 50% for behavioral traits, which means that as much of the phenotypic variance is accounted for by nongenetic as by genetic factors. In this sense, genetic research provides solid evidence for the importance of nongenetic factors.

Second, even if all the variance of a trait can be explained by genetic differences among individuals (and we hasten to add that no behavioral trait begins to approach this hypothetical case), this only describes "what is," not "what could be" or "what should be." Heritability describes the extent to which genetic differences among individuals in a particular population at a particular time contribute to observed (phenotypic) differences for a trait. In this sense, heritability is a descriptive statistic, not a constant like the speed of light. The relative magnitude of genetic and environmental influences can change as the population described changes. For example, one counterintuitive example of change is that genetic differences among individuals would increasingly account for phenotypic differences to the extent that salient environmental factors are equalized. In the case of cognitive ability, this would be the expected outcome of attempts to equalize educational opportunities.

In other words, heritability describes "what is" in a population—the genetic and environmental provenances of measured differences among individuals as they exist in a particular population with its particular mix of genetic and environmental influences. Heritability does not predict "what could be" nor does it prescribe "what should be." If this is understood, the following statement, which is at the crux of concerns about heredity and talent, will not sound paradoxical: Cognitive ability can be highly heritable in a population and yet show dramatic change for an individual who undergoes intense training. Heritability denotes probabilistic genetic influence for a population, not predetermined programming for an individual.

A third reason why it is wrong to think that genetic influences are immutable is that a necessary connection does not exist between the origins of a trait and intervention. Descriptions of "what is" do not have a necessary relationship to "what could be." Specifically, intervention programs for the gifted can be effective regardless of the origins of giftedness.

These concerns coalesce in the seldom-discussed but often-felt issue of political implications. In a recent discussion of this topic, Goldsmith (in press) makes three important points. First, it is wrong to suggest that scientific understanding of certain issues should not be pursued, although care must be taken to avoid interpretations of genetic determinism and other oversimplifications. Second, the rationale for intervention

should be demonstrated effectiveness, not efforts to denigrate evidence of genetic influence. Goldsmith's third point questions the assumption that genetic research will make people more hereditarian:

It would seem crucial to know what the general public, as well as political leaders, *currently* believe about the relative influence of inheritance and experience in molding behavior. It is not so clear that the public embraces experience over inheritance. Some of my experience suggests that an accurate description of current behavior-genetic findings to public groups outside academia often moves them toward a *less* hereditarian position (Goldsmith, in press).

Our view concerning social and political implications is that finding genetic influence is compatible with a wide range of actions, including no action at all. Values come into play when decisions are made concerning what is to be done with such knowledge. For example, finding genetic influence on cognitive ability by no means implies that those rich in ability must be made richer. Depending on one's values, it could be argued that scarce educational resources should go to those who most need them to function adequately in our increasingly technological society.

If heritability describes "what is" rather than predicts "what could be," then what does it matter whether or not genetic factors are important? The answer to this question depends on the answer to another question: Important for what purpose? For applied issues such as identification and intervention, genetics is unlikely to be of much specific help to the educator confronted with a gifted child. Knowledge of the importance of genetics might be helpful in more general ways. For example, finding genetic influence might aid identification by taking into account familial loading. Knowledge about genetic patterns of strengths and weaknesses might be useful in designing programs tailored to children's needs. Understanding the role of genetics can also affect our interpretation of other research. For example, most research on the development of talent focuses on familial factors such as parental tuition and encouragement. However, in families in which parents are genetically related to their children, it cannot be assumed that such links between parents and children are due solely to environment (Plomin & Bergeman, 1991). Another point is that just as cures are not necessarily related to causes of diseases, understanding causes can lead to more rational cures. In this sense, knowing "what is" is likely to guide us in the search for "what could be." More broadly, although finding genetic influence bears no necessary implications for social action, better decisions ought to be made with knowledge than without it. Finally, identification of specific genes involved in ability, discussed later in this chapter, would add considerably to the practical value of genetic knowledge. Still, for the present, it must be said that applications such as programs for the gifted would proceed largely

unchanged whether or not heredity contributes to the development of ability.

It should be noted, however, that behavioral genetic studies can contribute a great deal to our knowledge of environmental factors that affect behavior. Traditional environmental studies confound genetic and environmental influences; behavioral genetic research can disentangle genetic and environmental main effects, environment-genotype interaction and environment-genotype correlation. Identification of specific environmental factors that affect behavior may provide the best clues for designing effective intervention programs.

The major reason for wanting to know about the origins of ability is the basic science goal of explanation with no promise of practical application. An important first step, although just a first step, in understanding the origins of individual differences in ability is to ask the extent to which genetic factors are involved. This basic science interest in origins is also largely shared by educators and parents in a sense of curiosity about why children develop the way they do. We know that ability runs in families, but does it do so for reasons of nature or nurture?

Evidence for Genetic Influence

Human quantitative genetic research relies on family, adoption, and twin designs. Family studies of human behavior assess the extent to which genetically related individuals living together resemble each other. Such studies cannot disentangle possible environmental sources of resemblance. This was the problem with Galton's 1869 family study of talent in which he interpreted familial resemblance as due to heredity. Separating genetic and environmental sources of familial resemblance is the point of adoption studies. Genetically related individuals adopted apart give evidence of the extent to which familial resemblance is the result of hereditary resemblance. Genetically unrelated individuals adopted together indicate the extent to which familial resemblance is due to shared family environment.

Twin studies also provide a kind of natural experiment in which the resemblance of identical twins, whose genetic relatedness is 1.0, is compared to the resemblance of fraternal twins, first-degree relatives whose genetic relatedness is .50. If heredity affects a trait, identical twins should be more similar for the trait than fraternal twins. As in any quasi-experimental design, these methods have possible problems, most notably, the equal environments assumption for the twin method and selective placement for the adoption method. However, these are empirical issues and research suggests that these are not major problems. Moreover, the assumptions of the twin method are very different from the assumptions of the adoption method and yet the two methods generally converge on the conclusion that genetic effects are important. Details concerning quantitative genetic methods and their application to

behavior are available elsewhere (e.g., Plomin, 1990a; Plomin, DeFries, & McClearn, 1990).

Family, adoption, and twin studies can be used to estimate the magnitude of genetic effects as well as their statistical significance. This is the descriptive statistic heritability. As mentioned earlier, heritability is an estimate of effect size given a particular mix of existing genetic and environmental factors in a particular population at a particular time. Heritability estimates the proportion of phenotypic variance (i.e., individual differences in a population, not behavior of a single individual) that can be accounted for by genetic variance.

Consider height. Correlations for first-degree relatives are about .45 on average, whether relatives are reared together or adopted apart. Identical and fraternal twin correlations are .90 and .45, respectively, regardless of whether they are reared together or adopted apart. These results indicate significant genetic effects. For these height data, heritability is estimated as 90%. This estimate of effect size indicates that, of the differences among individuals in height in the populations sampled, most of the differences are due to genetic rather than environmental differences among individuals.

When these same methods are used to investigate genetic effects on general cognitive ability, they yield evidence for less but still appreciable genetic influence. Correlations for first-degree relatives living together are similar to their correlation for height. In a review of the world's literature of genetic research on IQ scores (Bouchard & McGue, 1981), the weighted average correlation was .42 for 8433 pairs of parents and their offspring in 32 studies. The weighted average correlation was .47 for siblings reared together (26,473 pairs in 69 studies). Unlike height, adopted-apart first-degree relatives are only about half as similar for IQ as are first-degree relatives living together. The average weighted correlation for 814 pairs of parents and their adopted-away offspring is .22; for 203 pairs of adopted-apart siblings the correlation is .24 (Bouchard & McGue, 1981).

The fact that the correlation for adopted-apart relatives is less than the correlation for relatives living together suggests that shared rearing environment contributes to the IQ resemblance of first-degree relatives living together. This fits with another finding from the adoption literature: Genetically-unrelated parents and offspring and siblings are similar. The average correlation for adoptive parents and adopted children is .19 (1397 pairs) and the average correlation for genetically unrelated children adopted into the same adoptive families is .32 (714 pairs; Bouchard & McGue, 1981).

Thus, in very rough summary, "genetic" relatives adopted apart correlate about .20, "environmental" relatives correlate about .20, and "genetic-plus-environmental" relatives correlate about .40. These adoption results are consistent with a heritability estimate of about .40, about half that for height.

The twin method converges on this conclusion. The average twin correlations are .86 for identical twins

(4672 pairs) and .60 for fraternal twins (5546 pairs; Bouchard & McGue, 1981). Because identical twins are twice as similar genetically as fraternal twins, a rough estimate of heritability doubles the difference between the identical and fraternal twin correlations. This estimate of heritability is about .50. It should be noted that the correlation of .60 for fraternal twins exceeds the correlation of .47 for nontwin siblings, which suggests that shared environmental influences contribute more to the resemblance of twins than nontwin siblings.

One of the most dramatic adoption designs, reared-apart identical twins, suggests a higher estimate of heritability than these other designs, although the number of such twin pairs is small for obvious reasons. For several small studies involving a total of 65 pairs of identical twins reared apart, the average correlation is .72 (Bouchard & McGue, 1981). The correlation for identical twins reared apart provides a direct estimate of heritability. This high heritability estimate has been confirmed in two recent studies of twins reared apart. In one report of 45 pairs of identical twins reared apart, the correlation was .75 (Bouchard, Lykken, McGue, Segal, & Tellegen, 1990). In a report of 45 pairs of Swedish identical twins reared apart, the correlation was .78 (Pedersen, Plomin, Nesselroade, & McClearn, 1992). The latter study also included 88 pairs of fraternal twins reared apart whose IQ correlation was .32 and matched identical and fraternal twins reared together. A model-fitting estimate of heritability that incorporates data from the four groups of twins in this study was .81, and a follow-up study three years later yielded similar results (Plomin, Pedersen, Lichtenstein, & McClearn, 1993). A possible explanation for this higher heritability estimate for twins reared apart is that, unlike most of the other twin and adoption studies, these studies involve adults rather than children and adolescents. As explained later, heritability appears to be greater later in life.

Model-fitting analyses that simultaneously analyze all of the family, adoption, and twin data summarized in the review by Bouchard and McGue (1981) yield heritability estimates of about .50 (Chipuer, Rovine, & Plomin, 1990; Loehlin, 1989). The error surrounding this estimate may be as high as .20, so we can only say with confidence that the heritability of IQ scores is $.50 \pm .20$. Nonetheless, even if heritability is at the bottom of this range, it is a remarkable achievement to account for so much of the variance of a trait as complex as general cognitive ability.

If half of the variance of IQ scores can be accounted for by heredity, the other half cannot and is attributed to environment. In this sense, these same genetic data provide strong evidence for the importance of the environment. These data also indicate how the environment works. Some of this environmental influence appears to be shared by family members making them similar to one another. For example, as indicated earlier, pairs of genetically unrelated children adopted into the same adoptive homes yield an average correlation of .32. This

suggests that about a third of the total variance of IQ scores may be due to a shared rearing environment. The average correlation of .19 between adoptive parents and their adopted children suggests less shared environmental influence, although it seems reasonable that parents and their children share less similar environments than do siblings. However, when we consider these data from a developmental perspective, a very different picture emerges, as described in the following section.

Beyond Nature–Nurture

A survey of more than 1000 social and behavioral scientists and educators indicated that most had accepted the evidence for a significant effect of heredity on IQ scores, traditionally one of the most controversial areas in behavioral genetics (Snyderman & Rothman, 1988). General acceptance of the important genetic contribution to individual differences in *g* makes it possible to go beyond this most basic nature–nurture issue to ask more interesting questions. Three examples will be mentioned briefly. The first concerns development.

Developmental Genetic Analysis: Genetic Change as Well as Continuity

When Galton first studied twins in 1876, he investigated the extent to which the twins' initial similarity or dissimilarity changed during development. Other early studies were also developmental, but this developmental perspective faded from genetic research until recent years.

Two types of developmental questions can be addressed in genetic research (Plomin, 1986). First, does heritability change with age? It is reasonable to suppose that environmental factors increasingly account for variance in cognitive ability as experiences accumulate during the course of life. To the contrary, genetic research suggests that cognitive ability shows a nearly linear increase in genetic influence from infancy through early childhood (Cardon, Fulker, DeFries, & Plomin, 1992; Fulker, DeFries, & Plomin, 1988; Wilson, 1983) and perhaps continuing throughout the lifespan (McCartney, Harris, & Bernieri, 1990; McGue, Bouchard, Iacono, & Lykken, in press; Plomin & Thompson, 1987). For example, as mentioned earlier, a recent report of the first genetic study of older adults reports a heritability of 80% for cognitive ability using the powerful design of twins reared apart and twins reared together (Pedersen et al., 1992).

Not only does heritability appear to increase during the lifespan, but the effects of shared environment appear to decrease. Although genetic research suggests substantial influence of shared environment as discussed in the previous section, recent evidence suggests that shared environmental influence that affects IQ scores may be much less after adolescence (Plomin, 1988).

The strongest evidence for the importance of shared environment comes from the correlation for adoptive siblings, that is, pairs of genetically unrelated children adopted into the same adoptive families. As indicated earlier, their average IQ correlation is .32. However, these studies happened to study adoptive siblings in childhood. In 1978, the first study of older adoptive siblings yielded a strikingly different result: The IQ correlation was $-.03$ for 84 pairs of adoptive siblings from 16 to 22 years of age (Scarr & Weinberg, 1978). Other studies of older adoptive siblings have also found similarly low IQ correlations (Kent, 1985; Teasdale & Owen, 1984). The most impressive evidence comes from a 10-year longitudinal follow-up study of over 200 pairs of adoptive siblings. At the average age of 8 years, the IQ correlation was .26. Ten years later, their IQ correlation was near zero (Loehlin, Horn, & Willerman, 1989). These data suggest that shared environment is important for IQ during childhood when children are living at home and then fades in importance after extrafamilial influences become more important.

A second type of developmental question concerns genetic contributions to changes with age and continuity in longitudinal analyses. It is important to recognize that genetic factors can contribute to change as well as to continuity in development (Plomin, 1986). Although genetic effects on cognitive ability contribute substantially to stability of cognitive ability during childhood, what is more surprising is the extent to which genetic effects appear to contribute to change with age (Fulker, Cherny, & Cardon, in press). Particularly interesting is the suggestion of substantial new genetic variation during the transition from early to middle childhood.

Multivariate Genetic Analysis: Genetic g

A second example of research that goes beyond the basic nature–nurture question is multivariate genetic analysis, which extends the univariate genetic analysis of the variance of a single trait to multivariate analysis of the covariance between traits. Multivariate genetic analysis makes it possible to estimate the extent to which genetic effects on one trait overlap with genetic effects on another trait. Analyses of this type in the realm of cognitive abilities indicate that specific tests and group factors show some genetic effects unique to each test and factor (Pedersen, Plomin, Nesselroade, & McClearn, 1993). Nonetheless, much of the genetic effects are shared in common across diverse tests and factors (Cardon & Fulker, in press).

Another recent finding makes a related point: The heritabilities of cognitive tests are strongly correlated with their g -loadings, their factor loadings on an unrotated first principal component (Jensen, 1987). That is, the more a test measures g , the more heritable it is. For example, in the study mentioned earlier of twins reared apart and twins reared together, the correlation between heritabilities and g -loadings

was .77 after differential reliabilities of the tests were controlled (Pedersen et al., 1992).

School Achievement and g : Same Genes, Different Environments

The third example also involves multivariate genetic analysis, but it is especially relevant to the origins and development of ability. School achievement is interesting from a genetic perspective because it is widely assumed that achievement and ability are different, almost by definition. Achievement is what a student achieves by effort, whereas ability is thought to involve inherent talent. For this reason, achievement test scores are assumed to be environmental in origin. However, a neglected finding is that achievement and ability tests are moderately correlated, which raises the possibility of genetic overlap between the two domains.

Although several twin studies of scholastic achievement have been reported in adolescence, until recently no research was available in middle childhood. In the *Western Reserve Twin Project* (WRTP), specific cognitive abilities and school achievement were investigated for a sample of 146 pairs of identical twins and 132 pairs of fraternal twins aged 6–12 (Thompson et al., 1991). Although school achievement tests yielded significant heritability estimates, these estimates were much lower than heritabilities for cognitive abilities—about .20 vs about .70. Most important are the results of multivariate genetic analysis: The well-known correlation between cognitive abilities and school achievement tests is due almost entirely to genetic factors in common to the two domains, a finding that has been replicated in another study (Wadsworth, in press) as well as in two studies focused on reading achievement (Brooks, Fulker, & DeFries, 1990; Cardon, DiLalla, Plomin, DeFries, & Fulker, 1990). Conversely, ability–achievement discrepancies are exclusively environmental in origin.

Although ability–achievement discrepancies have not been studied for high cognitive ability from a quantitative genetic perspective, a study addressing this question could have important practical implications. For instance, would the environment completely mediate ability–achievement discrepancies for high cognitive ability as it does for the entire range? For high cognitive ability these discrepancies must be manifested as underachievement. Identification of specific environmental factors that lead to underachievement in an extremely talented group could lead to changes in educational practice that would minimize underachievement by talented children.

Quantitative Genetics and High Cognitive Ability

The research described above addresses the etiology of individual differences in cognitive ability in the normal range. Much less is known about the origins of high

ability. It cannot be assumed that the etiology of the extremes of a dimension is the same as the etiology in the normal range. For example, at the low end of the ability spectrum, severe retardation shows little familiarity in contrast to the rest of the distribution of cognitive ability (Plomin, 1991).

Galton's 1869 study of talent was a family study. Since there was no satisfactory way to quantify ability, Galton relied on reputation as an index. By "reputation," he did not mean notoriety for a single act, nor mere social or official position, but "the reputation of a leader of opinion, of an originator, of a man to whom the world deliberately acknowledges itself largely indebted" (1869, p. 37). The designation "eminent" was applied to those individuals at the rank of 1 in 4000. The majority of individuals Galton considered to be the cream of this elite group, ranked as one in a million, and were termed "illustrious."

Taking the most eminent person in each family as a reference point, the other individuals who attained eminence were tabulated with respect to closeness of family relationship. Galton's results indicated that eminent status was more likely to appear in close relatives, with the likelihood of eminence decreasing as the degree of relationship became more remote. Eminence was attained by 26% of the fathers of the 100 most distinguished men, 23% of their brothers, and 36% of their sons. Second-degree relatives such as grandfathers, uncles, nephews, and grandsons achieved eminence to a much lower degree (about 7%), but much higher than the overall incidence of 1 in 4000 (i.e., .025%). These results conflate abilities of many different sorts, not just cognitive ability. Moreover, as indicated earlier, such familial resemblance cannot be attributed to heredity as Galton did. Galton started the nature-nurture controversy by overinterpreting his results to conclude that "ability will out" regardless of environment.

It is surprising that during the past century very little research has addressed the issue of the genetic and environment origins of high cognitive ability. Oden (1968) reported that, in a sample of gifted individuals who all had IQs of over 135 in Terman's study of the gifted, the 1571 offspring of these individuals yielded an average IQ of 133. Another study reported parent-offspring resemblance in another reanalysis of the Terman data (McAskie & Clarke, 1976). The analyses included 559 gifted parents with IQs over 135 and their 1027 offspring. Interestingly, the parent-offspring correlation was not significantly different from zero ($r = 0.08$) even though as a group the offspring mean resembled their parents' mean, as seen in the Oden (1968) report. McAskie and Clarke's finding is most likely due to the extremely truncated sample which attenuates the parent-offspring correlation. This is a problem that is inherent in studies of individual differences in extreme groups.

These two studies illustrate an important distinction that must be made when genetic and environmental

influences on the origins of high cognitive ability are explored. The issue is whether genetic factors affect high ability and how the magnitude of this genetic influence compares to the magnitude of genetic factors that contribute to individual differences in the normal range. The issue is not the heritability of high ability in the usual sense of genetic contributions to differences among high-ability individuals. The reasons why one child has an IQ of 150 and another an IQ of 145 are less important than understanding why both children have such high IQ scores as compared to the rest of the population.

This question can be addressed using a new approach that leads to an estimate of what is called *group heritability*, in contrast to the traditional heritability statistic which could be called *individual heritability*. Group heritability refers to the genetic contribution to the average difference between a selected group such as children of high ability and the rest of the population. The typical approach to group heritability in genetic research on disorders is to establish a cut-off score as a diagnostic index of the disorder (i.e., normal vs abnormal). Concordances can be calculated and compared for identical and fraternal twins, or liability (tetrachoric) correlations can be used which assume a continuous distribution even though the data, as they are used, are discontinuous.

A far superior approach has been developed by DeFries and Fulker (1985) and has been called DF analysis after its developers (Plomin & Rende, 1991). DF analysis requires that the continuum be assessed rather than assumed. It assesses group heritability as the differential regression to the population mean of the co-twins of identical and fraternal twin probands for a quantitative measure. That is, IQ scores of co-twins of probands ascertained because of high IQ scores are expected to regress toward the mean of the unselected population. However, to the extent that high ability is due to genetic factors, the regression to the mean will be less for identical twin co-twins than for fraternal twin co-twins. DF analysis was first applied to reading disability (DeFries et al., 1987). Group heritability for reading disability was found to be only about half the magnitude of individual heritability for reading ability, suggesting that the disorder of reading disability may be different etiologically than the dimension of reading ability.

Is group heritability of high ability significant? What is the magnitude of group heritability for high ability? The WRTP twin sample was used to estimate group heritability (Thompson et al., 1993). The DF approach was applied to IQ scores from traditional intelligence tests (Wechsler Intelligence Scale for Children-Revised and the Peabody Picture Vocabulary Test) expressed as a composite standard score with a mean of 0.0 and a standard deviation of 1.0. High ability was operationally defined as IQ scores 1.25 standard deviations above the sample mean.

As a preliminary analysis, concordances were calculated

separately for identical and fraternal twin pairs in which at least one member of the pair scored 1.25 standard deviations above the sample mean. Probandwise concordances were used in which the total number of affected individuals in concordant pairs is divided by the sum of the total number of affected individuals in concordant and discordant pairs. The probandwise concordances were 62% (18/29) for identical twins and 25% (6/24) for fraternal twins, suggesting genetic influence for high ability.

These twin concordances suggest that group heritability for high ability is additive in that the DZ (dizygotic) concordance is roughly half the magnitude of the MZ (monozygotic) concordance. This finding for high ability does not contradict the hypothesis that rare genius may be epistatic (Lykken et al., 1992). The genetics of genius may differ from the genetics of high cognitive ability. For example, specific constellations of many genes may be required for genius. The hallmark of such epistatic interactions is resemblance for MZ twins but not for first-degree relatives.

DF analysis provides an estimate of the magnitude of group heritability using continuous IQ scores rather than dichotomizing the scores. The gist of the DF approach to group heritability compares the mean score of the co-twins of identical twin probands to that of the co-twins of fraternal twin probands. Group heritability is suggested to the extent that the mean score of the former group regresses less far to the population mean than does the mean score of the latter group. For the high IQ sample, the mean standardized score of the probands is 1.67 and the population mean is 0.00. The co-twins of the identical twin probands regress very little to the population mean—their mean score is 1.53. In contrast, the co-twins of the fraternal twin probands regress more than halfway to the population mean—their mean score is 0.76. This pattern of results supports the suggestion of group heritability for high ability that emerged from the comparison of twin concordances.

DF analysis employs an elegant regression model which tests the differential regression to the mean for identical and fraternal twin probands, taking into account mean differences between the probands. The analysis yields estimates of group heritability and provides standard errors of the estimates. The analysis, described elsewhere (DeFries & Fulker, 1985, 1988), estimates group heritability as $.67 \pm .24$ for high ability. This significant group heritability suggests that about two-thirds of the difference between the IQs of the children in the high-ability group and the average IQ in the sample can be attributed to genetic factors.

This estimate of group heritability is similar to the traditional individual heritability for cognitive ability obtained in this same sample (Thompson et al., 1991). Together these results suggest an hypothesis with far-reaching implications: In terms of genetic influence, high cognitive ability may be merely the extreme of the normal continuum of cognitive ability.

Molecular Genetics and High Cognitive Ability

We are at the dawn of a new era in which molecular genetic techniques will revolutionize genetic research on behavior by identifying specific genes that contribute to genetic variance in behavioral dimensions and disorders (Plomin, 1990b). We have begun to employ these techniques in our research in order to identify specific genes that affect high cognitive ability (Aldhous, 1992).

It was only ten years ago that the now-standard techniques of the "new genetics" were first employed to identify genes responsible for single-gene disorders. As described elsewhere (e.g., Plomin et al., 1990), the discovery of restriction enzymes, which led to recombinant DNA and the ability to sequence DNA, also produced thousands of new DNA markers, genetic differences among people that involve DNA itself rather than gene products such as the blood groups. These new DNA markers can be used to identify a chromosomal region and, eventually, to isolate a gene and a gene product for single-gene disorders.

Notable early successes include cystic fibrosis and Duchenne muscular dystrophy. These are dichotomous traits, like Mendel's smooth vs wrinkled seeds, in which one gene is necessary and sufficient to explain the observed difference. Although several thousand single-gene disorders, most very rare, have been reported, behavior is much more complex. Behavior reflects the functioning of the whole organism and it is dynamic, changing in response to the environment. Genes that affect behavioral traits are transmitted hereditarily according to Mendel's laws in the same way as genes that affect any other phenotype. However, behavior is special in three ways. First, unlike Mendel's smooth vs wrinkled seeds, most behavioral dimensions and disorders are not distributed in simple either/or dichotomies such as talented vs not talented, although in psychopathology we often pretend that a line exists that sharply separates the normal from the abnormal. Second, behavioral traits are substantially influenced by nongenetic factors: heritabilities rarely exceed 50%. Third, genetic effects on behavioral dimensions such as cognitive ability are likely to involve many genes of variable but generally small effect size. Each of these points applies to the dimension of cognitive ability and to the dichotomy of convenience that we call high cognitive ability. The challenge is to use DNA markers to find genes in these complex systems of behavior that involve multiple genes as well as multiple nongenetic factors. Such genes of varying effect size that contribute to quantitative traits are called *quantitative trait loci* (QTL).

Linkage

For a single-gene trait, linkage is a method guaranteed to find the chromosomal location of the gene, even when nothing is known about the gene product. Linkage traces

the co-transmission of a marker and a disorder within a family pedigree. The exemplar is Huntington's disease, which was the first disorder mapped to a chromosome using the new DNA markers. Huntington's disease has long been known to be a single dominant gene that is lethal later in life regardless of a person's other genes or environment. Other single-gene disorders are quickly being put on the genome map through the use of linkage.

The problem is that behavioral dimensions are different. Most importantly, they show no suggestion of simple single-gene inheritance. Linkage can only identify a major gene that is largely responsible for a disorder. For the analysis of behavior, reliance on linkage techniques that can only detect major-gene effects is an example of losing one's wallet in a dark alley but looking for it in the street because the light is better there. It is now generally recognized that no major gene for behavioral dimensions or disorders is likely to be found in the population. However, current linkage research assumes that a major gene can be found in certain families. For this reason, linkage studies focus on large pedigrees with many affected individuals in the hope of finding a major gene responsible for the disorder in a particular pedigree. In this view, multiple-gene influence is seen at the population level because different major genes are responsible for the disorder in different families.

The alternative view espoused here is that major genes will not be found for behavior either in the population or in a family. Rather, for each individual, many genes make small contributions to variability and vulnerability. In this view, the genetic quest is to find, not *the* gene for a behavioral trait, but the QTL that affect the trait in a probabilistic rather than predetermined manner. Although some sledgehammer effects of major genes may be found, it seems more likely that many other alleles nudge development up as well as down for many individuals and do not show dramatic effects as in the classical single-gene disorders.

The point is not that behavior is too complex to take advantage of the new DNA markers, but rather that we need to bring the light of molecular genetics into the dark alley. New strategies are needed to identify genes that affect behavioral traits, even when the genes account for only a small amount of variance, when nongenetic factors are important, and when the traits are quantitatively distributed. That is, we need to use molecular genetic techniques in a quantitative genetic framework.

Allelic Association

Given the breathtaking pace of technological advances in molecular genetics, the safest bet is that at the turn of the century we will be investigating multiple-gene influences for complex dimensions and disorders using completely different techniques from those in use today.

However, one strategy that we are using in the meanwhile is called allelic association. Linkage refers to loci rather than alleles—linked traits such as hemophilia and color-blindness do not occur together in the population. In contrast, allelic association occurs when a DNA marker is so close to a relevant gene (or it is part of the gene) that affects the trait that a marker allele is correlated with the trait in unrelated individuals in the population.

The best case is when the marker is the relevant gene itself. That is, the marker can be in the coding region of a gene and thus code for actual polypeptide differences among people. Some background information is necessary here. Most DNA involves noncoding regions between genes that are not transcribed into messenger RNA and thus are not translated into amino acid sequences. Moreover, much DNA in a transcribed gene is spliced out (so-called introns) and is not translated into amino acid sequences that form polypeptides. Of the thousands of known markers, only a handful are known to be in coding sequences (exons). An example of functional markers that happen to be in coding sequences are markers for two of the five types of dopamine receptors, D₃ and D₄ dopamine receptors. In the case of dopamine D₄ receptor, it is known that receptor binding differs for people with different marker genotypes. However, the vast majority of current markers are likely to be in noncoding regions because natural selection permits variation in nonfunctional DNA much more than in functional DNA. Finding such functional markers is a high priority for research because of the power they provide for identifying QTL (Sobell, Heston, & Sommer, 1992).

Allelic association makes it possible to use markers that are not functional themselves but are very close to functional genetic variation. A particular combination of a marker allele and a functional variation in DNA that happen to be on the same chromosome is rarely separated by recombination (meiotic crossing over of chromosomes) if their loci are very close together on the chromosome.

Allelic associations have been found between disease states and markers in the HLA histocompatibility complex (Tiwari & Terasaki, 1985). In other words, particular alleles in this complex increase risk for certain diseases. For normal variation, the best example of allelic association is serum cholesterol levels for which about a quarter of the variance can be explained by four apolipoprotein gene markers (Sing & Boerwinkle, 1987). In psychiatry, a marker in the D₂ dopamine receptor has been reported in several studies to be associated with alcoholism (Cloninger, 1991). That is, the frequency of this allele appears to be greater in severe alcoholics than in controls, although failures to replicate have been reported.

A major advantage of allelic association analysis is that it can use samples of unrelated individuals, whereas linkage requires pedigrees of related individuals. In addition, allelic association is just as applicable to

quantitative traits as to disorders. Most importantly, by increasing the sample size of relatively easy-to-obtain unrelated subjects, association analysis can be made sufficiently powerful to detect small genetic effects.

A problem is that there are so many DNA markers. The allelic association approach is like a myopic search for a few needles in a haystack. In contrast to linkage which can detect a major gene far away from a marker, allelic associations can only be detected when a marker is very near a gene that affects the trait. For behavioral traits influenced by many genes as well as nongenetic factors, a near-sighted strategy such as association may be needed to see fine details of the landscape near a marker even though it has to sacrifice the ability to see distant mountains. This is not really a sacrifice because there are no mountains to be seen. Nonetheless, there are so many markers that randomly drawing straws from the haystack is unlikely to pay off. The odds can be stacked in our favor by beginning the search using markers in or near genes of neurological relevance. The odds can also be improved by using large samples and well-measured extreme groups to increase the power to detect small effects. The goal is to identify some, certainly not all, genes that contribute to the ubiquitous genetic variance found for behavioral traits.

Allelic Association and High Ability

We are using this allelic association approach in an attempt to identify QTL associated with high cognitive ability. DNA markers are employed that are in or near genes with possible neurological relevance such as the many neuroreceptor genes and genes involved in the regulation of these genes. From the WRTP sample of more than 500 children, we selected three groups of Caucasian children: 24 children with the highest IQ scores, 21 with average IQ scores, and 18 with the lowest IQ scores. The average IQ scores of the three groups are 130, 104, and 80, respectively.

We have obtained blood from these children and established permanent cell lines by transforming the lymphocytes with Epstein-Barr virus. Permanent cell lines provide unlimited amounts of DNA for marker analyses as well as a permanent resource for future DNA analyses of these samples. We have compared allelic frequencies for these groups for more than 20 DNA markers, including dopamine receptor 1 and 3, monoamine oxidase B, myelin associated protein, neurofilament protein, and fragile X repeat length. Although interesting preliminary results are beginning to emerge, we have agreed not to publish these results until we have replicated them in an independent sample. Our replication sample includes children with even higher IQ scores (mean IQ of 142), as well as children with even lower IQ scores (mean IQ of 74).

Nearly all molecular genetic research focuses on disorders, looking for DNA markers linked or associated with disruptions of normal development. We are

especially interested in identifying "increasing" alleles that contribute to high ability. For this reason, the pattern of results we are particularly interested in finding is one in which the allelic frequency is similar for the low-IQ and middle-IQ groups but different for the high-IQ group.

Conclusion

More is known about the origins of individual differences in general cognitive ability than any other behavioral dimension, although we are still closer to the beginning than to the end of the behavioral genetics story (Plomin & Neiderhiser, 1991). It is clear that genetics plays a major role in the story, and our DF analysis indicates that high ability is also strongly heritable. The convergence of evidence for the importance of genetic influence suggests that the current neglect of genetics in research on giftedness and talent needs to end.

Molecular genetics provides powerful tools that can be used to identify DNA differences among individuals without relying on familial resemblance. In addition to providing indisputable evidence of genetic influence, it will revolutionize genetic research by providing a measured genotype for investigating multivariate and longitudinal genetic issues, the links between the normal and abnormal, and interactions and correlations between genotype and environment. In a broader perspective, it will help to integrate genetic research in the increasingly fractionated biological and behavioral sciences at the universal level of DNA. The much-used phrase *paradigm shift* seems no exaggeration for advances of this magnitude. As is the case with most important advances, it will raise new ethical issues as well (Wright, 1990).

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Brain Research Related To Giftedness

H. J. EYSENCK AND P. T. BARRETT

Institute of Psychiatry, University of London, U.K.

Introduction

The term "gifted" is essentially undefined; it is used mainly in three quite different ways (Muehle, 1969; Knoche, 1977; Helbig, 1988). In the first place, it is used as synonymous with "intelligent"; high IQ is the measure used to define giftedness (Rost, 1993). This definition began with Terman et al. (1925), Meili (1951), and Hofstaetter (1957); Rost (1993) gives a long list of authors who have adopted it. There are many clear advantages favoring this use of the term. Giftedness, however interpreted, nearly always involves high IQ, even if this is not considered to be the only ingredient. It is relatively easy to measure; there are many good IQ tests, as well as tests of special cognitive abilities (verbal, numerical, visuo-spatial, etc.). Underlying the IQ, there are good theoretical and experimental foundations. Finally, most studies of giftedness, particularly in the area here surveyed, have in fact correlated brain research findings with IQ. For all these reasons, most of the work here discussed has used IQ as the preferred measure of giftedness.

A second definition of "giftedness" relates to the concept of "creativity" (Glover, Ronning & Reynolds, 1989; Eysenck, 1993). Creativity is a dispositional trait, not highly correlated with intelligence, and measured usually by tests of *divergent*, rather than *convergent* type tests, unusual word associations, preference for complex as opposed to simple art forms, etc. Unfortunately the term is used in two different ways. It may be used as a *trait*, defined as implying originality in cognitive output, or it may be used to define socially valuable *achievement*. Trait creativity does not correlate highly with achievement creativity, for the simple reason that achievement creativity implies and needs a great deal more than trait creativity. Thus in order to create an original work of art, or a novel theory in science, high intelligence, great persistence, social support, high motivation, and much else is needed, in addition to trait creativity (Eysenck, 1993). Einstein, Mozart, Shakespeare or Titian could not have shown their creativity in an African kraal, an Eskimo igloo, or an Indian wigwam!

A final definition of "giftedness" is in terms of highly specific talents. Musical ability often shows itself at astonishingly young ages (Mozart!), and appears to

be quite unique, particularly at the executive level; when we talk about composers we find that the truly great also have very high IQs (Cox, 1926). Drawing and painting appears to be a similarly unique ability, but again when we approach the genius class there is a strong admixture of intelligence. It would be extremely interesting to measure brain activities in highly musically or artistically gifted children, but this has not been done, and consequently we are compelled to use IQ as our main criterion of giftedness. This is matter, not of choice, but of necessity; using any other definition of giftedness would leave this chapter very short indeed! It would also leave us with very little psychological theory or empirical knowledge. Hence our concentration on brain research related to intellectual giftedness.

Cognitive factors are obviously important as far as "giftedness" is concerned, but there is also much evidence that creativity is highly correlated with personality (Eysenck, 1993). Here too there is considerable evidence of differential brain activity (Eysenck, 1990). Much of the discussion of the relationship between creativity/genius on the one hand and personality on the other has been concerned with the pathological side of personality (Prentky, 1980; Lange-Eichbaum, 1950). We will return to this point on a later page.

Other factors, like motivation, are of course also of supreme importance for creative achievement, but for giftedness as a trait, i.e. a dispositional variable, they are probably less important. Many gifted children fail to show any creative achievement when they grow up; their giftedness fails to be translated into real-life contribution to art or science. This difference between disposition and achievement is central to any discussion of giftedness; we may be gifted, but hide our talent under a bushel!

Given that giftedness, however defined, is a *psychological* concept, why would we look for its causation or correlates in the cortex? The main reason, of course, is that there is a strong genetic determination to all the variables associated with giftedness (Vernon, 1989). The most obvious relation is with IQ; there is no question that IQ is strongly determined by additive genetic variance (V_A), to the extent of roughly 70%. Between-family environmental variance adds another 20%, and within-family environmental variance 10% (Eysenck, 1979). There are many different sources of evidence for

this conclusion: studies of monozygotic twins brought up in separation; comparisons of monozygotic and dizygotic twins; children adopted at birth; regression to the mean; inbreeding and its opposite, heterosis—these are just a few of the methods used to measure the heritability of intelligence and put together a model of the genetic architecture involved.

Intelligence, in addition to a general ability factor (Spearman's *g*) contains also a number of specific ability factors, and it is important to discover whether these, too, are heavily determined by genetic factors. Nichols (1965), Petrill and Detterman (1991), and specifically Cardon et al. (1992) have answered the question in the affirmative. Cardon et al., in technically by far the most adequate study, looked at verbal, spatial, perceptual speed and memory factors independent of *g*, and found strong evidence for genetic determination. This is important as it serves to *direct* a child's interest and motivation in accordance with his special gifts; general giftedness is supplemented by special gifts determining the child's major likelihood of successful adaptation.

In a similar way there is ample evidence to show that personality, too, is strongly determined by genetic factors (Eaves, Eysenck, & Martin, 1989; Loehlin & Nichols, 1976). Here twin and adoption studies again play the most important role, and demonstrate quite clearly that at least half the phenotypic variance in the great majority of personality traits is contributed by genetic factors, although *epistasis* plays a role in addition to V_A . Practically all the environmental variance is within-family, with little if any evidence for between-family variance playing a part, contrary to common belief.

When we turn to such conceptions as creativity, genius and special artistic talent, we have to confess that we have little in the way of experimental research that could be compared with the large body of empirical material that exists in relation to IQ (Vernon, 1989). It is sometimes suggested that the fact that giftedness seems to run in families may support a genetic interpretation, but such a suggestion is clearly mistaken. Familial concordance can be produced equally easily by environmental as by genetic means; by itself it argues for neither explanation. Quite the opposite is in fact true; the fact that many a genius is born in an utterly undistinguished family (Gauss, Newton, Berlioz) makes environmental influences an unlikely candidate, and leaves genetics as the only explanation. Of the two dozen most famous mathematicians in the history of the world, all but two were born into families not containing any mathematicians (Eysenck, 1993); where but from a random segregation of genes could they have received their talent?

The main point here is that if DNA plays a large part in intelligence, and probably in creativity and special abilities, then surely we must postulate some intermediary links of a psychophysiological or hormonal kind between DNA and behavior. DNA cannot *directly* influence behavior; it can only do so via such intermediaries as

those postulated above. Hence the need to search for these intermediaries which will presumably emerge as biological correlates of creative and "gifted" behavior. This, at least, is the way research workers in this field have integrated these areas, and we will follow along the same path.

Experimental Methods in Brain Research

Before we examine the research evidence relating brain physiology and function to giftedness and intelligence, it is perhaps useful to describe some of the measurement techniques and terminology that are associated with this area.

The Electroencephalogram (EEG)

The EEG is a record of the electrical activity of the brain, conventionally recorded using metal electrodes placed in contact with the surface of the scalp. The electrical activity represents the mass action of neurons at both the cortical and subcortical levels of the brain. Effectively, the EEG is measuring voltage changes over time. Due to the density of the skull, interstitial fluids, and membrane thickness, the EEG signals are heavily attenuated and subsequently of the order of amplitude of tens of microvolts. Brain electrical activity is continuous and can be analyzed, using the mathematical methods of spectral decomposition and analysis, to show which particular frequencies are present at any point in time within the continuous trace. Conventionally, there are four major frequency bands of interest:

Delta: frequencies below 4 Hz. Delta wave activity is of high amplitude but low frequency. It is associated with unconsciousness whether induced by physical trauma, tumor, anesthesia, seizure, or sleep.

Theta: frequencies between 4 and 7.5 Hz. Theta activity is mostly seen in adults during drowsiness and sleep. More generally it is associated with maturational processes in young children. There is some evidence that theta activity is associated with emotional response as in feelings of frustration or pleasure. However, this evidence is ambiguous.

Alpha: frequencies between 8–13 Hz. Alpha activity is most commonly observed when an individual is fully awake, relaxed both physically and mentally, and in an environment relatively free of stimuli. These frequencies are seen predominantly over the occipital area of the scalp, with the eyes closed. Alpha wave activity is very sensitive to changes in mood and information processing workload.

Beta: frequencies above 13 Hz to about 40 Hz. Beta activity is associated with desynchronization or break-up of the alpha rhythm, due to novel stimulation, visual perception, or increased cognitive information processing activity. Generally, beta waveforms are observed in the frontal and central regions of the brain.

The ongoing EEG waveform can be analyzed in terms of single events or regions of interest (spikes, alpha spindling, paroxysmal discharges, artefacts), or by using power spectrum analysis, examined with regard to the frequencies being generated over a particular period of time. Topographic EEG is the name given to the methodology that graphically represents this frequency activity recorded over time, across up to 64 electrodes placed on the scalp. This spatial distribution of electrical power at each frequency, computed at each electrode position, can be plotted in the form of contour lines, color densities, or grey-scaled bitmaps. The power at each frequency for areas of the scalp between electrodes can be estimated by interpolation methods.

A comprehensive overview of the area can be found in Niedermeyer and Lopes da Silva (1982), Maurer (1989), Fisch (1990), and Binnie and McGillivray (1992).

Averaged Evoked Potentials

While the analysis of ongoing EEG has provided much information with regard to clinical syndromes and symptomology and has provided some insight into the relation between brain activity and behavior, it is limited in terms of the period of analysis of the data. Generally, ongoing EEG is assessed over a period of seconds or minutes and parameters computed from the data reflect this gross level of activity. However, when the brain is presented say with a tone or light flash or any stimulus of brief, transient duration (milliseconds), it is the instantaneous electrical response of the brain that is primarily of interest, not the long-term ongoing, background EEG. A problem that arises here though is that the instantaneous brain response is in most cases extremely difficult to detect from the general background “clutter” of ongoing brain activity. To use an analogy from the engineering world, the signal (the brain response) is masked by the noise (the background EEG activity). There are two ways of approaching the solution of this problem. The first involves developing signal processing methods that are sufficiently sensitive to detect the signal within the noise, the second approach uses the principle of averaging to enhance the signal. The first approach, known as single trial evoked potential analysis, is only just beginning to show promise (as discussed later). The second approach, that of averaging waveforms, has been the conventional method of analysis to date. If we repeatedly present a stimulus to an individual and record the instantaneous brain response to each stimulus (storing say half a second's worth of activity immediately following stimulus presentation), and add these stored traces to one another, slowly the evoked response is seen to emerge from the gradually reducing background activity. Essentially, each recorded trace contains a waveform that consists of a response and background activity over the duration of the response. If the background activity has no relation to the stimulus, it can be viewed as random “noise”. If we add several

traces together, the noise will tend to sum to zero (as with statistical “noise”), while the signal will tend to become larger relative to the reduction in noise. This is because the signal is a relatively constant feature of each trace, in effect non-random. Hence, when summing the voltage values which contain the signal, the features of the signal are enhanced. Depending upon the strength of the signal in response to a single stimulus, as few as 5 or as many as 1000 or more stimulus trials may be required to enhance the evoked potential. For most experiments looking for cortical evoked potentials, somewhere between 50 and 100 trials are normally presented. Prior to the advent of computers, signal averaging was done visually, using a storage oscilloscope that displayed each trace superimposed over previous traces. Since the early 1960s, however, a computer has been used to sample the voltage values from an EEG electrode after a stimulus has been presented, store the values as an array, then add to it the next sequence of trace values for each stimulus presentation. The final values in the array, divided by the number of stimulus presentations, represent the averaged evoked potential (AEP).

Figure 1 shows a typical AEP recorded using an auditory tone stimulus of 30 milliseconds (msec) duration and averaged over 100 stimulus presentations. As can be seen from this figure, the main features of interest appear to be evident at about 20 msec or so into the response, with the response appearing to diminish after about 400 msec. From the calculations made in producing this trace, and from the trace itself, several parameters can be extracted that describe trace variability, peak latencies, trace and peak integrated amplitude, and the spectral power at each frequency that is evident within the trace. In addition, by varying the stimulus or information processing required to be used by an individual during the presentation of a stimulus, it is possible to observe “paradigm specific” signal features. For example, the P300 latency parameter is computed from an AEP, being measured as the time from stimulus onset/offset to the maximum amplitude

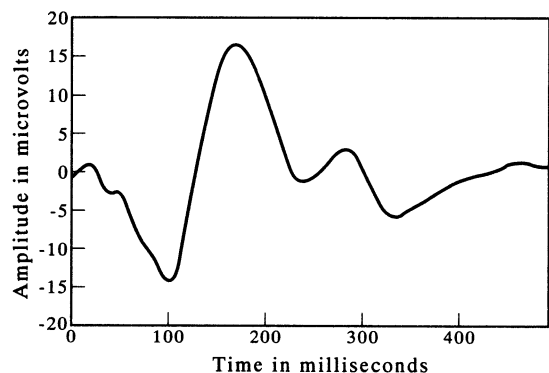


FIGURE 1. An averaged evoked brain potential to 100 auditory tone stimuli.

observed around 300 msec. There is in fact a definite positive voltage peak at around 300 msec that is a function of the specific experiment paradigm that introduces some level of uncertainty concerning a feature of the stimulus. Further information about evoked potential methodology can be found in Regan (1989) and Brunia, Mulder, and Verbaten (1991).

The Measurement of Cerebral Hemisphere Lateralization

If ongoing EEG or AEPs have been recorded from at least two sites on the scalp, one electrode over each brain hemisphere, then assessment of hemispheric differences can be examined using a variety of computed parameters. These parameters can be based on power at specific frequencies between the hemisphere sites, latency and amplitude differences, and the synchronicity of activity between the sites. A review of the computational aspects of lateralization analysis is presented by Sprott and Bryden (1983).

Brain Imaging (rCBF, SPECT, PET, CAT, MRS, MRI)

Since the late 1970s and early 1980s, methods of graphically imaging brain structure and activity have become possible. While X-ray techniques have been available for many years, these have generally required high power irradiation of body tissues that carry a risk of physical injury due to the radiation effects. In addition, the spatial resolution of the X-ray image was not particularly good when used as an imaging procedure for soft tissue structures like the brain. One approach to solving this problem is to examine regional cerebral blood flow (rCBF) within the brain, using some form of volume measurement as an estimate of brain activity. If an individual is administered a low radiation level, short half-life, radioactive isotope that is absorbed by the blood but does not cross the blood-brain barrier, it is possible using gamma scintillation cameras to inferentially compute the cerebral regional blood flow from the isotope "washout" activity. Crude spatial localization of blood flow and volume can thus be "imaged" in this manner. Alternatively, it is possible to use an isotope that does cross the blood-brain barrier and is "trapped" in cells for up to about 6-7 hours. Single Photon Emission Computed Tomography (SPECT) is used in conjunction with this particular technique as only a single photon is produced in each radioactive collision (positrons colliding with electrons). Rotating gamma cameras around the head of a subject detect photon activity and thus permit computation of the probable source of that activity. Although it is possible to use SPECT for reconstruction of regional tissue structures, it remains problematic to compute blood flow values.

A related approach to modeling the dynamics of brain activity is the Positron Emission Tomography (PET) methodology. In this technique, a low-level radioactive isotope is "tagged" onto a substance such as glucose, which is then injected intravenously into an individual. Since neural activity requires glucose to be metabolized for energy purposes, it is possible to detect areas within the brain that have metabolized glucose by using the isotope positron collision activity within the area of metabolic activity. The primary difference between SPECT and PET is that the radioactive substances used for PET collisions produce two photons per collision. These photons always have opposite directions of travel. From this directional information, source reconstruction is possible and subsequently the entire set of information is displayed as a graphical image. A 3D image is built up from the repeated analysis of data in terms of planar "slices" of the skull. So, in addition to having the ability to image the structural aspects of the brain, the dynamics may also be investigated by mapping the metabolic activity via isotope positron interaction.

The first structural 3D modeling technique for morphological imaging of the brain *in toto* used low power X-rays coupled with enhanced signal processing algorithms. The Computed Axial Tomography (CAT) scan projected X-rays in tightly defined planes, building up the 3D image from the computed particle interactions within each focused plane. Although the spatial resolution was still not high, it was, however, the first time a 3D realization of brain morphology had ever been produced *in vivo* within a living human subject. Since this pioneering work, X-ray power required to produce images has decreased while image resolution has increased via signal processing algorithms. In addition, a new method of imaging has recently been introduced, based upon the effect of an intense magnetic field upon the spin alignment of certain unpaired protons and nuclei within brain tissue. With the introduction of an externally applied strong magnetic field, the unpaired nucleons align their spins either parallel or antiparallel to the axis of the field. The two spin orientations have slightly different energies, with the separation between these energy levels proportional to the magnitude of the magnetic field. In addition, there is some movement around the spin angle by each specific type of nucleon that has been likened to a form of resonance within the magnetic field. These resonance frequencies are unique to each particular type of nucleon, allowing identification and spatial mapping of the presence of chemical substances by the use of such frequencies. This technique of Nuclear Magnetic Resonance (NMR) is also known as Magnetic Resonance Spectroscopy (MRS) and more generally as Magnetic Resonance Imaging (MRI) when applied to the detection of water protons (hydrogen nuclei) only. Both MRS and MRI are truly non-invasive imaging techniques in that they require no inhalation or ingestion of radioactive substances as with rCBF, SPECT, or PET, or bombardment with X-rays as with CAT scanning. In addition the spatial

resolution of MRI and MRS is far superior to that provided by the other techniques. Two recent reviews by Dager and Steen (1992) and Prichard (1992) outline the methodology and provide some initial evidence of its utility in brain research. A paper by Adams et al. (1992) also provides an insight into the comparative clinical utility of the various imaging methodologies discussed above.

Cerebral Hemisphere Lateralization

During the past 20 years a technological revolution has taken place within the fields of functional brain research, neuropsychology, and cognitive psychophysiology. This advance in technology has permitted measurement of brain structure, function, and activity that has had a significant impact on knowledge about the involvement of the brain in behavior. Strangely, this revolution appears to have been largely ignored within the area of giftedness. In addition, the standard of research implemented in this particular area is so low in quality as to render most of the reported results and conclusions unsound. The main focus of this chapter will be the exposition of the primary methodologies (and results following from their use) that are now available to researchers examining brain structure and function. Initially, we have examined the most relevant research results that have been generated from the psychophysiological investigation of gifted children.

One area that has persistently attracted research has been that concerned with the lateralization of cerebral hemisphere information processing and the concomitant notion of cerebral dominance. Since the work of Sperry (1964) and Gazzaniga (1967) reporting the behavioral effects of severing the two cerebral hemispheres, much experimental effort has been expended in attempting to demonstrate that right hemisphere processing is concerned with spatial, gestalt, "creative" functions, and left hemisphere processing with sequential, analytical, verbal information processing functions. With regard to the application of this lateralization construct to giftedness, the hypotheses put forward generally involve the notion of right cerebral dominance being associated with high levels of creativity, artistic and esthetic appreciation, and high levels of skill in games involving rapid assimilation and use of spatial information (tennis, pool, snooker, chess). Thus, gifted children are viewed as having some form of enhanced right hemisphere processing capability, whether such enhancement is via greater processing "power", "speed", or interhemispheric information exchange.

For example, Olson (1977) used a visual field task to investigate whether gifted children, who demonstrated Piagetian formal operational thought, used their right visual field to process verbal and spatial information (in the form of questions printed on sheets of paper, presented at the midline of a subject's field of view).

Olson concluded that the gifted children predominantly processed verbal questions using their right visual field, and spatial questions with their left visual field. Although this result was not especially novel, the use of a sample of children who were classified as Piagetian concrete operational level demonstrated that these children primarily used their right visual field for all printed items, both verbal and spatial. Hence, Olson inferred that early acquisition of Piagetian formal operational thought is related to giftedness and is associated with early hemispheric lateralization of information processing. Unfortunately, Olson did not report how many children took part in the study, their age or sex or handedness, the definition of the classification of "giftedness", how the Piagetian stages were measured in the children, and how the visual field usage measurements were made (except via videotape by several uninformed observers). The result from this study is therefore of dubious accuracy and validity.

Another related approach to determining hemispheric lateralization functions within the gifted child is that concerned with conjugate saccadic eye movements. These movements are used as an index of brain hemispheric processing. The reasoning (and assumptions) behind the use of these movements is as follows: if a subject is asked to visually fixate on an experimenter while being asked a question that involves introspection, the subject's eyes will move to the left or the right while such introspection is taking place. The lateral shift is sufficiently consistent to allow for classification of a subject as either a right or left mover. Evidence from several studies using this technique have indicated that left lateral movement is associated with spatial items, indicative of right hemispheric processing. Right lateral movement is associated with verbal items (Bakan, 1969; Harnad, 1972; Hines & Martindale, 1974; Rekdal, 1979; McCallum & Glynn, 1979; Doerr, 1980). The more creatively gifted, the more the predominance of left lateral eye movements and inferred right hemisphere activity. Leaving aside the assumption that lateral eye movement saccades actually reflect contralateral brain hemisphere processing, it is interesting to note Gur's (1975) observations on conjugate saccadic behavior. In a series of studies using this methodology, Gur noted that saccadic behavior may be more related to the position of the experimenter than to the assumed hemispheric processing content of an item. When solving spatial items, he found that when the experimenter was sitting behind a subject, eye movement was predominantly to the left (indicating right hemisphere processing). However, when the experimenter faced the subject, lateral eye movement was predominantly in one direction only, regardless of item content. Gur concluded that when an experimenter faces a subject, saccadic behavior is a function of a subject's characteristic mode of response. When the experimenter is seated behind a subject, the saccadic response is more a function of the type of item presented. Apart from Gur's observations, the other problem with this line of research is that

brain hemispheric involvement is inferred rather than measured directly.

More recently, Charlton, Bakan, and Moretti (1989) reviewed the current literature on eye movement and hemispheric processing literature. They concluded that the link between eye movement laterality and brain hemisphere processing is no longer an assumption but that converging lines of evidence from experiments using EEG, nuclear imaging, and cerebral blood flow provide support for such a proposition. Charlton and Bakan (1990), using 80 right-handed university students, also demonstrated that subjects who are classified as "left movers" tend to produce more random runs in a sequence of binary choices than "right movers" (the subjects were required to imagine that they were flipping a coin 300 times and note whether a head or tail occurred). The strength of the relationship between laterality and the number of runs in the sequence was -0.23 (using a differential laterality quotient), indicating greater right hemisphere involvement in the production of random runs. The correlation is significant at $P=0.0401$ two tail, but only explains 5% of the variation between laterality and number of runs. The results from this experiment, as with most others reviewed by Charlton *et al.* (1989) and from more current studies, indicate that the global assertions concerning conjugate lateral eye movement as a measure of hemispheric specificity are not strongly supported at all. For example, studies by Yagi (1987), Neubauer, Schuler, and Pfurtscheller (1988), Farah, Weisberg, Monheit, and Peronnet (1989), Dunn, Bartscher, Turaniczo, and Gram (1989) and Raine (1991) all yield results that tend to suggest that hemispheric lateralization within subjects is not a strong phenomenon. What dominance effects there are tend to be transient and related more to the task conditions rather than any enduring bias (Raine, 1991). Further to this point is the review by Gevins (1983) of the studies purporting to demonstrate hemispheric lateralization using spontaneous EEG and evoked brain potentials. Noting the criticisms of this research made earlier by Donchin, Kutas, and McCarthy (1977), Gevins systematically reviewed each of 17 major studies in this area. Each study was found to contain gross methodological and statistical flaws such that any results found were either ambiguous or invalid. Gevins' own work in this area (Gevins *et al.*, 1981; Gevins, Schaffer, Doyle, Cutillo, Tannehill, & Bressler, 1983; Gevins, 1989; Gevins & Illes, 1991) has shown that the simplistic assertions concerning cerebral hemisphere lateralization, cerebral dominance, and the division of processing within discrete brain hemispheres are not supported by detailed experimental work that examines the dynamics of spatial EEG and evoked brain potentials. His work and that of his co-workers has demonstrated that localization functions are transient and complex. This was demonstrated quite clearly in the Gevins *et al.* (1983) study on the lateralization of brain potentials during a visuomotor task. More recently, Efron (1990) critically reviewed the field, with equally negative results.

On another research front, Ertl and his colleagues (Chalke & Ertl, 1965; Ertl & Schafer, 1969; Ertl, 1971) demonstrated that averaged evoked potentials (AEPs) recorded from the brain response to visual flash stimuli were related to IQ test scores. Specifically, the latencies of the peak components within the AEP trace correlated negatively with IQ between about -0.30 and -0.50 . Ertl interpreted this correlation as indicating that high IQ subjects have "neurally efficient" brains. Ertl further extended this proposition by proposing that the most valued measure of neural efficiency was the average frequency of the non-alpha wave activity. He subsequently introduced the Brain Wave Analyzer, a device for automating collection of EEG and computation of seven parameters concerned with assessing neural efficiency. Two of these parameters involved estimation of brain hemispheric activity, a symmetry parameter assessing hemispheric synchronization of activity over several frequencies, and a dominance parameter assessing the ratio of frequencies generated in the left hemisphere as contrasted with the right hemisphere. Two studies by Fischer, Hunt, and Randhawa (1978, 1982), and a study by Trout, Packwood, and Wilson (1976) demonstrated that the only parameter marginally related to IQ was the symmetry parameter, assessing the synchronization of activity between the two hemispheres, albeit only at two electrode locations over the parietal area of the scalp. Greater symmetry was associated with higher performance on the cognitive tests.

Finally, returning to the emphasis of hemispheric dominance, some early empirical studies found that there was a small but apparently reliable deficit for left-handed subjects on test of spatial ability (Levy, 1969; Miller, 1971; Nebes, 1971). The proposed hemispheric explanation for this effect is that the bilateral development of the language abilities thought to characterize left-handed individuals encroach upon the neural space allotted for development of the spatial abilities in the right-handed, leading to a decrement in spatial ability. However, a recent review of later studies in this area by Natsopoulos, Kiosseoglou, and Xeromeritou (1992) has indicated that this explanation is not supported by the evidence. Rather, the opposite appears to be the case. Of relevance here is the work of Geschwind and his colleagues (Geschwind & Behan, 1982; Geschwind & Galaburda, 1984, 1987). He has argued that prenatal exposure to high levels of the predominantly male hormone testosterone may influence underlying brain organization by enhancing the development of the right hemisphere relative to that of the left. Benbow and Stanley (1980, 1983) and Benbow (1986, 1988), in an examination of the physiological characteristics of the intellectually gifted and mathematically precocious, found that there was a greater number of males than females in the gifted groups of children who formed the sample for the Study of Mathematically Precocious Youth. In addition, it was also found that there was a higher number of left-handed children in the groups than would be expected by chance and that giftedness

was positively related to visual myopia and incidence of allergies. The large-scale analysis of the project Talent data (Flanagan, Dailey, Shaycroft, Gorham, Orr, & Goldberg, 1962) reported by Lubinski and Humphreys (1990, 1992) replicated the findings of Benbow concerning the relationships between myopia and the frequency ratio of males to females in the gifted groups. However, the evidence on allergy problems was not replicated.

O'Boyle and Benbow (1990) and O'Boyle, Alexander, and Benbow (1991) further examined the role of the right hemisphere in cognitive processing using dichotic listening for syllables and chimeric faces (Levy, Heller, Banich, & Burton, 1983a, b) in right-handed children. The results from these experiments indicated that gifted children (defined as being in the top 2% of the Scholastic Aptitude Test) tended to demonstrate more high frequency EEG in the left hemisphere while in a resting "baseline" condition and greater desynchronization of alpha frequency in the right hemisphere while solving the chimeric face problem. Notably, when processing verbal information, no differences were observed between the gifted children and a control group of average ability children. One problem with the O'Boyle et al. (1991) study that specifically used the EEG to determine hemispheric activity was that there were only six children in the gifted group and eight in the control group. As Gevins (1983) has previously indicated, results based upon such low numbers of subjects lack both statistical power and credibility.

The areas of investigation reported above are those that seem to best define the approaches adopted by researchers involved with the physiological concepts of giftedness. Although there have been some other studies that have appeared from time to time in the literature—for example, the work on sleep patterns in gifted children—reported in Pivik, Bylsma, Busby, and Sawyer (1982) and Busby and Pivik (1983), and some work reported by Lubar, Gross, Shively, and Mann (1990) on the differences between gifted, normal, and learning disabled children in AEP laterality—few significant results have emerged from the work. Rather, the complexity of the phenomena under examination has invariably swamped the data, especially when most of the experiments have involved groups of gifted children of less than 10 subjects. The observational, semi-actuarial, work of Benbow, Lubinski, and Humphreys reported above does provide insight into the patterning of attributes associated with giftedness (defined primarily by high scores on a wide range of psychometric ability tests), but cannot allow computational inference as to causality or underlying physiological associations (Eysenck, 1988). Given a more restricted definition of giftedness is considered, based upon psychometric IQ test scores (Levine, 1985; Leung, Robson, & Lim, 1992), one avenue of research in this area is to examine the biological basis of IQ test scores. The data from Lubinski and Humphreys on mathematical precocity in children support the fact that these children all scored well

above average on IQ test composites. Thus, although psychometric IQ may not be a necessary condition for defining giftedness, it does nevertheless appear to be one of the most important attributes in giftedness per se. In addition, the use of psychometric IQ scores assumes that the abilities under examination are measured on a continuum. That is, the concept of giftedness is defined solely on the basis of elevated psychometric test scores, not on other behavioral traits or characteristics of an individual. The importance of considering this avenue of research is that instead of having to focus on discrete groups of individuals classed as gifted, normal, or learning disabled, the entire measurement range of the IQ scores under examination can be used. This has benefits for statistical measurement properties of the data, as well as enabling analytical inferences to be drawn about the categorical nature or otherwise of the definition of giftedness. In addition, sampling problems are eased due to the loosening of restrictions placed upon membership of any sample. To obtain a representative sample of gifted children that might satisfy test power constraints for a reasonable effect size generally involves sampling at least 40 or 50 such children, by sex (it is also debatable whether the statistical inference properties of normal distribution theory are applicable when subsampling from the tail of a distribution). In addition, working with restricted groups such as these can produce unexpected statistical problems as discussed by Vernon (1990) and Lynn (1990a) concerning the relationship between spatial and verbal abilities in restricted IQ range samples.

One area which has produced some very significant results is that examining brain/hemispheric size differences and their relation to psychometric ability test scores. Unlike the more conventional studies using cranial capacity and head circumference (Jerison, 1973; Broman, Nichols, Shaughnessy, & Kennedy, 1987; Lynn, 1989, 1990b; Osborne, 1992) that suggest a positive correlation of around 0.3 between these physiological parameters and IQ, two recent studies have reported relationships between direct brain volume measures and IQ. Yeo, Turkheimer, Raz, and Bigler (1987) used computerized axial tomography (CAT) scans of 41 individuals in order to compute brain hemispheric volume. Their results indicated that total brain or total hemispheric volumes were not related to IQ test scores. However, a simple measure of hemispheric asymmetry (left-right hemisphere size) correlated 0.57 with an IQ difference score computed by subtracting WAIS performance IQ score from the verbal IQ score. This correlation indicates that the larger the verbal IQ in relation to performance IQ, the greater the size of the left brain hemisphere to the right hemisphere. Although the correlation between brain asymmetry and the IQ difference score was larger for the male than for the female subjects, the two coefficients were statistically equal in size. Willerman, Schultz, Rutledge, and Bigler (1991), using magnetic resonance imaging (MRI) to assess brain size in 40 college students, found that brain

size did correlate with psychometric IQ scores at around 0.35, after corrections for body size and a deflationary correction for the extreme measurement range of IQ in their sample. Hemispheric asymmetries were computed in a similar fashion to the Yeo et al. (1987) method, yielding a significantly different pattern of correlations. These asymmetry correlations (reported in Willerman, Schultz, Rutledge, & Bigler (1992)) demonstrated that for males, hemispheric asymmetry correlated 0.44 with the verbal minus performance IQ difference score, replicating the Yeo et al. finding. However, for the female subjects, this correlation was -0.55 , indicating a larger right hemisphere being associated with verbal performance. In fact, for the female group, it was found that the size of the left hemisphere better predicted nonverbal performance than verbal performance, a finding reversed within the males. Ankney (1992) in a re-examination of brain mass data initially collected from autopsy records by Ho, Roessman, Straumfjord, and Monroe (1980a, b) also demonstrated that brains from males are about 100 g heavier than female brains, correcting for body height and body surface area. These data are interpreted by Ankney in the framework of a general assumption that specific abilities, at which males and females excel, are related to specific areas or quantities of brain mass. This assumption is given some credence in the review of work in this area by Kimura and Hampson (1992).

Information Processing: The Brain

Nuclear imaging of brain structure, briefly mentioned above, has also produced some preliminary results that suggest this methodology has a major part to play in the eventual understanding of brain-behavior relationships. Some initial work in cerebral regional blood flow (reviewed in Wood, 1983) indicated that task specificity could be observed in blood flow increases in particular areas of the brain, specifically verbal tasks being associated with increased left hemisphere flow and spatial tasks being associated with increased right hemisphere activation. However, as Wood points out, this work cannot be said to strongly support such clear laterality effects; rather it is of a suggestive nature only. A recent study reported by Leli et al. (1982) using 11 normal right-handed male subjects indicated that a right-left sensorimotor discrimination task produced significant increases in blood flow in both hemispheres, with left hemisphere blood flow increases being negatively related to WAIS performance IQ (administered on a separate occasion). The problem with this study, as with most others using nuclear imaging, is that the small numbers of subjects used do not allow any statistical inferences to be drawn with a reasonable level of confidence. So, while studies such as these might be indicative of a possible relationship, they cannot indicate what its size might be. For example, a 99% confidence interval on a correlation of 0.75, using 11 subjects, ranges from 0.06 to 0.95.

Haier (1990) has suggested that the primary way forward for intelligence research is principally through radioactive isotope PET and structural, non-radioactive, MRI proton-based imaging techniques. The basis for such a statement comes from his own and others' work on cortical glucose metabolic rate in individuals who also complete psychometric or behavioral tests. The "activation" form of experiment is one where the radioactive substance is given immediately prior to a subject completing a cognitive or behavioral task. The radioactive isotope tagged-glucose is subsequently metabolized by the specific areas of the brain that are involved in the task, then imaged via the PET methodology. The "passive" form of experiment is where cognitive or behavioral measures are completed external to the imaging process. Glucose metabolic uptake is effected during resting conditions where an individual is isolated from sound and light while the isotope doped glucose is administered and ultimately imaged. The cerebral spatial uptake of glucose is then correlated with the external variable test scores. De Leon et al. (1983) compared 15 young normal subjects with 22 elderly normal subjects and 24 Alzheimer patients on WAIS IQ and other tests of cognitive function in a passive format experiment. Correlations of up to 0.6 were found between glucose metabolic rate and IQ, higher cortical activity being associated with a higher metabolic rate. These correlations were computed over a combined normal elderly and Alzheimer patient group, with no significant difference between the elderly and young normal groups. Chase et al. (1984) in a similar study essentially replicated these results. However, this form of passive experiment has generally failed to generate consistent brain-behavior relationships (Duara et al., 1984; Haxby et al., 1986; Boivin et al., 1992). In contrast, the activation study of Haier et al. (1988), using eight subjects who completed Raven's Advanced Progressive Matrices during the glucose uptake period, indicated that higher cortical glucose metabolic rate was related to lower performance on the matrices. This result was confirmed by Parks et al. (1988) using a test of verbal fluency, and Berent et al. (1988) who showed negative correlations between WAIS memory scores and glucose metabolism rate. These activation studies indicate that high IQ subjects appear to solve problems more "efficiently" than do low IQ subjects, requiring less energy to maintain performance at a higher level of accuracy. Haier et al. (1992a) tested this hypothesis in an experiment that examined learning of a spatial game task within a group of eight normal subjects. It was hypothesized that learning should produce a decrement in cerebral glucose uptake. The subjects were initially injected with the glucose and PET scanned while playing the game for the first time, they then practiced the game constantly over a 2-month period and were then scanned again while playing the game. The results indicated significant widespread reductions in glucose uptake across several regions of the brain. Haier et al. (1992b) extended the analysis to examine whether higher

IQ subjects had greater reductions in glucose uptake than lower IQ subjects. The pattern of correlations between Raven's Advanced Progressive Matrices, WAIS IQ scores, and metabolic reduction coefficients indicated significant negative relationships, thus confirming the hypothesis. However, with such small sample sizes, these results can only be taken as preliminary indications of effect size. A correlation of about 0.7 observed over eight subjects is significant at $P = 0.053$ with a 99% confidence region between -0.28 and 0.97 . Taking all the activation studies reported above, there are now indications of a consistent negative relationship between glucose uptake rate and cognitive abilities, even if the probable size of such a relationship cannot yet be estimated. As Matarazzo (1992) has indicated, this is only the beginning of this particular approach to examining brain-behavior relationships. A further technical advance in this area is the advent of Magnetic Resonance Spectroscopy (MRS) applied to *in vivo* brain tissue. This technique was originally used for *in vitro* characterization of chemical samples. In fact the development of MRI was based upon adapting existing MRS technology to the detection of hydrogen nuclei in water molecules within tissue structures. However, the main problem with current MRI imaging is that it is suited to detection of relatively large protons only, mainly water-based. MRS, on the other hand, is capable of detecting a variety of nuclei such as those based upon phosphorus, carbon, and hydrogen.

Ongoing Brain Activity

The ongoing electrical activity of the brain is an obvious source of data for the psychophysiological recording of events possibly related to IQ, but a careful survey by Lindsley (1961) showed quite early on that there is no clear-cut relation in normal adults, although in early childhood (when slower gamma and delta waves give way to faster and prevalent alpha) and in brain-injured persons (Ostow, 1954) some relationships are found. Recently, Gasser and co-workers (Gasser, Mocks, Leonard, Bacher, & Verleger, 1983; Gasser, Von Lucadou-Muller, Verleger, & Bacher, 1983; Gasser, Bacher, & Steinberg, 1985) have reported correlations between spectral power and IQ, averaging about 0.5 in children. All EEG parameters were standardized for age as were the tests of intelligence (the WISC verbal subtest and the Columbia Mental Maturity Scale). A group of mentally retarded children ($N=25$) also used in the 1983 Gasser, Mocks, et al. study were shown to generate higher EEG \times IQ correlations (averaging about 0.6) than the normal children group ($N=31$). Gasser et al. (1985) demonstrated that the test-retest reliability for absolute and relative spectral power within the six power bands was mostly in the range of 0.60–0.75.

Giannirapani (1985) has recently published a monograph detailing extensive investigations into the localization of EEG spectral power and mental abilities as assessed by the WISC and WAIS IQ tests. EEG was

acquired under eight conditions ranging from white noise, music, complex visual patterns, to solving arithmetic problems. Sixteen monopolar electrode placements were used encompassing prefrontal to occipital placements. The main results from the analyses indicated that performance on the various subtests of the WISC and WAIS was significantly related to EEG power at specific frequencies within specific brain areas.

Thatcher, McAlaster, Lester, Horst, and Cantor (1983) and Gasser, Jennen-Steinmetz, and Verleger (1987) examined the spectral coherence of the EEG from various scalp regions of children. Coherence was defined as the similarity estimate of power generated at a particular frequency across two signal channels over a fixed duration. The function varies between $+1$ and -1 , and can be interpreted (and manipulated) much in the same way as a product moment correlation. A coherence value of $+1$ would indicate that both signals (say from two regions of the brain) have the same power at a particular frequency within a particular duration. The Gasser et al. study reported results from the same children as those used in their previous studies. Thatcher et al.'s sample consisted of 191 children aged between 5 and 16 years; they partialled out age and sex before examining the coherence measures. Overall, both studies showed that higher coherence values were associated with lower IQ. That is, the higher the IQ, the more differentiated the brain activity between scalp regions. This result is similar to that reported above by Fischer et al. (1978, 1982) using Ertl's brain wave analyzer. Fischer et al.'s results marginally indicated that the greater the hemispheric synchrony, the higher the IQ of a subject. Within Gasser et al.'s mentally retarded group of children, the coherence values were appreciably higher than observed in the normal control group of children, indicating greater synchrony of activity. These two studies were seen as an important indicator that one index of biological intelligence may simply be the amount of brain used by an individual in any problem solving task. In the EEG area, *use* is being inferred from the disruption of semi-stable background frequency generation across various scalp locations. From the PET activation studies reported above, the inference from the EEG coherence parameter results appears ambiguous, mainly because it is unknown precisely how to map cerebral glucose metabolic rate to EEG frequency and power. Also, cognitive task conditions and sample composition within the two areas of study are completely different. The EEG studies involved children at rest, the PET studies used adults actively engaged in a cognitive task.

Averaged Evoked Potentials

From the late 1960s onwards, a systematic body of evidence has been produced indicating several relationships between parameters computed from specific features of averaged evoked potentials (AEPs) and IQ test scores. As indicated above, Ertl was the first investigator to show that short visual AEP component peak latencies

were found to correlate with high IQ. This work was replicated and extended further by Ertl and Schafer (1969), Ertl (1971, 1973), Bennett (1968), Shucard and Horn (1972), Hendrickson (reported in Eysenck, 1973, p. 429), Weinberg (1969), and Gucker (1973). The average correlation found across these various studies was about -0.30 . However, several investigators were unable to obtain replication of these results (Rhodes, Dustman, & Beck, 1969; Dustman & Beck, 1972; Dustman, Schenkenberg, & Beck, 1975; Davis, 1971; Rust, 1975), generally finding zero or slightly positive correlations between latencies and IQ. Engel and Henderson's (1973) study of 119 children led them to conclude that no relationship existed between visual evoked response latencies and IQ. This was a significant study in that their methodology was good and the subject numbers large. Eysenck and Barrett (1985) discuss more fully this issue and some reasons for the non-replication of Ertl's initial results. One important issue here was the selection of subject groups. Ertl tended to use polarized IQ groups (high vs low IQ) rather than a normal range, a point made especially by Dustman et al. (1975) who concluded that the small latency-IQ relationship could only be demonstrated using extreme subject groups.

In addition to the analysis of the AEPs in terms of component latencies, Ertl (1971, 1973), Osaka and Osaka (1980), and Shucard and Callaway (1973) also computed their power spectra. From these analyses they concluded that the amplitude of the maximum spectral frequency did not correlate significantly with IQ. However, Flinn, Kirsch, and Flinn (1977) in a similar analysis found that low IQ subjects had larger low frequency (< 12 Hz) amplitudes than high IQ subjects. In addition, high IQ subjects were found to have significantly larger high frequency (> 30 Hz) components than low IQ subjects. The correlation between IQ and amplitude within the lower frequency power bands was about -0.37 . For the higher frequency bands it averaged about 0.36 .

Recently, Hendrickson and Hendrickson (1980), Blinkhorn and Hendrickson (1982), and Hendrickson and Hendrickson (1982) have provided new evidence on the correlation of IQ with AEP parameters. Based upon a novel model of synaptic structure, function, and nerve transmission, the Hendricksons derived two measures that could be extracted from an AEP. A complexity measure (otherwise known as the *string* measure) was assessed by computing the contour perimeter of the AEP waveform; the larger this value, the higher an individual's IQ. The second measure, the *variance*, was computed by taking the average variability of each sample point on an AEP over a number of epochs. The greater the variance, the lower an individual's IQ. The empirical evidence regarding the complexity/variance of the AEP is drawn from two studies. The first, reported by Blinkhorn and Hendrickson (1982), correlated the complexity (string) measure from auditory AEPs with performance on Raven's Advanced Progressive Matrices (APM) and a variety of verbal ability tests. Various

correlations between the string measure (computed from AEPs generated over 90, 64 and 32 epochs) and the APM yielded a mid-range correlation of approximately 0.45 . The verbal test scores did not correlate significantly with the string measure. However, because the range of the scores on the APM was restricted, Blinkhorn and Hendrickson corrected this value for a full range of IQ. The correlation was thus boosted to a maximum of 0.84 . In the second study (Hendrickson & Hendrickson, 1982) a random sample of 219 mixed sex, secondary school children was used, with measured IQ using the WAIS test. The correlations between the WAIS performance total and the string and variance measures were 0.53 and -0.53 respectively. The correlations between the WAIS verbal total and the string and variance measures were 0.68 , and -0.69 respectively. Several replications of these pioneering results have been attempted by various workers with some success. Two reviews of the area by Deary and Caryl (1992), and Barrett and Eysenck (1992) provide the details of these studies.

A second approach to examining the AEP \times IQ relationship has focused on the effects of information processing workload on AEPs (Schafer, 1979; Schafer, Amochaev, & Russell, 1981). These studies have all demonstrated a cognitive modulation of EEG activity, that is, unexpected stimuli tend to produce higher amplitude AEPs than do expected stimuli. Schafer has extended the scope of this empirical phenomenon by hypothesizing that high IQ individuals would commit less neural effort to processing expected stimuli than would low IQ individuals; this difference in effort (neural adaptability) being observed in reduced amplitude AEPs from high IQ subjects. Schafer and Marcus (1973) and Schafer (1982, 1984, 1985) reported correlations averaging about 0.63 between the level of neural adaptability and IQ scores. That is, the greater the amplitude disparity between AEPs computed from epochs generated by expected and unexpected series of auditory stimuli, the higher the individual's IQ score. When corrected for attenuation of range within the IQ test scores, the average correlation was about 0.78 . It is of interest to note that Callaway (1975) was unable to obtain a significant correlation using a similar methodology. A detailed review of the theories underlying both the Hendrickson and Schafer paradigms and the experimental evidence noted above is provided in Eysenck and Barrett (1985).

Finally, there is the work by Zhang, Caryl, and Deary (1989a, b) on the relationship between visual AEP components, inspection time, and IQ. Inspection time (IT) may be defined as the minimum display time required by an individual to accurately discriminate a difference between two stimuli. The prototypical task emerged from a psychophysical theory developed by Vickers, Nettlebeck, and Willson (1972). Nettlebeck (1987) and Kranzler and Jensen (1989) have reviewed a large body of evidence demonstrating that IT correlates with IQ on average between -0.4 and -0.5 . Within the Zhang et al. experiments, IT stimuli were presented

on a LED display; the task required discrimination of the relative length of pairs of illuminated lines (one twice the length of the other) which were followed by a backward mask. Using an adaptive algorithm, an individual's IT was assessed to 85% accuracy; then another 100 trials were presented at this level. EPs were recorded from a single central vertex electrode. From the analyses undertaken by Zhang et al., a new AEP component was generated, called the *P200*, parameter. This is defined by computing the mean voltage for an AEP, and noting the intersection of this mean value by the upward slope of the waveform from the *N140-150* trough, the time is counted until the *P200* peak is reached by the waveform. Across two groups of 16 subjects, this parameter correlated from 0.43 to 0.58 with their IT values. From another series of experiments reported in Zhang et al. (1989b), the *P200*, parameter and AH5 IQ correlated -0.34 across 35 subjects and between *P200*, and IT, 0.65 across 37 subjects. As part of this second series of experiments, Zhang et al. also included a condition of simple (SRT) and discriminative reaction time (DRT). *P300* component amplitude and latency was assessed for each individual and correlated with SRT and DRT values and IQ. None of the correlations between RT and *P300* measures was significant. In addition, no *P300* measures correlated with IQ. This is in contrast to a recent paper by McGarry-Roberts, Stelmack, and Campbell (1992) who recorded *P300* potentials during the performance of six simple computer administered cognitive tasks. Using the MAB IQ test scores from the 30 subjects who took part, they found that *P300* latencies increased with increasing task difficulty and that two canonical variates (for *P300* latencies and MAB IQ) correlated inversely with each other ($-0.36P < 0.05$). O'Donnell, Friedman, Swearer, and Drachman (1992) also replicated this negative correlation between the *P300* AEP component and a factor score based upon three WAIS subtests of Information, Similarities, and Picture Completion. This correlation was -0.44 within 41 subjects. The results from both the *P200*, and *P300* AEP paradigms indicate that the latencies of these parameters are consistently negatively related to IQ test scores. Since there is a large body of evidence confirming the relationship between *P300* and cognitive information processing workload, it can be concluded that the shorter latencies found within higher IQ subjects may reflect neural efficiency or higher speeds of processing, a conclusion that may partially support Haier's speculations above, based upon his work using PET imaging.

One possible problem with the AEP work reported above (and in fact all AEP work) is that the AEP represents the average of a set of waveforms recorded in response to a stimulus. It is assumed that each waveform represents a consistent brain response to a stimulus, with only slight error or "jitter" around each sample point. In fact this is the basis for the Hendrickson string and variance measures given above. However, this assumption may not be valid for all evoked potential

traces, neither may it be desirable if an investigator is looking for transient responses to stimuli that cannot be replicated or repeated in any meaningful fashion, but which are significant to an area of study. For example, consider using video film "events" to look at emotional responses to transient stimuli within a video sequence, or the use of a rare probe stimulus to ascertain attentional processes while a subject is engaged in alternative cognitive processing. Effectively, the stimulus and brain response may be considered as a unique pairing, with any attempt at averaging rendered impossible by the nature of the stimulus itself. In these cases, a single trial evoked potential is required to be extracted from the ongoing background EEG. This has proven almost impossible with current techniques of signal processing and waveform analysis (Cerutti, Baselli, Liberati, & Avesi, 1987; Basar, 1988). However, a recent advance in waveform analysis has opened up a new avenue of research into extremely fast transient waveforms. The method is known as wavelet analysis, first proposed by Grossman and Morlet (1984). Without going into technical details, the wavelet transform surpasses current Fourier decomposition of signals such that an evoked potential can be separated from background EEG with very high resolution of both frequency and time, simultaneously. That is, as a signal occurs, the instantaneous frequencies that have produced the signal can be computed moment by moment, with a time resolution far exceeding that of classical Fourier analysis. At present, this methodology is still being investigated and computational algorithms examined (Mallat, 1989; Crowe, Gibson, Woolfson, & Somekh, 1992; Bartnik, Blinowska, & Durka, 1992). However, the significance of this methodology is that it will allow much finer temporal resolution of discrete evoked potentials within the brain. In addition, the ability to estimate the instantaneous frequency "mix" of signals will also provide information as to the likely sources of generation of the waveforms. As the spatial resolution of the nuclear imaging methodologies increases, so does the temporal and spatial resolution (via magnetoencephalography (see Regan, 1989)) of the electrical imaging techniques.

The Psychophysiology of Personality

The literature on biological determinants of personality has been surveyed by Eysenck (1990), Gale and Eysenck (1992), and Zuckerman (1991). Here we shall be concerned only with those personality dimensions which are closely related to the creative aspects of giftedness, i.e. personality traits which enable certain aspects of giftedness such as originality to appear. There is considerable evidence that *introversion* is frequently found associated with artistic and scientific success (e.g. Goetz & Goetz, 1979a, b; Roe, 1951; Eysenck, 1993). Artists and scientists are differentiated in terms of *neuroticism-stability*, with scientists tending towards

the stable end, artists towards the neurotic. Of course these are only trends, and not everyone who is artistically gifted is neurotic, nor are all scientists stable. However, overall there appears to be a fairly definite tendency in this direction.

The evidence suggests fairly strongly that underlying the extraversion-introversion dimension are physiological differences in *cortical arousal*, which in turn is modulated by the ascending reticular activating system (Eysenck, 1967). Extraverts respond poorly to incoming stimuli, and require strong stimulation to achieve an acceptable level of arousal; hence their high sociability, variety-seeking, changeable behavior. Introverts over-respond to incoming stimuli, and respond best to low levels of stimulation; hence their aversion to social occasions, sensation-seeking and risk-taking. There is a large body of literature linking psychophysiological measures (EEG, EDR, CNV, etc.) with extraversion, with results which have usually supported the theory (Eysenck & Eysenck, 1985).

As regards neuroticism-stability, it seems clear that this is related to the limbic system and the autonomic system, with excessive reactivity related to neurosis, particularly in the sympathetic part of the autonomic system. The problems in verifying this general theory have been discussed in detail elsewhere (Eysenck, 1990), but overall the theory is probably along the right lines. Artists, who "recollect emotion in tranquillity", would have little to recollect unless their emotions were particularly strongly and easily engaged; this may account for their high degree of neuroticism. Scientists should not be swayed by emotion but by reason; this may be the reason why they are more likely to be stable and unemotional.

However, more directly related to creativity is the third major dimension of personality, namely *psychoticism* (Eysenck & Eysenck, 1976). This is conceived of as a dispositional trait variable, predisposing people to respond to severe stress with functional psychotic disorders; people high on this trait are not psychotic, but share with psychotics some of the characteristics which are frequently found in schizophrenics and manic-depressives. The discovery of this personality dimension helps to explain the paradox that has always attended the finding of considerable psychopathology in so many geniuses, coupled with the equally insistent finding that fully developed psychosis is hostile to the production of original works of science or art (Eysenck, 1993).

Most relevant here is the tendency towards "overinclusive thinking" on the part of psychotics. This resembles the greater associative spreading of ideas of creative people; they tend to have associative gradients which are flat and extensive, rather than steep and restricted. On the word association test, for instance, psychotics and creative people both tend to give associations to stimulus words that are remote and unusual. There are of course also marked differences between normal high *P* scorers and psychotics; the former retain the ability to look critically at the products of their fertile brains, and

reject far-fetched and nonsensical associations, while the latter are unable to do so.

The literature on the biological causes and correlates of schizophrenia, manic-depressive illness, and psychoticism is also immense, and cannot be discussed here; readers interested in following up this particular aspect of giftedness are invited to read Zuckerman's (1991) textbook, as well as Eysenck's (1993) attempt to formulate a theory of creativity on this basis. Our purpose in writing this brief section has been mainly to draw attention to an area of giftedness that is usually neglected, but which is likely to repay extended study.

Summary and Conclusions

It will be obvious that the very complex set of results and theories here reported cannot easily be summarized. In attempting to do so we will of course have to omit many qualifications that are needed to avoid the unjustified appearance.

(1) "Giftedness" is a fuzzy concept that can be defined in three major ways: (1) as synonymous with *general intelligence*; (2) as synonymous with *creativity*; (3) as synonymous with special (artistic or scientific) ability.

(2) Most work on the biology of giftedness has been done in respect of intelligence, and hence most of this article is devoted to that topic.

(3) Giftedness is also related to *personality*, and brief mention at least has been made of some of the work done in that area.

(4) Intelligence, personality and special abilities are all strongly determined by genetic factors, and as DNA cannot directly influence behavior, there must exist biological intermediaries (psychophysiological, hormonal) which correlate with giftedness.

(5) Lateralization of cerebral hemisphere functioning, and general cerebral dominance, have often been suggested as being closely related to giftedness. While the evidence does not rule out such a possibility, support is meager, and the theory has not been stated in an acceptable form.

(6) Resting EEG recordings and evoked potentials have been found to correlate quite highly with intelligence, but anomalies are still too frequent to give us a convenient and acceptable measure of giftedness, although the time may not be far off when such a measure becomes feasible.

(7) Information processing investigations using nuclear imaging, positron emission tomography and magnetic resonance spectroscopy all hold out great promise of precise location and measurement of mental activity and individual differences, but here too it is too early to be certain of replicability.

(8) Much of the work reported in all these fields is of inferior quality, done on too small and poorly selected samples, and poorly carried out and reported. No such studies should be carried out and reported unless the number of subjects was at least 50, groups clearly

defined along measurable continua, and procedures and statistical analyses outlined in detail.

(9) Personality correlates of giftedness in the biological field have a good theoretical basis, and have received considerable empirical support. They form an important aspect of giftedness, particularly in the sense of creativity, and have a good theoretical basis in psychophysiology.

(10) The whole area is in a state of growth, and promises to give us many answers to causal questions raised by the problems associated with giftedness. The technical problems are considerable, but not insurmountable, and it seems likely that the next few years will see a marked increase and improvement in the number and quality of papers devoted to this topic.

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Thinking Processes: Being and Becoming Gifted

B. M. SHORE

McGill University, Montreal, Quebec, Canada

L. S. KANEVSKY

Simon Fraser University, Burnaby, British Columbia, Canada

Introduction

In this chapter we explore thinking processes as an important component of a contemporary conception of giftedness and its development. We address four issues related to thinking processes and giftedness: First, some of the principal ways in which the thinking processes of gifted persons differ from those of other people, with a focus on recent and ongoing research into cognitive processes; second, and very speculatively, evidence to link the intellectual performance of very young children to the higher level thinking observed in older children and in adults; third, and briefly, the nature and success of programs intended to train people to think in these ways and thereby to enhance their intellectual abilities; and fourth, some concluding thoughts about broader educational implications.

One of the first challenges facing a researcher interested in gifted children is to define giftedness in terms that can be operationalized in the investigations that follow. Studies have ranged widely in the definitions and their operationalization. We would like to suggest that rather than being a liability, this diversity may be an asset to the body of literature addressing the role of cognition in giftedness. This chapter will introduce the reader to findings of studies based on differing definitions and explore consistencies and inconsistencies that contribute to our evolving understanding of high ability.

In any attempt such as this, we are necessarily constrained by the persistent problem of defining giftedness. In adults, the cognitive literature has adopted the term “expert” (Ericsson & Smith, 1991), but there is no more agreement about the meaning of “expertise” than “giftedness”. We have chosen to work with three operationally defined groups, and to live with the problems resulting from their inequivalence and the possibility that outstanding performance on one of the criteria at a particular stage in one’s life is correlated with similar standing on either of the other criteria later at other times. These three groups are of children with high IQs, children who do very well in school, and adult experts.

To understand differences in thinking processes, we must examine children or adults who are exceptional in contrast to others in some recognized way. It is necessary to identify target processes that distinguish types of high performance, and to discover the correlates, predictors and consequences of these processes, with reference to the original variable on which the different groups were identified, and also with other variables. It is very important to take into account that this line of research is intended to produce alternative definitions of giftedness, not merely to embellish existing definitions.

With the very young, this research begins with children who might be described as developmentally advanced in their intellectual functioning. This includes advanced vocabulary, logical reasoning ability, ciphering, and verbal comprehension, among other qualities. It does not much concern us to attempt to define in advance whether we are talking about a “top” group of 1%, 5%, or 50%. Measures of IQ or similar tests directly address such issues, and are widely used in this type of research.

With school-age children and adolescents, some of the research on thinking processes continue to compare children who differ widely in IQ, and some consider scholastic performance. The continued emphasis on IQ reflects its ubiquity in identification procedures within formal “gifted programs” (Alvino, McDonnell, & Richert, 1981; Yarborough & Johnson, 1983)—we do not endorse this, but we merely observe it. The inclusion of children who do extremely well in school should, under ideal circumstances, take into account the nature of the school experience. High grades in a course of study exemplified by rote repetition of the texts or teachers’ statements does not define the same kind of intellectual (including creative) performance as high success in an enquiry-based program in which students are investigators in the subject matter (cf. Bruner, 1960). Once again, the underlying thinking processes being equated with giftedness may be very different. On the other hand, if common thinking processes are found among gifted persons defined by a variety of definitions,

then this would be especially interesting, and we are proposing in this chapter that such an understanding of high ability is beginning to evolve.

One of the ways the cognitive literature directly addresses high performance in adults is in the form of the discussion of expertise. While there is as much variation and imprecision in the definitions of expertise (Anderson, 1982; Ericsson & Smith, 1991) as there is about giftedness (cf. Maker, 1982; Renzulli, 1986; Sternberg & Davidson, 1986), essentially experts are people with advanced training, competence, and experience in a field. The cognitive literature compares experts in some context with nonexperts typically labeled as novices. The latter are usually adolescents or young adults about to enter a period of training to develop expertise (e.g., medical studies, tournament chess competition, computer programming, electronic or other diagnosis, etc.).

From this perspective we arrived at our three somewhat different working definitions of groups in whom thinking processes are to be studied: children with high IQ (or similar) scores, children who do very well in school, and adults recognized in their domains of activity as experts. As unsatisfactory as this situation may be to a doctrinaire theoretician or psychometrician, we propose that these definitions are educationally very useful. We do not purport that they cover all types of giftedness or any of their components. Education as a nearly universal activity of great social importance cannot wait for theoretically perfect circumstances to gain important understandings of how children and adults think, and how these might ultimately be connected. Working with key concepts based upon cognitive psychology, we and other researchers are discovering that there is much to be learned from the coordinated study of these three groups.

Thinking Processes and Giftedness

Theoretical Context

Three theoretical threads can be traced in current research on thinking processes in the gifted. The first is essentially developmental and is well represented by the works of Bloom (1985), Feldman (1986), Horowitz and O'Brien (1985), and the forthcoming volumes edited by Horowitz and Friedman (in press, a, b). There is a developmental controversy about high ability in school children: Is their superior performance merely precocity (Robinson, 1977; Rogers, 1986; Scruggs & Cohn, 1983), or does it reflect fundamental differences in thinking processes? Each view has direct implications: Accelerate gifted students through existing curriculum in response to precocity, or adapt curriculum (including teaching methods) to take account of differences in thinking processes. Both perspectives have been argued at one time or another, though the movement in this controversy has been increasingly toward understanding

differences in thinking processes (Borkowski & Peck, 1986; Carr & Borkowski, 1987; Keating, 1975; Scruggs, Mastropieri, Monson, & Jorgensen, 1985; Shore, 1982; Sternberg, 1985; Webb, 1974). A quantitative alternative to the precocity argument is that gifted individuals are endowed with more of something that distinguishes them, such as denser dendritic structure of brain cells, myelination, memory capacity, etc. The two are not incompatible, since one addresses function and the other structure. Of course giftedness may emerge as the result of both quantitative and qualitative differences rather than one or the other. Berliner (1986) has bridged these two positions with the interesting suggestion that sustained precocity eventually becomes differences in kind, not merely amount. This hypothesis remains to be tested in the context of cognitive research.

A second important theoretical framework has been offered by Sternberg (1984, 1985). His Triarchic Theory of Intelligence has three main types of information-processing abilities: (a) metacomponents, for planning, monitoring and evaluating thinking, (b) performance components, used to execute tasks, and (c) knowledge-acquisition components, related to achievement. Davidson and Sternberg (1984) presented a subtheory of giftedness in which coping with novelty and automatization of complex tasks are important. Metacomponents were suggested in Flavell's (1976) earlier speculation about the nature of metacognition. With regard to performance components, we had been attracted to the importance of flexibility in problem-solving strategies as a complement to metacognition (Shore, 1982). Starting in the early 1980s, Sternberg and his co-workers began the development of extremely useful theory that permitted links to be made between cognitive processes and giftedness. Our major contribution has been to generate a large and still growing bank of evidence in support of some of the links perceived by both research groups. This theory and evidence link psychometric understanding of abilities and a cognitive approach based on a dynamic understanding of the processes.

The dynamic nature of the processes we are addressing raises the third important theoretical thread which has been emphasized in our work. It is an extension of Vygotsky's (1978, 1986) theory of the development of higher intellectual processes to the study of giftedness. Investigations of the IQ-related and individual differences in what and how children learn has provided evidence that the quantitative-qualitative controversy might better be conceptualized as a rich interaction (Kanevsky, 1990, in press). The combined contributions of the differences may result in spiralling developmental advantage for able learners over their peers. They acquire more knowledge more efficiently, and so on, throughout their lives.

Principal Contributions of Our Studies

In this overview of our contributions (and those of our students) to this topic, we focus on the evolution of our

studies from replications or extensions of classic laboratory tasks through to studies of classroom learning. This development is partly but not entirely historical. While more of the earlier studies employed laboratory tasks that may be regarded as having less “ecological validity”, understanding cognitive processes has required that we vary the designs of our studies across these settings at different times. We have also distinguished between studies that have been published and others which are in progress or recently completed. We have not yet determined if our data point entirely and directly support theories such as Sternberg’s and Vygotsky’s. There is certainly a great deal of congruence, and the opportunity to theorize about our findings will come soon; a few speculations will be offered later.

We began with studies employing familiar *laboratory tasks* on which individual differences warranted further study. Our results and those obtained by graduate students working with us showed that:

- on a variation of Piaget’s conical mountain task in which we used a toy farm scene, gifted preschoolers were less likely to make egocentric errors in perspective taking and were better able to take another’s perspective even when the two views partially overlapped (Tarshis & Shore, 1991);

- on a series of puzzles and construction tasks, mothers interacted with more able preschoolers in ways which favored the children’s development of metacognitive techniques for monitoring their problem solving (Moss, 1986, 1990);

- on the portable rod-and-frame task in which a bar is to be aligned vertically while framed by a box without additional cues, verbally able teenagers used verbal abilities rather than spatial skills as the task appears to demand (Shore, Hymovitch, & Lajoie, 1982; Shore & Carey, 1984);

- on a highly spatial computer game in which successive operations in a machine shop are emulated in order to produce products from blocks, in addition to being more successful at the task, more able young teenagers also recommended improvements to the game that would have increased the challenge and complexity of the task (Bowen, Shore, & Cartwright, 1992);

- in research on impulsivity (fast, inaccurate performance) and reflectivity (slow, accurate), fast and accurate students are usually a minority and are not discussed; we found that children from an unselected group who were fast and accurate on the measures bore many similarities to students we might describe as gifted (based on IQ) and, further, that accuracy over speed was their distinguishing characteristic (Lajoie & Shore, 1986, 1987);

- high IQ children switched strategies on water–jar combination problems when alternative solutions were valid but not required; metacognition appeared to be higher with more able and accurate students when they were faster, corroborating Lajoie and Shore’s advice that it was not necessary for able students to slow down to enhance certain kinds of performance; solution speed

decreased on a key trial where an alternative solution was possible but not necessary, suggesting that it may have been considered (Shore & Dover, 1987; Dover & Shore, 1991).

- young high IQ children acquired and generalized a strategy for solving two versions of the Tower of Hanoi puzzle more efficiently than their average IQ peers; in addition, more of the high IQ children spontaneously expressed their recognition of the similarities in the tasks and their preference for achieving a solution without the tutors’ aid when they were struggling (Kanevsky, 1990; Kanevsky & Rapagna, 1990).

Work yet to be reported (done with L. Lazar) has shown that:

- on a computerized pattern-recognition task which enabled separate timing of the planning and execution stages, more able subjects devoted a relatively greater proportion of their overall time to the planning stage, and executed the final solution much more rapidly.

The main problem with the above tasks was low “ecological validity”. How much of real life is spent solving computer puzzles or doing laboratory style tasks? In addition, prior knowledge is of uncertain importance and it was difficult to examine creative processes.

We then introduced *confirmatory studies* in which the tasks were test materials from school curricula in mathematics and physics, wherein key research has been done on expertise. Our results to date have shown that:

- high performing secondary school physics students exhibited superior metacognitive knowledge and drew more extensively upon their prior knowledge in the subject than students doing less well in the same classes, and the patterns of responses for these better performing students more closely resembled those of experts than average-performing students also included in the study (Coleman & Shore, 1991).

Studies yet to be reported have shown that:

- more able secondary mathematics students will, when unsuccessful in mathematics problems, switch to a second legitimate solution strategy with apparent automaticity, whereas less able students revert, if they change at all, to trial-and-error (a study with C. Kaizer);

- the course of action for such flexibility may be determined very early in the solution process, for example, at the point of categorizing the problem; a study (with S. Pelletier) has shown that high performing secondary mathematics students and graduate students in mathematics spontaneously group and subgroup more problems together than average performing students, evidence that they perceive similarities across problems that are regarded as distinct by others;

- on a computer game based upon determining the pattern in number-series problems, able students more often test explicit hypotheses as part of their solution strategies (a study with M. Godrie).

We are also trying to reach beyond “real” tasks in laboratory settings to the study of *learning over time*

in classrooms or other settings. This work, recently completed or in progress, has found that:

—faced with the task of giving meaning to unfamiliar or erroneous terms embedded in a text, gifted learning-disabled students' performance and understanding of their own functioning resembled those of gifted children more than learning-disabled children—gifted learning-disabled students are metacognitively strong (see Hannah, 1989, for a preliminary report);

—more able senior high school physics students have more elaborate and inter-related knowledge structures into which new learning is integrated, and specific training in cognitive mapping (such as used by Donald, 1987; Kozma & Roekel, 1986) enhances this process across ability levels (a study with L. Austin).

Possible Theoretical Directions

Ascribing meaning in context, hypothesizing links among complex concepts, proposing enhancements to complex games, and the other processes we have examined involve a degree of creative or productive thinking. Getzels and Csikszentmihalyi (1976) pointed out that creative contributions depend on question asking and problem finding. This may be a useful theoretical perspective to take with these studies. Xenos-Whiston (1989) studied the teachers at our summer laboratory school for gifted students over eight years, and has shown that these exemplary teachers of the gifted are distinguished as a group by being contributors to knowledge (e.g., publishing, artistic production, program development, materials design) and in expecting similar efforts from their students. This supports attention to knowledge production as a curricular element. It is also consistent with Bruner's (1960) admonition not to teach the conclusions of a field, but, instead, the processes by which an expert learns. It also echoes Kamii's (1985, 1989) observations of young children's mathematics learning, in which the discovery and invention of the subject is crucial, and peer teaching is the catalyst for learning.

In contrast, the acquisition of basic information is of relatively limited interest in this research, given the populations we are studying—gifted students and experts. It is important not to overemphasize parallels with classic studies in which the target learning is nonsense syllables, paired words, or simple factual knowledge. Nonetheless, Scruggs and Mastropieri (1984) have shown that differences in learning strategies occur between gifted and other secondary school students even with associative learning or the acquisition of factual information.

We have not yet decided what might be the best theoretical context to bring all these elements together. There is certainly great consistency with contemporary cognitive science, but this literature has paid insufficient attention to individual differences. There is

also considerable support in our work for important elements of Sternberg's (1985) "triarchic" theory of intelligence and its componential subtheory (1981). He (1986) has also offered a conception of giftedness consistent with his theory. Some cognitive theories begin with the thinking processes of experts. They attend to these processes because the outstanding performance of experts is drawn to their attention in some manner. Correspondingly, intelligence theories need to describe and explain outstanding rather than merely commonplace accomplishments and functioning. Some cognitive theories have focused more on the development of cognitive abilities than on the products, for example those of Piaget and Vygotsky.

In addition, theories of intelligence have not been sufficiently integrated with theories of creativity to incorporate what appears to us to be an important element in any suitable theory, namely, knowledge production. Guilford (1967, 1972, 1975) had such an insight, but his work on the "Structure of Intellect" and that of his successors (most notably Meeker, 1969) does not deal adequately with the complexity and breadth of some of the tasks on which we have observed important differences, nor with the time frames on which this performance occurs.

Finally, Vygotsky's theory holds promise for gauging the similarities and differences in the thinking of high and average ability individuals; however, it is a relative newcomer to investigations involving gifted and creative individuals. At this time, its ability to contribute to this discussion is hindered primarily by the limited selection of tasks appropriate for implementation in the contemporary variations of his dynamic assessment methodology.

We expect that a theory which can account for the kinds of performance we are discussing will have to link all these elements: creativity or knowledge production, learning, individual differences, and the nature of expertise. Familiar examples are found in higher education: the occupational imperative for scholars to have original ideas, and the curricular goal for students to ask original questions and attempt to answer them. Research and development enterprises also place great value on knowledge production. Bruner (1960) pointed out the relevance of such efforts at all levels of education. Our goal is to examine learning processes and experiences—including educational experiences—that underlie becoming a knowledge producer.

This builds upon the work completed and that underway as follows:

—research on the thinking processes in relation to the education of gifted children, which suggests that knowledge-production goals are especially appropriate for gifted and creative children (Haensly & Roberts, 1983; Renzulli & Reis, 1985), perhaps for all children in different ways (Bruner, 1960);

—our examination of the relation between professors' research methods and teaching methods, which shows

that few undergraduates engage in knowledge production (Shore, Pinker, & Bates, 1990);

—our research and others' demonstrating that in many ways the learning processes of gifted students resemble those of experts in a field different to those of other students—and one of the distinguishing characteristics of experts is their involvement in knowledge production.

How Gifted Children Think Differently

In this section we summarize seven of the principal ways in which the thinking processes of gifted children are different from those of others. We draw upon our own research described above but also upon the broader literature. Portions of this summary are also found in Shore (1991), and the complementary literature has also been summarized by Coleman and Shore (1991).

MEMORY AND THE KNOWLEDGE BASE

Capable students and experts know more, but that is not all. They better know what they know; their existing knowledge is highly interconnected and new knowledge is immediately linked in many ways to prior knowledge (Larkin, McDermott, Simon, & Simon, 1980). This was one of the most important of Krutetskii's observations: Capable students,

without comparing the "similar", without special exercises or hints from the teacher, independently generalize mathematical objects, relations, and operations "on the spot" . . . (pp. 262–263).

Kanevsky (1990, in press) found this ability in her dynamic analysis of the learning potential of high IQ children as young as four years old. Three prominent cognitive theorists have made related assertions. Ausubel (1968) suggested that what a learner already knows and how it is organized directly affect further learning and memory. Resnick's (1989) cognitive theory of learning further asserts that learners elaborate what they learn and strive to understand it explicitly for the purpose of connecting new knowledge to old. Greeno (1989) and Resnick have suggested that effective memory absolutely requires such placement in content.

Gifted students and experts also know better how to use what they know. In a broad review of the literature, Alexander and Judy (1988) showed that the extent of specific and strategic knowledge interact to favor academic performance. Sternberg (1981) had theorized that gifted students might use their extensive knowledge bases differently from the non-gifted. Coleman and Shore (1991) found supporting evidence: High and average achievers in an advanced high school physics course, plus two physics graduate students and a physics teacher as experts, were asked to think aloud while solving five physics problems. The responses were tape-recorded, then transcribed and divided into clauses

(noun-verb segments). These segments were coded in several categories. Experts and high performers made significantly more references to prior knowledge that was not given in the problem, and fewer to information given in the problem. Such use of prior knowledge implies more than its existence; one must also know how and when to use it selectively.

SELF-REGULATORY PROCESSES

Experts monitor and guide their own thinking while they work on a task (Bereiter & Scardamalia, 1987; Glaser, 1985; Paris, Lipson, & Wixon, 1983; Scardamalia & Bereiter, 1985). This process is called metacognition (Flavell, 1976). It has been raised in the gifted literature (Meichenbaum, 1980; Wong, 1982; Woodrum, 1979), and is evident in many of Krutetskii's (1976) reported protocols (see especially his Chapter 13). Sheppard (1992) found that high ability 10- to 12-year-olds were more aware of and able to describe the self-regulation of their thinking while they engaged in a challenging activity after drawing a machine intended to function in a manner similar to that of their mind.

In the previously mentioned study on physics problems, Coleman and Shore (1991) also found significantly more correct evaluations of their own thinking processes by experts and high performers (and fewer incorrect statements indicating metacognitive processes).

SPEED OF THINKING PROCESSES

It is commonly thought that bright students are intellectually faster. The more items one answers correctly on timed tests, such as most IQ tests, the higher one's score. The same is true for most school examinations. Overall solution times on problems are, indeed, shorter for experts, but the expert-novice literature points out that experts take longer pauses while retrieving relevant information to solve a problem (Larkin, 1979), and that they rapidly develop rapid, automatic skill (automaticity) in basic operations (Perfetti & Lesgold, 1979). Davidson and Sternberg (1984) proposed that more intelligent persons spend more time on higher-order planning in problem solving.

Several of our studies illuminate this point. Dover and Shore (1991) used Luchins's (1942, 1951) water-jar combination task with gifted and average 11-year-old pupils—we shall describe the study in more detail below. One of the results was that slower performance accompanied flexibility and metacognition in average subjects, but rapid performance accompanied greater metacognitive knowledge and flexibility in gifted subjects. Lajoie and Shore (1986) showed that accuracy was a more important predictor than speed of overall performance on an IQ test. A further study, as yet unreported (with Lazar), used a computer pattern-recognition task in which the planning and execution stages could be separately timed. Relatively more time

was spent by more able students on planning, but much less on reporting the solution.

PROBLEM REPRESENTATION AND CATEGORIZATION

Experts represent and categorize problems differently from novices (Chi, Glaser, & Rees, 1982; Neigemann & Parr, 1986; Sternberg, 1981; Sternberg & Powell, 1983). Krutetskii (1976, see his chapter 12) clearly identified a period of "information gathering" as an important stage, and showed that able students more readily determine the nature of missing data, their representation of a problem extends beyond the information given, and they better exclude irrelevant information. Scruggs, Mastropieri, Monson, and Jorgensen (1985) reviewed similar processes in the gifted literature.

Kanevsky's (1990) average and high IQ four- to eight-year-olds differed in their spontaneous recognition of the similarity of features of the two versions of the Tower of Hanoi puzzle that they were given as acquisition and generalization tasks. As one would expect, the high ability children more often commented on the commonalities in the rules, apparatus, and strategy. It was suggested that this was due to differences in their understanding or internal representation of the problem that made these commonalities more apparent to them. As a result of this, the group differences in the generalization of the solution strategy is also believed to be partially attributable to differences in the children's problem representations. The high IQ children were also quicker to develop a clear understanding of the task. This was apparent in a distinct drop in their need for assistance two to three trials before their average ability peers. Most high ability children mastered the solution strategy in the two trials after achieving an understanding of the task while the average ability children required from three to eight.

Another study, nearing completion with graduate student S. Pelletier, used adaptations of several of Krutetskii's problems with high and average performing mathematics secondary students. Students were asked to group them into similar types (based on Chi, Glaser, & Rees, 1982). No mention was made of solving the problems. High performing students, like a sample of mathematics graduate students, used fewer levels of categorization, seeing greater common elements among more problems. Such differences during initial categorization of the tasks support the notion of differences in problem representation.

PROCEDURAL KNOWLEDGE

The cognitive literature distinguishes between declarative and procedural knowledge (Dillon, 1986). Declarative knowledge roughly consists of "what" one knows, and procedural knowledge with how to do things or to use one's knowledge. Experts employ

highly elaborated procedures or strategies, sometimes rapidly developed (Glaser, 1985; Heller & Reif, 1984). Krutetskii (1976) described this vividly:

The trials made by mathematically inept students always bore the character of blind, unmotivated manipulations, chaotic and unsystematic attempts to find a solution (more accurately, they were attempts at guessing, at coming across a solution at random).

Capable pupils, however, were marked by an organized system of searching, subordinated to a definite program or plan. The trials of the capable pupils were always purposeful, systematized attempts, directed toward verifying the assumptions they had made. In making a trial, capable pupils usually realized why it was being made, what was expected, and what was to come next (p. 292).

In another study yet to be reported, with C. Kaizer, conducted with grade eight students, we observed students whose intellectual strengths were either more verbal or visual while they solved mathematical word problems from Krutetskii. When they had difficulty solving a problem, the more able switched to another appropriate strategy. The less able engaged in trial-and-error or guessing. Our study in progress (with M. Godrie) also appears to be confirming the testing of assumptions or hypotheses, as reported by Krutetskii.

FLEXIBILITY

Flexibility has many meanings, of which the common feature appears to be the ability to see alternative representations or adopt alternative strategies, especially when it is necessary to make a change for success on a task. Flexibility has been a central concept in some conceptualizations of creativity (Cohen, 1989; Goswami, 1990), in Davidson and Sternberg's (1986) view of the role of insight and adaptation to novelty (also see Davidson, 1986), and in several influential views of special or remedial education (e.g., Feuerstein, Rand, & Rynders, 1988). Krutetskii (see pp. 282-283) also emphasized that flexibility is one of the most important qualities of outstanding performance in mathematics, and it is frequently referred to in general Russian views of abilities. Vygotsky's methodology for the dynamic assessment of learning potential challenges a learner to acquire and to transfer a strategy. Knowledge that can be flexibly applied is of greater interest than inert knowledge. We have to be careful not to say that the less able are incapable of being flexible, since their flexibility may be constrained by their more limited knowledge.

Shore and Carey (1983) selected two groups of teenagers, one high on a verbal subtest of an IQ test (vocabulary), and a second group that was higher on a spatial subtest (block design). All were presented with a spatial task, the rod-and-frame apparatus in which one is asked to recognize the verticality of a rotatable rod against a background which can also be turned so as to distract the viewer. The high-spatial students were

"lost for words" to explain their own generally accurate performance. The high-verbal group talked much more while doing the task, using verbally expressed imagery to guide their equally accurate solutions. The high-verbal group appeared to reinterpret the task to suit their strengths. Getzels and Csikszentmihalyi (1976) found that one of the observable qualities of art students who a decade later became successful artists was that they carefully examined a still-life object from many perspectives and reinterpreted the problem; others leapt right into a direct representation.

Dover and Shore's (1991) water-jar study used nine tasks. The first two were practice. Numbers 3 to 6 required three jars. Numbers 7 and 8 could be solved with two or three jars. Number 9 could only be solved with two jars. We found that able students more often successfully broke the "set" at number 9 when they had to switch from using three jars to two, they made fewer errors on all trials (half made none at all), and they were faster on further test trials (numbers 3 to 6) where alternative solutions did not exist, but significant speed differences disappeared on trials 7 and 8 where either two or three jars could be used. Able children replied more often without prompting, and were more aware of how the "set" influenced their thinking strategies; however, they were not more likely to spontaneously offer the alternative solution strategy (using only two jars instead of three) when it was available but not necessary (numbers 7 and 8). This nicely illustrates the importance of examining the process of students' thinking across a task, not just their visible performance or a tally of right and wrong.

PREFERENCE FOR COMPLEXITY

Some time before the prominence of cognitive theory as we now know it, creativity researcher Barron (1958) documented how successful creative adults in such professions as architecture and art had greater preference for complexity in drawings and shapes than did an unselected sample. They were also much more tolerant of ambiguity and did not insist upon the tidy resolution of a problem. Today, we might well label his target group as "experts". Two recent studies have linked this preference for complexity to giftedness. Garofalo (in press) has shown that superior secondary mathematics students, whom he describes as meaning-oriented rather than solution-oriented, preferred more complex and demanding problems. Bowen, Shore, and Cartwright (1992) also found that gifted students suggested changes to a computer game that would increase its complexity and challenge.

Experts, gifted and creative people seem to thrive in environments which are rich and active, in which they do not know all the answers, indeed, where right answers to questions are not the principal intellectual commodity. This may well apply to all learners, though their achievements may vary even under such conditions.

When tasks were not found to be sufficiently complex, young, high IQ children attempting to master a Tower of Hanoi solution strategy would introduce some complexity of their own. They would elaborate the story context of the task or make suggestions of ways to make the task more difficult even before the strategy had been acquired.

Of course there is some overlap among these seven ways in which the thinking processes of gifted learners have been observed to differ from those of other people. Flexibility, for example, depends on procedural knowledge, the nature of the knowledge base and problem representation. These differences provide pedagogical clues which may benefit bright children and also help to improve the learning performance of other students. Some of these implications might also make for more interesting lessons and more interesting independent projects. These are hypotheses which could and should be tested in classrooms.

Development of Thinking Processes

Investigations of the lifespan development of thinking processes of gifted individuals do not exist. The research literature is interspersed with comparative studies of thinking, learning, and problem-solving skills, but none is longitudinal in nature. In this section we shall attempt to link our work with young children to other work that describes early evidence for the thinking processes addressed throughout this chapter. This will highlight areas that have potential to explain differences found in the thinking of gifted and non-gifted adults. It must be noted that these are highly speculative and desperately in need of further study.

Field observations made during the Harvard Project (White, 1983), a longitudinal study of two-and-a-half-year-olds, uncovered a number of similarities and differences between talented and average children. No "appreciable differences" were found in sensory skills, perceptual-motor abilities, general motor control, or popularity. The more talented children were, however, able to attract and hold the attention of adults more effectively. They used adults more effectively as resources, made more self-evaluative comments, had "an unusually well-developed capacity to sense discrepancies or differences" (p. 14), dealt well with abstractions, were less egocentric and thus better in perspective-taking activities. They were able to plan and complete more complex tasks and use resources more effectively in doing so. The picture of the differences that emerges appears to be consistent with the research reported earlier in this chapter regarding flexibility, monitoring, and a preference for complexity.

Other advances in our understanding of young children's learning have been facilitated by implementations of modified versions of Vygotsky's (1978) dynamic assessment methodology. One advantage of these procedures when working with young children is that

they require the investigator to interact with the child throughout the acquisition and generalization of an intellectual skill, rather than observing passively. Thus we have gained insight into the progressive internalization of social interaction which Vygotsky believed played a critical role in development.

Patterns of early social interaction between high ability preschoolers and their mothers appear to be one of the influences that promote the development of superior thinking abilities (Moss, 1990). In her investigation of dyadic problem solving of non-gifted and gifted preschoolers with their mothers, Moss found a greater proportion of gifted children's and their mothers' comments were metacognitive in nature than that of their average ability peers. These included comments related to checking results, predicting consequences, monitoring and reality testing in nature. The children were perceived to be internalizing the patterns of questioning and problem solving modeled by their mothers. Based on her findings, Moss suggests that direct modeling of metacognitive activities in parent-child play activities offer "scaffolding" experiences that will facilitate the acquisition of a repertoire of higher level thinking skills that can play a key role in classroom competence when a child reaches school age.

Age-related differences in children's learning were also found in Kanevsky's (Kanevsky, 1990; Kanevsky & Rapagna, 1991) study of generalization using the Tower of Hanoi. In addition to applying their learning more flexibly and learning more independently, the seven- and eight-year-old high IQ children seldom repeated a mistake and were more likely to comment spontaneously on the similarity in the strategy used on the various versions of the puzzle than the four- and five-year-old high IQ children. The increased level of their problem-solving skill was also reflected in the decline in the number of planning comments made with increasing age. The latter can be explained within Vygotsky's theory as evidence of the internalization of what was once experienced in social interaction. Planning for this activity had become "inner speech". There was also evidence of an increasing level of intrinsic motivation for learning (Kanevsky, in press). The high ability children, more than their average peers, enjoyed increasing control over the solution. As age increases, so does their collection of learning-to-control-learning skills. Thus, their learning becomes more efficient and their knowledge increases.

To speculate that this trend might continue throughout life has an intuitive appeal when one considers the superior scores able learners earn on achievement tests, intelligence tests, problem-solving assignments, and so on. Expert learners are expert thinkers when faced with a novel task. This potential to learn is a life-long advantage which offers accumulating benefits. However, this is only speculation. Current research on learning requires the consideration of influences beyond the cognitive when attempting to explain differences in what and how children learn. These include interest, volition (Corno, 1989), self-efficacy (Schunk, 1989),

achievement motivation (Ames, 1992; Elliott & Dweck, 1988), the nature of the interaction (if any) with the investigator or teacher (Zimmerman, 1989), and so on. Therefore, future investigations of the thinking processes of gifted individuals should also acknowledge the roles played by these variables.

Training Thinking Processes

All education is ultimately concerned with thinking skills of one type or another, but we shall limit our discussion of this topic to three issues, and in each of them we shall focus on the kinds of cognitive processes we have discussed: for example, metacognition, flexibility, and planning of responses. We shall not address such approaches as the Meekers' development of Structure of Intellect (SOI) materials (Meeker & Meeker, 1986), or de Bono's (1982) Cognitive Research Trust (CoRT) program. Though these and others have some following in gifted education, neither has been related to the kinds of thinking processes we have described in this chapter.

The three topics we shall address are thinking skills training in general, in special education, and with regard to exceptionally competent performance. We caution that this chapter presents our reflection on a topic for which there is not enough hard evidence to be certain, and it is therefore again highly speculative. Our goal is to provoke reflection on these issues, not to settle them.

Thinking Skills Training in General

The literature on this is small but growing. There is also great divergence of models and types of thinking skills that are presented. Specific training approaches particularly address metacognition (Carns & Carns, 1991; Pesut, 1990), including the use of self-questioning techniques to enhance metacognition (Haller, Child, & Walberg, 1988), and control of transfer (Jelsma, VanMerrinboer, & Bijlstra, 1990), and generally take the form of direct training practice in the skills involved. We earlier mentioned our ongoing research (with L. Austin) that is demonstrating that cognitive mapping (Kozma & Van Roekel, 1986) can be used to enhance the webbing of concepts and high level learning in the classroom. The literature is characterized by optimism that these strategies can be taught and learned, accompanied by suggestions about how to do it (Anderson, 1982; Lochhead & Clement, 1979; Nickerson, Perkins, & Smith, 1985; Peat, Mulcahy, & Darko-Yeboah, 1989; Pressley & Associates, 1990; Segal, Chipman, & Glaser, 1985), but very few studies have addressed the transfer of these skills from the training programs to arms-length classroom learning (Feldman, 1990) or to performance outside the classroom (several unanswered research questions are offered by Chipman, Segal, & Glaser, 1985). There is not universal agreement that these

programs work, including observations of the limitations of the evidence available (Sweller, 1990).

It is our impression that the processes and their applications are too general and still too vaguely defined for broad applications to lead to useful specific results. If we accept Piaget's thesis that children must construct their own realities to learn well, expressed in educational terms by Bruner (1960) and Kamii (1985, 1989), then we cannot expect children to learn general thinking strategies out of context and to then apply them to specific learning. There cannot be a process without context or content, a lesson still not learned even by many gifted programs. Every mathematics student learns that operations are performed on something, and what the something is can considerably affect the process.

Teaching metacognition, strategy flexibility, knowledge webbing, or other cognitive skills, needs to be what the cognitive literature calls situated, in context. Perhaps this is not necessarily the case with adults whose knowledge base is already large and more abstract. One of the problems in the cognitive literature from which these ideas have come is that it is a literature of adult (expert) performance, yet the majority of applications have been with children. This is a risky extrapolation, but definitely worthy of study.

Thinking Skills, Special Education and Reading

The greatest amount of research on metacognitive and other thinking training has been in special education and in remedial reading instruction. As we have just suggested, this is an example of extremely broad generalization from concepts recognized in expert adult performance to underperforming children. This daring application has met with considerable but not universal success.

Metacognitive skills, especially monitoring (Chan & Cole, 1986; Palincsar & Brown, 1984), can considerably improve children's performance. Thinking-skills programs have been extensively used among learning-disabled students (Larson & Gerber, 1987; Orlando & Bartel, 1989) and in the improvement of reading (Duffy & Roehler, 1987; Duffy et al., 1987; Palincsar, Brown, & Martin, 1987; Paris, Jacobs, & Cross, 1987; Stevens, Madden, Slavin, & Farnisch, 1987). The weight of evidence to date is that cognitively based thinking strategies, especially self-questioning and metacognition, do enhance substandard performance, especially in young adolescents (Haller, Child, & Walberg, 1988), and sometimes dramatically (Feuerstein, Rand, & Rynders, 1988).

Nonetheless there remain cautions in the design and implementation of such programs (Abikoff, 1991; Bettencourt, 1987; DeStefano & Gordon, 1986). The most difficult problem is to be able to generalize from successful applications. How individualized are the interventions, and to what extent is their success related

to the general skills being taught or to the nature of the program? There is the risk of an implicit contradiction in a domain of educational activity characterized by individual educational plans (IEPs) and the successful application of highly generalizable teaching strategies. We need to know what the critical ingredients are in each successful case. We especially need to know the limits of such interventions. Case studies have indicated that amazing progress is possible in individual cases, but what can be reasonably expected in large numbers? Do cognitive training programs overcome intellectual deficiencies, do they provide a path around them, or to some extent a combination of the two? Are the newly acquired skills used in the same ways as they are by initially more competent learners and by adult experts? Are they as effectively transferred? Are there individual differences in their applicability?

Thinking Skills and Giftedness

A number of recommended programs for gifted children, especially in North America, include explicit thinking-skills training. Among the most common approaches in gifted programs are SOI (Meeker, 1969; and subsequent materials), Future Problem Solving (Crabbe, 1982), Odyssey of the Mind (Micklus, 1985), numerous applications of Creative Problem Solving (Parnes, 1962), and CoRT (de Bono, 1982; Maier, 1982). We found only one reference to cognitive processes such as we have addressed, in a program for disadvantaged gifted children (Shlomo & Reichenberg, 1990), and others to art education for gifted students (Kay, in press). Kay's work in particular suggests that cognitive skills can be acquired in context with excellent outcomes. Replication in a number of other areas is, however, much needed. An excellent model for assessing the impact of such training in both gifted and general education is provided by Starko's (1988) evaluation of the outcomes of students' involvement in programs designed according to principles recommended by Renzulli (cf. Renzulli & Reis, 1985). She demonstrated positive effects not merely in the training activities, but also in attitudes toward school, insight into personal strengths and weaknesses, career goals, and research skills.

Slightly contrary results were obtained in a study in which the intervention was more constrained than in Starko's observation of the implementation of Renzulli's Type III activities. Average and high ability 10- to 12-year-olds were found to be differentially sensitive to a five-day metacognitive awareness program. On the first day, Sheppard (1992) found the high ability students were more able to create a metaphorical machine that worked as their minds did while they were also engaged in a challenging activity (in this case a hard mathematics problem). Their descriptions of the machine's operation included more steps than those of their average ability peers. By the fourth day, the high

ability students had tired of the machine metaphor and began to invent fictional machines or ignore the machine constraint on their product completely (it seemed as though they changed the task from Type II to Type III). The average ability students were still growing in their ability to find machines and explain the similarities between the machine's operation and their mind's on the fifth day. A more thorough investigation of the effect of awareness training on the outcomes of metacognitive strategy instruction is planned. At this point, it can be said that high ability students are more metacognitively aware before training and, as in other skill domains, they become bored with routine practice.

One of the speculative issues that has attracted our attention is the place of gifted students in the development of adults who later become experts. We have suggested elsewhere (Shore, in press) that experts may be selected for training from the ranks of highly motivated young people who already have acquired a large part of the knowledge and skills that enables them to be recognized by recognized experts as likely to be able to be trained to be like themselves. These people are called novices in the cognitive literature, and the research we have cited suggests that gifted students greatly resemble these novices (not to be confused with total beginners). Shulman (1986), in his discussion of teaching, wrote: "Our central question concerns the transition from expert student to novice teacher" (p. 8). This relativistic use of the term "expert" may be appropriate, since being a student is an occupation that some people definitely master. However, at the point of choice of occupation or application of the rudiments of expertise already acquired, the learner is definitely a novice. We suggest that this developmental issue may be one of the most interesting to pursue in terms of cognitive skills and gifted students, and that it might provide a very useful link between the gifted and cognitive literatures.

Overall Assessment of Training Programs

Some very interesting models have been developed, but they have so far little direct application to programs for highly able students. A lot of work remains to be done in validating the training of cognitive skills among less able students, but the work shows great promise. It is not possible to state clearly at this time that anybody can learn to think like a gifted child or like an adult expert, and that may never come to pass, but an entirely reasonable goal is to enhance the thinking skills of a large number of people to any reasonable degree as a result of studying successful thinking in children and adults. This is clearly an attainable goal. The next task is to present the successes with sufficient precision to be able to better understand the limitations and opportunities of this approach, and thereby to more effectively plan future applications. This has been done in some areas of special

education and remedial reading, but not yet in general education.

Part of the problem is that the applications have so far been from successful adult or expert thinking to developing solutions for children with difficulties. One of the great opportunities for links between gifted and general education is to redefine some of these processes in developmental terms, and specifically in terms of the childhood antecedents of expertise. The specification of developmental trajectories for cognitive and metacognitive skills must be pursued before this can be achieved. Are there qualitative differences in the nature of the skills that develop? Do they simply differ in the rate of development? Are other factors at work as expertise develops? These are goals that we shall pursue and look forward to exploring with others, and we begin with the following (and concluding) discussion.

Educational Implications

An important component of educational success is teachers' awareness of how children learn and think. Carpenter, Fennema, Peterson, Chiang, and Loef (1989) showed that a simple week-long workshop intervention which helped teachers understand how children learned mathematics led to noticeable changes in their classroom performance and in their students' learning. If we are going to be able to define appropriate differentiated pedagogy for bright students, then educational researchers and practitioners need to understand if and how these pupils think differently from others. If they merely think more quickly, then we need only teach more quickly. If they merely make fewer errors, then we can shorten the practice and skip some of the review. Precocity and accuracy do not necessarily imply any qualitative difference fundamental to an understanding of intellectual giftedness any more or less than differences in the nature of children's problem representation and the flexibility of their thinking.

In accord with the theoretical directions which we speculated might be taken by this line of research, we are drawn back to an educational implication which we propose may be of over-riding importance, and which may, in somewhat different but equally important ways, apply across ability levels. This is that bright children need, especially need, to be introduced to learning from the point of view of an enquirer, an explorer, a question asker. Bright learners should experience the kind of thinking that leads to new discovery, at every opportunity. There is also little doubt that all children can benefit from such a mindset. They might not benefit to the same degree or in all the same ways, but discovering these differences is one of the challenges of this research.

Discovering the nature of outstanding ability and factors influencing its development should, in general, have benefits for all children.

From this perspective, the challenge in the selection and training of teachers is to ensure that they are

independent learners, have experienced and experience making a contribution to knowledge in any valued field of human endeavor, be it artistic or cultural, social, academic, or professional. Shulman (1986, p. 14) explored the nature of teachers' professional knowledge and turned Shaw's rather insulting phrase "He who can, does. He who cannot, teaches" into "Those who can, do. Those who understand, teach". The offending phrase appears only in an appendix to *Man and Superman* (Shaw, 1946/1903, p. 253) in a somewhat tongue-in-cheek handbook for a revolutionary or anarchist. Education is not the only enterprise to suffer his fifteen pages of biting wit.

Studies of highly gifted or high performing individuals (Bloom, 1985; Feldman, 1986) have repeatedly shown "that extraordinary achievement requires recognition, encouragement, and years of hard work" (Gruber & Richard, 1990, p. 148). Parents, teachers, mentors, coaches—they go by many names—are central to this process.

Teachers need to respond to children's interests as primary curriculum guides. There are also some very specific things, derived from the research we have described, that should be validated as important practices, for example:

- (1) Help students to make broad connections in memory.
- (2) Use knowledge widely in new situations.
- (3) Use different learning modes, not always verbal.
- (4) Invent new solutions to problems.
- (5) Value elegant solutions, not just right answers.
- (6) Emphasize planning of response strategies.
- (7) Relate new learning to old.
- (8) Assessing patterns, relations, missing and redundant information.
- (9) Downplay (but do not ignore) low-level functions.
- (10) Reinforce and model metacognitive strategies.
- (11) Provide diverse tasks that require the application of new learning in different contexts and media in order to promote generalization.
- (12) Nurture an awareness of self-regulatory activity.

When learning new material it is possible to summarize the main points and to consider how this new learning is related to previous learning in the same and different subjects, and to general experience. The links, direct or fuzzy, become as important as the points. When students are working on a project or task, they can be asked and ask themselves to assess how their work is proceeding, whether it appears to be leading them to their desired outcome, and whether they wish to reconsider part of the plan they are pursuing (if they have not such a plan, this exercise might help). Students can try to divide their work on tasks into information-gathering and execution stages. They can concentrate on evaluating the quality of their harvest in the first stage before launching into the latter. They can judge if they reached out adequately into the extremes of linked knowledge in order to make the best of their current activity. Are there other suitable strategies, or how would someone with

other expertise approach this? When they encounter a difficulty, what adjustments to plans may be useful? Do they sense themselves guessing inappropriately? Can they anticipate what might be the difficult points in a task before beginning it, and be prepared with alternative approaches? Can they benefit from working collaboratively?

Our view has been expressed elsewhere in the literature on general education, and it is interesting how closely it parallels advice available in the gifted literature (cf. Rogers, 1983):

Indeed, the urgent need to teach thinking skills at all levels of education continues, but we should not rely upon special courses and texts to do the job. Instead, every teacher should create an atmosphere where students are encouraged to read deeply, to question, to engage in divergent thinking, to look for relationships among ideas, and to grapple with real-life issues (Carr, 1988, p. 73).

With these recommendations in mind, the need for a better understanding of the developmental trajectory of cognitive and metacognitive skills becomes critical. Learners will need developmentally appropriate assessments of their performance and feedback in order to optimize their progress.

Might these approaches be well matched to processes that are spontaneously demonstrated by very capable learners? How much would their learning and attitudes toward school improve if this were done? Could other students benefit as well from such elaboration of their curriculum?

These questions have not been answered by research on practices in gifted education (cf. Shore, Cornell, Robinson, & Ward, 1991), and laboratory-style research is not likely to provide full answers. Such research can be done in classrooms with the active collaboration and even leadership of teachers who are interested in the education of capable students. In classrooms, the interactive contributions of cognitive, metacognitive, motivational, emotional, and environmental variables to learning can be considered in concert rather than in isolation. Thus, an integrated understanding of the influences they play in overall development can be constructed. To study them individually is no longer satisfactory.

The research summarized in this chapter has offered evidence of both precocious development and qualitative differences in the content and processes of the thinking of gifted or expert individuals and their less able or experienced peers. It may also be appropriate to resume studies of aptitude-treatment interactions to investigate the differences in the outcomes of gifted and other students who have been provided the same curriculum and instruction.

We have been concerned for a long time that gifted education has been progressively cutting itself off from the mainstream of education by expressing the learners'

uniqueness in terms of qualities that appeared to be in conflict with the goals and methods of general education (Shore, Rejskind, & Kanevsky, in press). Attention has been focused on the need for rapid pacing and other acceleration, extended and advanced subject matter. Little attention has been paid to the adjustments that need to be made in methods of learning and teaching to take account of thinking differences, nor to what we can learn from the successes of able students to improve the learning of other students as well. Research on thinking processes may offer the possibility of a benefit to general education through meeting the needs of able students. This may be politically as well as pedagogically important.

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Longitudinal Studies of Giftedness: Investigating the Fulfillment of Promise

RENA F. SUBOTNIK

Hunter College, City University of New York, New York, U.S.A.

KAREN D. ARNOLD

Boston College, Chestnut Hill, Massachusetts, U.S.A.

Introduction

The purposes of education for the gifted parallel the objectives of longitudinal research. Educators seek to identify individuals whose early achievements relate to accomplishments later in life. School systems provide special programs and opportunities for the gifted in order to affect the realization of promise. And researchers and practitioners attempt to understand the ways in which the characteristics of gifted individuals interact with naturally occurring and intentional environments that shape continued behavior and achievement.

The study of individuals over time allows for both descriptive and explanatory findings about gifted individuals (Nesselroade & Baltes, 1979). Like cross-sectional studies which examine samples of different ages or ability levels on the same dependent variables at the same point in time, longitudinal investigations illuminate group and individual differences in gifted populations. Longitudinal methods go beyond cross-sectional research, however, in investigating the processes of change (Schaie, 1983). Specifically, longitudinal designs accomplish the following purposes:

- to describe and to provide causal explanations for intra-individual change;
- to describe and to provide causal explanations for inter-individual differences in intra-individual change;
- to describe the interactions of developmental variables.

Definition of Longitudinal Research

In essence, longitudinal research can be defined as repeated measurement methodology (Nesselroade & Baltes, 1979) in which data are collected from the same individuals on the same or comparable variables

for two or more distinct time periods (Menard, 1991). Multiple observations of the same individuals over time permits analyses of changes and developmental differences within and among individuals. This basic definition distinguishes longitudinal research from cross-sectional and retrospective studies, even though these latter designs are often used as indirect measures of change.

Cross-sectional studies, or the measurement of individuals at one point in time, are often used to impute intervention outcomes. Simultaneous measurement of individuals of different ages is often used as a proxy for developmental change; however, cross-sectional studies can directly measure only inter-individual differences. Retrospective studies, in which eminent individuals reflect on past experiences, also fail to provide a true causal view of developmental outcomes. In retrospective research, intra-individual change patterns are distorted by hindsight. Retrospective designs cannot provide contemporaneous reports of significant stages in life experiences nor record subjects' perspectives on events as they occur. Further, control groups are generally unobtainable due to the difficulty of matching subjects of retrospective studies on childhood or adolescent characteristics.

Beyond the basic requirement of repeated measures, longitudinal study designs vary widely, leading some scholars to consider longitudinal designs as a family of methods (Nesselroade & Baltes, 1979). Standard rules do not exist for study duration, for the number of data collection points (or waves) in a longitudinal inquiry, or for the amount of time between waves. The common educational research practice of one semester or academic year pre/post test studies with two or three data points is not generally considered to be longitudinal. Instead, longitudinal studies report on information collected from subjects over months and years. A recent inventory of European longitudinal

research contains only studies with at least three data points, spanning at least three years, and focusing on individual development (Schneider & Edelman, 1990). Straight retrospective studies were excluded.

Within the longitudinal study paradigm, researchers use a variety of designs and data collection methods, including qualitative interview and ethnographic approaches, survey research, quasi-experiments, and single-subject designs. In addition, the content and theoretical context of a given study determine its design. Longitudinal methodology is especially useful for the study of human development, exploring the growth and change that takes place within an individual over time, and for noting similarities between that individual and others in his or her cohort. Of particular interest in the field of gifted education are the following three strands: how budding talent is transformed into extraordinary performance, how gifted children's development compares to that of average children or dissimilarly gifted children, and determining the effectiveness of programs designed especially for children identified as gifted.

Examples of Longitudinal Research Questions and Procedures

Example #1: Talent Development

What characteristics and educational experiences produce exceptional teachers of gifted students? To study such a question, variables cited in the literature on teacher characteristics must first be identified. Second, interviews with teachers known to be outstanding based on reports of students participating in local gifted programs should be conducted. Did these teachers receive special training? Did they start teaching early in their adult lives, or did they bring to teaching their experiences from another profession or trade? Were their parents or grandparents teachers? What are their opinions about the label "gifted"? Collecting such base-line data on a cohort operates in much the same way as conducting cross-sectional research.

Supported by the literature and interviews, some hypotheses could be generated and refined concerning the necessary characteristics and progressive experiences that lead to excellent instruction for gifted students. Educators returning to university for advanced degrees who have superior recommendations as teachers could be identified as a study cohort. Data could be collected from observations, interviews, questionnaires, and attitude surveys. Each year, follow-up information could be collected on philosophy of teaching, perceptions of giftedness, the application of personal interests to curriculum design, attendance at staff development and conferences related to gifted education, enrollment in post-masters program, teaching assignments, and so forth. Over the years, patterns of characteristics and experiences within the cohort would become increasingly salient and useful for analysis. After 10 years, some

very valuable qualitative and quantitative data would be available for policy making and teacher training. The study would be strengthened if, in the fifth year, another cohort was established to control for the political and social milieu of the study period. Control groups for each cohort would be made up of less highly recommended educators. Yearly outcomes from each cohort and corresponding control groups would be assessed. Which teachers evolve from novice to master over the course of the years? What progression characterizes the development of master teachers? What base-line variables serve as predictors of outstanding instruction? What educational opportunities, as opposed to naturally occurring interventions, seemed most useful? What obstacles hindered the fulfillment of exceptional promise?

Example #2: Cognitive Development and Program Evaluation

A community might create a special program for gifted children with exceptional spatial reasoning ability because it values talents that relate to movement, three-dimensional design (engineering, architecture, or sculpture), and mathematics. A spatial reasoning instrument would be chosen and testers trained to administer it. A cohort of primary age children would be identified and invited to participate in this educational program. Unlike the first example provided above, subjects would be identified based on an abstract test removed from the actual skill itself. Over the course of their elementary school years, various measures of academic, creative, moral, aesthetic, and verbal ability could be collected from the identified group, from a random sample of children in the regular program, and from a high verbal group in a different gifted program. A longitudinal study would allow investigators to observe how strong spatial skills interact with academic requirements at various stages of the children's elementary school experience. The test's reliability and predictive validity could be explored and developmental differences among groups of children could be compared over multiple points in time. The age at which a screen for spatial abilities would be most likely to catch both late bloomers and precociously talented children could be investigated to find the most propitious time for test administration. Finally, we can ask: Does early identification of spatial reasoning skills with concurrent provision of special services predict the fulfillment of talent in movement, design, or mathematics?

Review of Longitudinal Research Using Gifted Populations

Central to the identification and nurturing of giftedness is a longitudinal question: What early manifestations of ability are trustworthy indicators of culturally desirable adult accomplishments? Seminal longitudinal research

addressing the relationship of early exceptional performance and later accomplishment was conducted by Terman in order to test the validity of the Stanford Binet intelligence test as an instrument that could identify childhood genius and predict adult productivity (Burks et al., 1930; Oden, 1968; Terman, 1925; Terman & Oden, 1947, 1959). Terman began his study in the 1920s with over 1500 California school children who scored in the top 1% in IQ. His major interests were to disprove popular beliefs of the time including the "early ripe, early rot" phenomenon, in which precocious children's gifts would decline into entropy before maturing to adulthood. A second popular supposition held that an individual's gift was inevitably accompanied by a companion negative quality. In other words, a brilliant child would certainly be weak in social or physical domains. In order to dispel these popular myths, Terman collected a wide assortment of data on physical, emotional, academic, and social variables. He contacted his subjects at several key points in their lives to test his theories that children identified as gifted by the Stanford Binet would indeed grow up to be highly successful and productive adults. When his midlife reports revealed distinctive patterns of success for most but not all of his subjects, he was able to make cross-sectional comparisons that referenced specific childhood and adolescent characteristics that augured well or poorly for his high IQ subjects.

Vaillant (1977) directed the latter phase of a 30-year follow-up of male Harvard undergraduates who had attended the university in the 1940s. Subjects had been selected on the basis of academic brilliance and emotional stability. In adulthood, the greatest and, for Vaillant, the most interesting group differences appeared in the area of coping mechanisms. Information on how members of the study cohort dealt with inevitable life difficulties allowed the researchers to develop a schema for correlating categories of coping mechanisms with life satisfaction, health, and career attainments. This long-range view of the Harvard men provided a rich set of variables to explain some of the profound differences that separated gifted undergraduates from one another in later years.

In order to explore personality development of gifted men as predicted by standardized and projective tests, Murray (1938, 1955) conducted a 23-year study of male, upper-middle class, Harvard undergraduates. Murray focused on variables such as memory, social interaction, and responses to stress. The elegant design utilized five cohorts to replicate each component of the project. There have been no further waves of this study conducted, and to date there have been no further analyses of the data.

Current Research

The latest report from a longitudinal study based on problem finding ability was published in 1990 by Csikszentmihalyi. Getzels and Csikszentmihalyi

(1976) collected data from students at a prestigious art institute in the early 1970s, including intelligence tests, values and attitudes scales, and observations of their subjects at work. Problem finding was defined as the ability to manipulate objects into interesting artistic problems. Those who were categorized as problem finders interacted with more objects and took a longer time to come to closure on the composition of their drawings. At the 7-year data collection point, problem finding emerged as the best predictor of success in the professional world of art. At the 18-year follow-up, problem finding played a smaller predictive role in attaining recognition in the art world. Instead, social skills and other components of practical intelligence, such as networking, took precedence.

Much of the longitudinal research conducted during the past 20 years follows relatively small samples within single cohorts. A tiny fraction are cross-cultural or cross-national. Some of the most ambitious projects are government- or foundation-sponsored studies of general populations in which gifted subpopulations can be investigated. In the United States, for instance, the National Longitudinal Study of the High School Class of 1972 traces a nationally representative sample of adults (Burkheimer et al., 1982; ETS, 1991; Fetters, 1975). Similarly, "High School and Beyond" is tracking American students who completed secondary school in 1980 (ETS, 1991; High School and Beyond, 1985). The Malmo longitudinal study began in 1938 with all 1542 third graders in that Swedish city's public and private schools. The core sample of 754 was last contacted in 1988. Although not designed as an investigation of giftedness, the original purpose of the Malmo study was the exploration of the relationship between home background and IQ (Fagerland, cited in Schneider & Edelman, 1990).

A German longitudinal study of approximately 9000 13th-school-year students was begun in 1973 by the Institute for Test Development and Talent Research. Designed to trace the educational and career paths of the subjects, the sample size has allowed longitudinal analyses of high achievers (top 10% in grade point average and scholastic aptitude tests) in science, mathematics, and business (Trost, 1991). At age 30, the high achievers were more likely to be working harder and longer at more satisfying and well-paid jobs (Trost, 1990). These projects were not designed primarily as investigations of gifted individuals, yet the large sample sizes and the availability of machine-readable data for secondary analyses allow for observations of some gifted subsamples.

Such large-scale studies with nationally or regionally representative samples have the advantage of control groups and generalizability. Looking at the gifted as a subset of a more general sample is less ideal, however, than collecting data on original subject characteristics that test theoretically-driven or multidimensional identification methods. Generally, this research was not designed to answer questions about exceptional individuals, therefore information of interest was missed and significant data were lost to ceiling effects. Also, qualitative information

is normally lacking from large-scale national studies. Finally, even these major research efforts of relatively short duration suffer from the time-of-measurement and history effects of single-cohort longitudinal studies.

Large-Sample Multi-Cohort Studies

A few large-sample, multi-cohort longitudinal studies of gifted populations are currently underway. In Germany, the Munich Longitudinal Studies of Giftedness began in 1985 with a sample that was identified based on a multi-dimensional definition of giftedness (Heller, 1991; Perleth & Heller, 1993). The total sample of 26,000 children and adolescents comprises six cohorts who have been measured on a wide variety of cognitive, personality, and achievement variables at three data collection points. In addition to the use of multiple identification methods and diverse quantitative measures of development, the investigation includes a qualitative interview component. The scale and design of the study have allowed the researchers to control for the effects of age and grade in school and for cohort effects. Time-of-measurement effects remain a problem despite the multiple cohorts. Because of the short spans between cohorts, they all share the common historical experiences of the late 1980s. Early findings, however, point to the importance of retaining multiple methods for early identification of the gifted. Achievement in specific domains has thus far been predicted by domain-specific tests, while personality factors such as motivation have played a mediating role in achievement outcomes. IQ tests alone have proven to be unsatisfactory predictors of the development of particular talents.

A Russian replication of the Munich study begun in 1989 by Matyushkin should add significantly to the knowledge base. A planned replication will also take place in Korea (Perleth & Heller, 1993). Cross-national comparisons of results will offer an authoritative account of the interaction of culture and the development of giftedness. Another study which allows the rare opportunity for cross-national comparisons is a longitudinal investigation of technical creativity in Germany and China. The goals of the study include comparative analyses of a model of technical creativity in two distinct cultural settings, and determination of the contribution of technical creativity in the prediction of scientific talent (Hany, 1993; Hany & Hany, 1988; Heller & Hany, 1989).

Giesen directed an 18-year study of four cohorts first studied in the 11th grade (Giesen, 1981; Gold, 1988; Hummer, 1986). The study, which began in 1972, explores the correlates of academic achievement and satisfaction with schooling, as well as the socialization outcomes of different educational tracks. The sample of approximately 3000 German students was followed through high school and university by means of questionnaires, intelligence tests and knowledge assessments.

Schaie (1983a) has studied life span development and written extensively on longitudinal research methods. The Seattle Longitudinal Study is a 21-year longitudinal investigation of intelligence in adulthood (Schaie, 1983b). The study uses a sophisticated multi-cohort sequential design, in which seven birth cohorts are followed longitudinally over a 14-year period, in order to control for historical and time-of-measurement effects. Schaie's research refutes the widespread belief that mental abilities decline continuously after young adulthood (Schaie & Baltes, 1975; Schaie & Hertzog, 1983).

The largest American longitudinal project focusing on giftedness is a 50-year follow-up of individuals who show early talent in mathematical reasoning (Lubinski and Benbow, 1993). The Study of Mathematically Precocious Youth (SMPY) began in 1972 with a cohort of 13-year olds who scored highly on a mathematics test normally taken by older students as a college entrance examination (Scholastic Aptitude Test of Mathematics: SATM). The SMPY sample of 4000 students currently includes four cohorts who have participated in three or four waves of data collection. Many of the study subjects took part in special educational opportunities ranging from acceleration to programs associated with the project. Findings from the first 20 years of the study show that exceptional scores on the SATM in early adolescence are associated with high academic achievement and the choice of careers in mathematics and science. Large numbers of math-talented young adolescents, particularly women, leave mathematics-related fields, however. (See Benbow, this volume, for a more complete description of gender differences in mathematically talented students.) The SMPY research is a good example of a large-scale longitudinal study which controls for cohort and history effects. Over the half-century of the entire study, the design will also allow control for time-of-measurement effects. The concentration of the SMPY research on a single talent domain and means of identification permits intensive analysis of the development of exceptional mathematical reasoning ability and the predictive validity of one test.

Small-Sample Single-Cohort Studies

Single-cohort studies that follow relatively small samples for years or decades tend to fall into one of three categories: outcome studies of samples identified as gifted in a specific domain, studies of the predictive validity of measures of giftedness, and follow-up studies of the effects of gifted programs. In the past 15 years, longitudinal studies of each type have been conducted with diverse populations, variables, and designs. This diversity, along with the single-cohort designs and small sample sizes, discourages the direct comparison of study results as well as the generalizability of findings from any given study. Despite these cautions, common patterns can be determined from the body of recent longitudinal work. Furthermore, even single-cohort lon-

itudinal designs are well suited for investigations into the development of giftedness, the realization of early potential, and the unique paths of gifted individuals.

Subotnik and Steiner (1993) followed secondary school students who showed exceptional early promise in science. The 96 students in their sample were Westinghouse Science Talent Search winners chosen in a national competition on the basis of outstanding original research. Interview data revealed that the attrition from university science by Westinghouse winners was related to poor choice in selection of an undergraduate institution, which led to a dearth of mentors and to a lack of opportunities for undergraduate research, rather than to poor academic performance or waning interest. The Westinghouse study provides an example of the benefits of a small, intensively studied, group of highly talented individuals.

The Illinois Valedictorian Project utilized a similar qualitative design to study the effects of outstanding secondary school performance on subsequent educational and occupational attainment (Arnold, 1993b). Arnold followed 81 students who graduated in 1981 as one of the top grade earners in midwestern American public or private high schools. Despite superb academic performance in their university studies, female subjects lowered their intellectual self-esteem over the undergraduate years, and the transition from academic to career achievement was particularly complex and problematic for these academically talented females (Arnold, 1993a). In general, early scholastic performance was found to be highly predictive of future educational achievement but less effective as an indicator of career attainment or eminence. Although the Illinois Valedictorian Project is a single-cohort design, U.S. studies on the effects of secondary school performance have begun in other states (Perrone & Dow, 1993).

Kaufman (1981) followed Presidential Scholars who were identified in the 1960s as the top two graduating high school students in each state of the United States. This select group was deeply affected by the events and values of their historical era. As adults, women Presidential Scholars achieved less highly than their male counterparts in educational and occupational spheres.

In an Israeli study, Milgram and Hong (1993) investigated the relationship of adolescent leisure activities to adult accomplishments. Eighteen years after secondary school, 48 of the original 159 subjects were surveyed on their occupational accomplishments. A third of the men and women were employed in fields that matched their adolescent leisure activities and this group had higher adult work attainment than peers whose careers were unrelated to their early interests. Milgram and Hong concluded that creative leisure activities are useful predictors of adult accomplishment.

A German study of the social life of highly gifted students has followed 300 elementary school students and their significant teachers, peers, and family members (Rost, 1993; Wild, 1991). Begun in 1987 with a nationally

representative sample, the Marburg Giftedness Study compares highly gifted children with a control group on a range of psychological measures and on school and leisure activities. Children were identified as gifted in terms of broad intellectual capacity as measured by a composite of three intelligence test scores. Gifted children were found to be at least as well adjusted as non-gifted schoolmates, were more popular with peers, and used more adaptive achievement-oriented cognitive approaches and attributions. Family variables and play behavior were similar across intelligence levels. As compared to testing, Rost found teacher selection, peer designation, and self-nomination ineffective tools for identifying giftedness.

In Norway, researchers at the University of Trondheim have been following 46 students who were first contacted in 1984 at ages 10–11. This study focuses on how gender differences in mathematics and science interact with background characteristics and aspirations of gifted Norwegian students (Undheim & Nordvik, cited in Schneider & Edelstein, 1990).

Monks and associates conducted a study of gifted secondary school students in Holland (Monks, van Bostel, Roelofs, & Sanders, 1986). Subjects were studied on a wide range of ability and psychological variables including such factors as intelligence, creativity, learning style, achievement motivation, and social-emotional characteristics. The Monks study draws from the Triad Model of Giftedness (Renzulli, 1986) in describing outcomes for gifted students.

Freeman (1979) directed the Gulbenkian Project in England, a longitudinal study of the social and emotional development of gifted children. Study subjects were pupils whose parents had identified them as gifted. These 70 students were matched with two control groups, one of equally intelligent classmates who had been nominated by parents, and a second of random ability peers. Freeman found that intelligence and general adjustment were not negatively correlated, but concluded that parent nominations tend to result in less well-balanced children identified as gifted.

American investigators at Harvard Project Zero are tracking the development of musical reasoning in children and the process of musical thinking in conservatory instrumental and voice students (Davidson & Scripp, 1993; Scripp & Davidson, 1993). With their focus on comparing normal with exceptional development, the Project Zero studies of musical reasoning are providing educators with essential information that can be used to provide appropriate curricula and services for musically talented individuals. A study from the Chopin Institute in Poland has traced longitudinally 35 musicians as a subset of a cross-sectional study of 166 professional musicians. The study centers on family background, personality characteristics, career growth, and conditions for talent development at the highest levels in music. Study subjects range in age from 20 to 90 years old (Manturzevska, cited in Schneider & Edelstein, 1990).

Predictive Validity of Tests

The predictive validity of tests relates closely to the identification of giftedness. Terman's interest in intelligence, for example, led him to define giftedness as exceptionally high IQ. This definition, in turn, required valid and reliable instrumentation. Later conceptions of giftedness have stressed domain-specific talents, like mathematical aptitude, or particular cognitive abilities, like creative thinking. Still other theories and school-based programs consider giftedness as a multidimensional construct. Definitions of giftedness relate directly to policy and program efforts. Tests which purport to measure exceptional potential and behavior, therefore, have concrete implications for individual identification and treatment, rendering test validity a central issue in the field.

Terman's studies can be viewed as long-term research on the predictive validity of IQ measures. More recently, Benbow and Stanley's (1986) SMPY studies investigate the Scholastic Aptitude Test in mathematics as a forecaster for educational achievement and career attainment in science and math. The predictive validity of a widely used test of creativity has been the subject of a series of longitudinal studies (Torrance, 1980). A review of these studies by Cramond (1993) concluded that the Torrance Tests of Creative Thinking (TTCT) were better predictors of adult creative achievement than IQ, secondary school grades, and peer nominations. The Munich studies of giftedness found the predictive validity of the TTCT to vary according to the age of the test taker (Perleth & Heller, 1993). Milgram and Milgram (1976) found the TTCT problematic because of its correlation with intelligence, developing the Tel Aviv Creativity Test as an alternative measure of ideational fluency that would not be confounded with intelligence. Milgram and Hong (1993) found that the Tel Aviv Creativity Test, taken by Israeli adolescents, was correlated with adult accomplishment.

The ability of psychometric instruments to predict specific later outcomes varies according to the criterion variable, or type of gifted behavior, under investigation. Tests of creativity, not surprisingly, appear to be better predictors of creative and artistic behaviors than IQ tests. Tests of mathematics reasoning predict math and science achievement, and IQ tests continue to be valid predictors of many academic accomplishments. Few research studies have compared directly the outcomes of different identification methods. A welcome exception is Albert and Runco's longitudinal study of a group of boys identified as gifted on the basis of IQ scores and a second group of boys who showed high ability in mathematics (Albert, 1993; Albert & Runco, 1986). A German group compared the predictive validity of performance versus paper-and-pencil tests, using a sample of 300 kindergarten children. Ninth grade performance, particularly in mathematics, was found to be correlated with teacher ratings, grades, and mathematics achievement tests (Gitter, cited in Schneider & Edelstein, 1990).

A Croatian longitudinal study followed 558 students from their early teenage years in 1970 until 1989 in order to determine the validity of a regional gifted identification model (Korin, cited in Schneider & Edelstein, 1990). Researchers at the Institute for Psychology for the Hungarian Academy of Sciences have been investigating the validity of teacher ratings and a battery of psychological tests in predicting later gifted behavior. The 1033 subjects were first studied at 9 years of age. Notably, this study includes two cohorts (Gefferth, cited in Schneider & Edelstein, 1990).

The German National Scholarship Foundation initiated an elegant multi-stage identification project in 1970 designed to provide financial and academic support to Germany's top potential scholars. The initial pool included all 13th-year students in German schools offering the *Arbitur* certificate. Awards were based on a series of standardized tests, interviews, and recommendations. A follow up conducted after 5 years explored the contributions of the various components of the identification procedure to academic achievement, satisfaction with area of study, and self-esteem (Laagland, 1978; Trost, 1986).

Remaining areas to be investigated include comparisons of test validity for individuals of different ages, cultures, and nations. Given the current practice of identifying highly able children on the basis of a multidimensional definition of giftedness, longitudinal research needs to account for the weight that each dimension contributes to achievement outcomes.

Gifted Program Outcomes

Of paramount interest to educators of the gifted is the effect of special programs and educational interventions on long-term outcomes. The very concept of differentiated education of the gifted is controversial, as is the scope and nature of gifted and talented programs. National and local educational policies, funding levels, and program designs all rely on the belief that gifted students require special opportunities to fulfil their potential. Only longitudinal research designs can establish an empirical link between interventions and outcomes. Extracting the influences of any specific characteristic or life experience on adult accomplishment is a daunting methodological task, however, and few studies of adults begin in the childhood years when most gifted programs occur.

Fortunately, some longitudinal studies of gifted program outcomes have been conducted. Moon and Feldhusen (1993) followed 23 students 6 years after their participation in an elementary school gifted program (PACE). Subjects had spent at least 3 years in a pull-out program based on the Purdue Three-Stage Model (Feldhusen & Kolloff, 1979). The elementary school gifted program appeared to have developed students'

Emerging Themes in Longitudinal Research: A Brief Synthesis

The longitudinal literature on giftedness is a lively and diverse area of research. Studies of talent development, test validity, and program effects have been carried out in varied contexts. The studies described in this chapter, viewed comprehensively, present some unifying themes that are ripe for further exploration. Gender seems to be a universally important variable in patterns of development and change. Across studies, females show lower self-confidence and aspirations, even when matched with males of equivalent talent or test scores. Further, tests tend to predict males' achievement fairly accurately but to underpredict female accomplishments. Inclusion of samples with low socioeconomic status and other underrepresented groups in gifted programs are expected to convey the same pattern of outcomes.

What are some of the variables found to provide the structure and support for talent development and achievement? Early in life, a gifted child benefits from family values that focus on achievement motivation. Later, mentors are essential for providing intellectual stimulation, emotional support, and entry into the professional world.

Personality variables play a central role in defining the extent to which a gift will be developed. Individuals who make opportunities for themselves to be involved intensively with passionate interests, and who aspire to mastery in those areas, hold the keys to future renown or perhaps even eminence.

What the field of gifted education considers to be success is, in fact, a central question driving the direction taken by longitudinal study. Is high level professional competence in areas of national need a reasonable outcome? Is self-actualization an appropriate criterion variable? Or should the focus be on finding and developing world class talent to enrich and extend fields important to global quality of life?

Methods of identification are inextricably tied to our chosen outcomes. Psychometric instruments are used in virtually all screening processes for reasons of efficiency and effectiveness. The studies described in this chapter generally support the continued use of testing with the proviso that instrumentation be appropriate for program goals or talent domains and not be the sole source of information used for decision making. A move to multi-dimensional screening processes is beneficial, but must correspond to domains schools are able to support. Gifted programs designed to meet the needs of children with heterogeneous talents will necessarily have different and perhaps less spectacular outcomes than those catering to talent development in a specific field. In general, the body of longitudinal research confirms the efficacy of differentiated education for the gifted, pointing to the importance of supporting giftedness and talent at home and at school for the benefit of the individual and society.

cognitive skills and enhanced their self-confidence. By late adolescence, many PACE participants and their parents viewed the program as having been a life-changing educational experience. Another study (Delcourt, 1993) traced students 3 years after their participation in a theoretically-driven, secondary school gifted program based on the Renzulli Triad conception of giftedness (Renzulli, 1986). Unlike the structured intellectual activities of the PACE program, however, the Triad students worked independently on creative projects. Delcourt found that adolescent interest and experience in producing high quality products related closely to young adult career goals, activities, and accomplishments (Delcourt, 1993).

Spiegel (cited in Schneider & Edelstein, 1990) studied the cognitive and social development effects of day care on gifted and non-gifted Austrian children between ages 2 and 6. In Britain, researchers investigated the effects of a science curriculum that sought to accelerate the onset of formal operational thinking in 12-14-year-olds (Adey, 1988). A longitudinal study assessed developmental differences in creativity and cognitive measures among Russian children at ages 6-7 and 16-17. Subjects had taken part in a special learning process stressing creativity (Shoumakova, cited in Schneider & Edelstein, 1990). Rudnitski (1993) followed the careers of men and women who participated in a special graduate school program based on Tannenbaum's theory of giftedness (1986). A decade after their participation in the Graduate Education Leadership Project (GLEP), most of the 38 subjects had attained leadership positions in gifted education. The study indicates that an adult program with multi-dimensional identification procedures, special opportunities, and mentoring experiences positively affects the professional outcomes of gifted men and women.

Other longitudinal studies of gifted programs include Fleming and Hollinger's (1993) 10-year study of a late 1970s career program for gifted high school girls. Generalizability of the Project Choice study is restricted by cohort effects, in which historical gender roles interacted strongly with subjects' aspirations and career outcomes. The research is strengthened, however, by the robust sample size, a control group, and the inclusion of diverse school settings and subjects. The Project Choice design permitted the documentation of interactions between program participation, high school setting, and socioeconomic status, and their effects on the career paths of gifted women.

Although these research projects on the outcomes of gifted programs were rigorously conducted and reported, they, like the small-sample, single-cohort studies described above, cannot definitively establish the results of interventions (Trost, 1990). Much larger samples and carefully constructed control groups will be necessary to move beyond the tentative finding that early identification and participation in theoretically-based gifted programs relates to subsequent performance in various talent areas.

Practical and Methodological Advantages and Difficulties of Longitudinal Research

As previously stated, a large body of critical questions in the field of gifted education are best answered by some form of longitudinal inquiry. Demonstrating the effects of a particular program or identification method on achievement is critical, given increasing fiscal accountability and pressing international needs for creative productivity in various fields. In order to rationalize the use of potentially expensive, controversial and politically sensitive selection practices, educators of the gifted must be able to show that admission and service policies are reasonably effective and efficient. Monitoring the progress of individuals with exceptional potential can also highlight obstacles to the fulfillment of promise. This knowledge can then serve as the basis of future educational policy.

In addition to its unique ability to answer questions about gifted development and outcomes, longitudinal research provides special rewards to researchers. Terman experienced ongoing relationships with a number of his study participants. Anyone who employs in-depth interviews as a component of longitudinal study will inevitably establish ties with individual members of their cohort. Watching gangly, self-conscious adolescents evolve into serious graduate students or clever entrepreneurs is an intensely interesting experience. Gifted subjects tend to be particularly intriguing because they have insights into the investigated topics and often make original contributions to the study's theoretical or methodological framework. In the case of the Westinghouse longitudinal research conducted by Subotnik since 1984, one of her study subjects became so fascinated by the project that she offered to assist in the data collection and analysis of the next stage. Her contributions were so valuable that she became co-author of the report (Subotnik & Steiner, 1993).

In the course of tracking and reporting on 1981 Illinois high school valedictorians, Arnold (1993b) has described the various twists and turns that are innate to long-term life histories. She employs the example of academically brilliant "Ellen", who had appeared headed, at two collection points, for a life of female stereotyped domesticity. In between, and currently, Ellen has taken more dramatic plunges into academic pursuits. She is presently a doctoral student in science education. If at any one of the earlier points cross-sectional instead of longitudinal methodology had been used, the picture of Ellen and many of her peers would have been distorted. Longitudinal study allows for a more comprehensive representation of talented adults encountering the vicissitudes of social, physical, and emotional events and changes. Longitudinal studies remind readers that the fulfillment of potential can occur in many different patterns and times over the course of the life span.

Finally, those readers who have struggled with intransigent bureaucracies for access to a sample of children

or adults can appreciate how searching for lost subjects in a longitudinal study can be a small price to pay for continued access to an interesting and endlessly informative subject pool.

The major drawbacks of conducting longitudinal research are the formidable commitment and resources required for comprehensive study designs. Academicians seeking quick publications and grantors desiring prompt results find the time span of repeated measures research problematic. Although the need for studies with multiple cohorts, control groups, and large representative samples is pressing, the financial requirements for such designs can be prohibitive. Costs are high for repeated survey administration, data analysis, postage, interviews, transcriptions, phone expenses, and travel. Major longitudinal studies can require the organization of research institutes with continuing professional and support staffs, budgets, and facilities. Only government agencies and large foundations can contemplate long-term funding of these studies, a commitment made more tenuous by their changing priorities and by cycles of public opinion and policy regarding gifted education.

The logistical difficulties and enormous researcher commitment are as challenging as the financial demands. Keeping track of subjects over the duration of a study is a time-consuming and frustrating task. Reaching geographically mobile subjects, particularly for interviews, is also challenging, as is the task of reducing and interpreting huge amounts of data. In short, the more adequate the design—with multiple cohorts and large samples—the greater the financial, logistical, and researcher demands.

Longitudinal methodology is vulnerable to various threats to validity (Schaie, 1983). Repeated measures can result in bias through practice effects as subjects become familiar with test items or interview questions. Further, long-term participation might contaminate results by affecting the behavior, self-image, or reflectiveness of subjects.

Subject attrition plagues every longitudinal study and threatens the validity of findings. Researchers lose subjects who die, become unreachable after moves, or refuse to continue their participation. The problem is particularly acute with a cohort that exhibits exceptional talent in a specific domain such as sculptors, scientists, or dancers. Such samples tend to be smaller than those composed of younger students studied under the rubric of more generic intellectual, academic, or creative giftedness. The loss of subjects from unique small-sample cohorts can result in dangerously small follow-up sample sizes.

Regardless of sample size, attrition (or subject mortality) is not random (Arzi, 1989). In addition to possible differences between geographically stable and mobile individuals, subjects may leave studies when they are unhappy, not achieving highly, or deviating from what they perceive the study to value. Understanding how nonrespondents might differ systematically from remaining subjects is extremely difficult. Finding a small

group of “leavers” and comparing them to respondents is probably the best way to deal with this problem. Researchers can also analyze the cases of subjects who leave and subsequently rejoin longitudinal studies. In any case, researchers must acknowledge that attrition is non-random and speculate on possible systematic differences between subjects who are lost and those who are retained.

Single-cohort studies suffer additional threats to validity. A cohort, or group of same-age individuals, experiences the same social context within a given time period. These historical, or cohort, effects can confound developmental findings. Changing roles of Western women, for instance, make it difficult to generalize from the experience of the Terman study women or from the Project Choice participants to gifted women in general. Similar to contaminating cohort effects are time-of-measurement effects in which subjects experience specific historical events that interact indelibly with their development. The American Depression, recent political changes in Eastern Europe, and Southeast Asian immigration to the West are examples of specific phenomena that might deeply influence certain cohorts. Finally, single-cohort studies, especially those lacking control groups, cannot disentangle maturation effects or the influence of an educational experience from other life events.

Are these weaknesses sufficient to argue against the use of longitudinal designs? The practical difficulties in mounting a multi-cohort study are well worth overcoming for the ability to illuminate significant steps in the process of change and to establish the consequences of educational interventions. Even single-cohort studies remain valuable as investigations of previously unstudied groups and exceptional individuals with rare talents. Although care is needed in generalizing from single-cohort studies, intensive small-sample research can provide critical insights into the uniqueness of gifted individuals and generate hypotheses for future large-scale studies. Finally, meta-analyses of single-cohort longitudinal studies can build a convergent picture of the development of giftedness.

Needs for Future Research

The greatest proportion of current longitudinal study in gifted education deals with populations of adults or youths. Starting with an adult or late adolescent cohort allows the researcher to circumvent cognitive developmental issues that obscure variables of more interest to the investigator. Also, many who conduct longitudinal research are interested in a specific talent area, and a wider arena for the display of talents exists by the teenage years as compared to earlier years. Further, older adolescents and adults are able, upon questioning, to reflect on their talents and articulate their feelings and thoughts more easily than young children. Finally, outstanding productivity in adulthood is the outcome

of real interest for many longitudinal researchers, and the wait is shorter from adolescence than from early childhood. These are sensible reasons for studying adults and adolescent subjects, and certainly provide rationales that have been taken to heart by most researchers employing longitudinal methods in gifted education.

In terms of service to the field and educational practice, research on adolescents ignores the preponderance of gifted programs at the primary and elementary school levels. Secondary schools are apparently seen as better meeting the needs of academically talented students through homogeneous grouping or tracking. Musically talented students may often participate in instrumental and vocal ensembles. The athletically talented have access to individual and team sports. If secondary school students are exceptionally fortunate, they can work with mentors during their final pre-university years. At the early elementary level, in contrast, educators' energies tend to be focused on protecting children from the primary school curriculum with its emphasis on the acquisition of basic cognitive skills like categorizing and recognizing relationships, skills the intellectually gifted child has, by definition, already mastered.

Many important questions about childhood giftedness have not yet been adequately addressed. How is the development of children identified purely on the basis of potential—who show no demonstrable talent except for school or test-based skills—different from the development of peers? What is the long-range effect of different types of programs on gifted students' academic, social, and creative growth? Project Spectrum is proposing early recognition of a wide variety of talents in young children (Gardner & Hatch, 1989). How will this educational agenda intersect with the talent development research thus far conducted with adolescents and young adults?

Providing collections of longitudinal research for use by scholars and educators is an important step in the expansion of the knowledge base on giftedness. Several volumes of studies in the social sciences have appeared in the last decade (Migdal et al., 1981; Schaie, 1983; Schneider & Edelman, 1990; Verdonik & Sherrord, 1984; Young et al., 1991). Most of these collections focus on North American studies. The European Science Foundation has recently provided funding for an inventory of European longitudinal studies (Schneider & Edelman, 1990), most of which are unavailable in English-language journals. The European Network on Longitudinal Studies on Individual Development (ENLS) was formed in 1985 to collect reports and to provide a dissemination and communications network for scholars. Each of these inventories of longitudinal research includes some studies on giftedness, and access to international data sets would be particularly important in encouraging cross-cultural and cross-national comparison studies.

Repositories of longitudinal data sets, such as the Murray Foundation in Boston, provide researchers with access to data for secondary analyses; many large-sample

longitudinal studies of general populations are appropriate for reanalysis of gifted and non-gifted subsamples. The National Research Center for Gifted Education, recently established in the United States, has listed the need for longitudinal research as a top national priority in the field (Reid, 1991). Subotnik and Arnold (1993) are the editors of the first collection dedicated to longitudinal studies of the gifted. National Institutes and volumes of collected works that focus attention on longitudinal research, compile longitudinal studies, provide data sets for reanalysis, or sponsor visiting scholars, are badly needed, given the expense of repeated data collection and the importance of study findings.

Based on the accumulated literature, what directions can longitudinal research take to contribute most to the field of gifted education? Two paths invite exploration. One direction is to continue to provide the missing pieces that connect adult fulfillment of talent with demonstrated potential in a specific field. Some excellent studies that address how well performance in general academic, mathematics, science, and leisure time activities serve as predictors of outstanding talent have been briefly described above. In order for these studies to become more rigorous, thereby overcoming the design weaknesses delineated in this chapter, more multiple-cohort studies must be conducted that address the contaminating influences of historical context, time-of-measurement effects, and subject attrition. Replication studies may be conducted with new cohorts. Greater emphasis on cross-cultural and cross-national investigations within each talent area could increase profoundly the generalizability of study outcomes. Secondary analyses and meta-analyses of existing data sets are a fruitful and underutilized source of information. Lastly, longitudinal research needs to rely more consistently on strong theoretical foundations.

The second direction for research, and perhaps the most pressing challenge, is to apply the techniques of longitudinal research to educational practice in the primary and middle elementary schools. The largest amount of financial and creative effort in the field is expended on elementary school programs. Investigations of the interactive effects of individual talent with other aspects of human development—cognitive, affective, moral, and aesthetic—should be encouraged and promoted.

The field of gifted education needs answers to questions of paramount academic, ethical, and political importance: Are we identifying and serving the right people? Are we providing appropriate services to the people we identify? What factors in talent development are controllable through education? Progress in answering these questions will rely heavily on more widespread use of longitudinal research methods.

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Prodigies and Savants: What They Have to Tell Us About Giftedness and Human Cognition

MARTHA J. MORELOCK AND DAVID HENRY FELDMAN

Tufts University, Medford, Massachusetts, U.S.A.

Introduction

Giftedness is perhaps most intriguing when it is found where it is least expected. This may account for the fascination which child prodigies and idiot savants have long held for human beings. The child prodigy displays astounding adult-like mastery of a demanding domain of endeavor; while the idiot savant manifests islands of extreme capability showcased against a backdrop of overall severely deficient intellect.

Historically, research into prodigy and savant capabilities has been conducted within two separate disciplinary frameworks. Studies of savant talent are rooted in the literature on mental retardation; while those of prodigies are found in the literature on giftedness. Recently, however, developmentalists from both disciplines have suggested that the domain-specificity characteristic of both prodigy and savant talent means that our concepts of intelligence, giftedness, and handicap need to be revised (Feldman, 1980, 1982, 1986; Gardner, 1983; O'Connor, 1989). Research within the last 20 years suggests that the prodigy and the idiot savant phenomena—as different as they may seem to be on the surface—share certain commonalities which are revealing for our understanding of human cognition in general. Equally revealing may be the stark differences which they manifest.

This chapter begins by providing a general overview of the individual histories of research on the prodigy and the savant. Moving to a more narrow focus, it will then combine discussion of the two phenomena by comparing examples of prodigious performance with ones of savant performance in two of the domains where both have been found: music and art. It will conclude with a speculative discussion of possible brain-based commonalities and differences serving as substrates for prodigy and savant capabilities.

The Prodigy

A prodigy is a child who, before the age of 10, performs at the level of an adult professional in some cognitively

demanding field (Feldman, 1986). This precise definition of prodigiousness has only been in existence since 1979 (Feldman, 1979)—in spite of the fact that “prodigy” was used loosely to refer to extraordinary youngsters for many years prior to that. Historically, the term was part of a prophetic tradition signaling impending change (Feldman, 1986). It referred to an entire range of unnatural phenomena extending from the advent of notable uncanny or extraordinary happenings to the existence of humans or animals regarded as “freak”.

Over time, the term began to be used more narrowly to refer to extreme human precocity (Morelock & Feldman, 1991). The “sign” or “portent” aspect of its meaning was dropped, while the essential connotation of “unnatural” or “inexplicable” remained. The term continued, however, to be used indefinitely to refer to a broad range of manifestations of precocity (Barlow, 1952).

With the advent of IQ and its widespread acceptance as the gauge of giftedness, the phenomenon of the prodigy became subsumed under the IQ umbrella (Feldman, 1979). Children who could compose sonatas at the age of 6 were implicitly assumed to be high IQ children with penchants for given fields. Nevertheless, there appeared in the European literature two systematic research studies of child prodigies failing to support the equivalence of prodigious achievement with extraordinarily high IQ (Baumgarten, 1930; Revesz, 1925). In 1980, a third study of prodigious achievement appeared (Feldman, 1980). Published in the American literature, it too brought into question the relationship of IQ (i.e., generalized abstract verbal-conceptual capability) to prodigious achievement in various fields. To date, these three remain the only scientific studies of child prodigies in the world literature.¹ They are discussed below.

A Case Study of A Music Prodigy

Revesz (1925) conducted the first case study of a music prodigy to appear in the world literature: an in-depth study of 7-year-old Hungarian music prodigy Erwin Nyiregyhazi. It utilized a combination of interviews;

observations of Erwin in and out of performing situations; anecdotes from family, teachers, and acquaintances; and formal assessments using the available techniques of the day (e.g., the 1908 Binet–Simon Scale). It continues to be unique in that it is the only study to analyze in detail the musical cognition as well as musicianship skills of a prodigy. For example, Revesz assessed Erwin’s basic acoustic faculties and musical memory, his transposing and sight reading skills, his interpretive skills as a pianist, and the technical quality of his musical compositions. According to Revesz, Erwin’s musical abilities compared favorably with those of other legendary prodigies and great musicians of the day.

Erwin’s talent showed itself from a very early age. By the age of 2, he was correctly reproducing tunes sung to him, and before he turned 4, he had demonstrated perfect pitch by reproducing on the mouth organ any melody sung to him. When he was 4, he began to play the piano and compose melodies. He began taking formal music lessons in his fifth year; and from age 6 to 12, Erwin became a celebrated performer—playing before the British royal family as well as other audiences in Budapest and Vienna.

Revesz used the Binet–Simon scale to assess Erwin’s general intellectual ability. Test results showed that Erwin’s mental age exceeded his chronological age of 7 by 3 years. Thus, by modern reckoning, his IQ measured slightly above 140. Revesz asserted that the test failed to adequately reflect the true extent of Erwin’s brilliance, noting that the child “analyzed his own inner life in the manner of a trained psychologist” and “expressed himself with great caution and in remarkably pregnant phraseology” (Revesz, 1925, p. 42).

Revesz noted that in spite of Erwin’s remarkable musical talents and exhibited brilliance, the prodigy was, in every respect other than his music, a child: “Erwin was a child in the full sense of the word; a clever, gay, friendly, charming boy. . . . He played as children play, was fond of boyish exploits, and enjoyed them very much” (Revesz, 1925, pp. 57–58). This mingling of child and adult in the prodigy proved to be a consistent theme throughout later studies of prodigiousness as well (Baumgarten, 1930; Feldman, 1980, 1986).

Nine Prodigies: Patterns of Ability and Personality

Baumgarten (1930) studied nine child prodigies: two pianists, two violinists, one orchestra conductor, one artist, one geographer, one chess prodigy, and a dancer. She chose to focus specifically on the children as whole personalities rather than emphasizing only their

extraordinary achievements. She also examined their individual patterns of varying abilities. Like Revesz, she wrote of the intriguing mixture of adult and child qualities and the frequent childlike naiveté demonstrated by her subjects. She found that the prodigies appeared ambitious, pragmatic, wary of those who might harm their careers, passionately devoted to their fields, unafraid of public performance, and desirous of using their gifts for the good of their families.

On a battery of standardized intelligence tests, the children’s scores ranged from 120 IQ to at least 160 IQ, when translated into contemporary terms. Their performance was impressive, to be sure, but certainly not as unusual as one would have expected from the degree of extraordinariness of their special talents. Baumgarten’s conclusion was that her subjects’ overall intellectual competence, as reflected in their test results, failed to explain their outstanding performance in particular fields.

In analyzing intra-subject patterns of varying abilities, Baumgarten found some surprising results. For example, violinists and pianists demonstrated poor hand coordination in bending wire, drawing, and folding and cutting—although one girl violinist showed a talent for drawing. At the same time, a 6-year-old boy who showed difficulty in making a circle out of two or three sections or a pentagon from two sections, was nevertheless extraordinarily good at map drawing.

Baumgarten concluded that more than the testing of intellectual abilities was needed to explain prodigious achievement. She suggested that factors of inheritance, temperament, family, education, environment, and culture should also be examined.

The Prodigy from a Cognitive-Developmental Perspective

The third systematic study of child prodigies to be found in the literature (Feldman, 1980, 1986) was inspired by Piagetian cognitive-developmental theory. The study began as a straightforward psychological experiment designed to refute the Piagetian assertion that, universally, children’s cognitive development proceeds in major predictable sequential stages grossly encompassing all of a child’s thinking capacities at any given point in time. It follows from this assertion, that in order to account for a prodigy’s adult-level performance in a specific field, one must assume that the child’s overall cognitive development is generally advanced beyond his or her years. However, four cognitive-developmental measures administered to two 8-year-old chess prodigies

¹Although the literature contains only three systematic scientific studies of child prodigies, a number of biographical or psychohistorical accounts of the lives of prodigies have been published. See, for example, Kathleen Montour’s “William James Sidis: The broken twig” (Montour, 1977), Norbert Wiener’s 1953

autobiography, *Ex-Prodigy: My Childhood and Youth* (Wiener, 1953); Amy Wallace’s 1986 book (also about William James Sidis) *The Prodigy* (Wallace, 1986); and Fred Waitzkin’s 1984 book, *Searching for Bobby Fischer: The World of Chess, Observed by the Father of a Child Prodigy* (Waitzkin, 1984).

and a 10-year-old musician–composer showed all three children performing age-appropriately in logic, role-taking, spatial reasoning, and moral judgment—thus challenging the traditional Piagetian conceptualization (Bensusan, 1976).¹ These findings, like those of Revesz and Baumgarten, suggested that giftedness is *domain-specific*, rather than solely the expression of a generalized and pervasive intellectual endowment.

With the addition of three more prodigies—a young mathematician, a writer, and an “omnibus prodigy” showing prodigious achievement in a number of areas, but who eventually began to focus on music composition and performance²—the study evolved into an open-ended effort to observe, understand, and explain the prodigy phenomenon. Extending beyond a decade, association with the six prodigies and their families resulted in a theoretical framework, the co-incidence theory, which seeks to explain not only prodigious development, but also all human achievement. Below is a brief overview of the theory.

Co-incidence

Co-incidence, briefly defined, is “the melding of the many sets of forces that interact in the development and expression of human potential” (Feldman, 1986, p. 11). Within the co-incidence framework, the developmental process itself—rather than the individual person—is placed at the center of the theoretical structure. The ultimate goal of the theory is to explain how the process works across the full range of situations in human development. The forces of co-incidence, briefly presented, consist of the following (Feldman, 1991).

BIOLOGICAL QUALITIES

Biological qualities include both genetic and nongenetic features forming a foundational substrate for the development of differential talents or general intellectual capacity.

INDIVIDUAL PSYCHOLOGICAL QUALITIES

These might include executive and planning functions such as those featured in the work of Robert Sternberg (1988), or multiple intelligences, such as those proposed

by Howard Gardner (1983); as well as personal and emotional qualities such as unusual sensitivities (Piechowski, 1991) serving to heighten an individual’s response to selective sensory or intellectual experiences.

PROXIMAL CONTEXT

The proximal context includes the immediate surround of the developing child, including such factors as hygiene, nutrition, caretaker practice, and educational interventions.

INTERMEDIATE CONTEXT

This includes family structure (e.g., number of children, birth order, and family traditions which might serve to orient a child toward a particular domain—a family history of interest in mathematics or music, for example). Also included in the intermediate context would be other immediately relevant institutions such as established health care resources.

DOMAIN AND THE SURROUNDING FIELD

This dimension—a central feature of the co-incidence theory—focuses on the development of domains of knowledge (e.g., art or music) and associated shifts in culturally afforded opportunities for vocational or avocational activities connected with those domains (e.g., artist, art historian, musician, composer, music store proprietor). Considerations include the constraints and demands of association with a particular field, its current and emerging forms, techniques and technologies for expression and exploration of those forms, how the field is organized and talent recognized, recruited, and developed, and where supportive resources are obtained. Additionally of interest are those institutions determining the social standing of various fields and allowing or preventing expression of talent within domains.

DISTINCT CONTEXT

The distant context includes social and historical factors encouraging, prohibiting, or shaping the expression of individual potential. Of interest, for example, would

¹The four measures given were: (1) Inhelder and Piaget’s (Inhelder & Piaget, 1958) five chemicals task, a test of level of acquisition of various concrete and formal logical operations; (2) a role-taking task devised by John Flavell (Flavell, 1968) and his associates at the University of Minnesota, the aim of which is to test social-cognitive development by assessing the level of ability to take another’s point of view; (3) a map-drawing exercise, an adaptation of Piaget and Inhelder’s (Piaget & Inhelder, 1948) layout diagram task (Snyder, Feldman, & La Rossa, 1976), which gives a general estimate of the level of the coordination of spatial-logical

reasoning; and (4) a psychometric measure of level of moral judgment and reasoning prepared by James Rest (Rest, 1974) based on Kohlberg’s stages of moral development.

²At the age of 3 1/2, when Adam, the omnibus prodigy, first entered the study, he was reported to read, write, speak several languages, study mathematics, and compose for the guitar. He was, as well, a child of extraordinarily high IQ, with an IQ measuring beyond the assessment capabilities of current instrumentation. He was consequently designated an “Extraordinarily High IQ/Omnibus Prodigy” (Morelock & Feldman, 1991).

be political movements, religious institutions, war, or economic growth and decline (Simonton, 1984).

Co-incidence and the Child Prodigy

Co-incidence may be thought of as a type of equation into which may be “plugged” more or less the varieties of forces listed above. The synergistic result will be a specific form of expression of human potential—the child prodigy, for example. Of course, the developmental reality is that none of the component forces remain static. All of them, including the developing child, are in a constant state of flux. Orchestrating the interaction of these multiple fluid forces so that there is continuous positive movement toward the fruition of human potential is the challenge presented by the theory of co-incidence.

The child prodigy phenomenon is the result of a fortuitous concordance of the forces of co-incidence leading to the maximization of human potential. Essentially, in most of the cases of prodigiousness contained in the literature, a child of extraordinary native ability is born into a family recognizing, valuing, and fostering that ability when the child’s introduction to the culturally available domain reveals its presence. The child is generally exposed to master teachers who instruct the prodigy in a way most likely to engage the interest and sustain the commitment of the child. Invariably, as well, the child demonstrates a combination of inner-directedness and passionate commitment to the field of achievement.

Prodigious achievement only occurs in domains accessible to children. As a general rule, domains which spawn child prodigies require little prerequisite knowledge and can be both meaningful and attractive to children. In addition, the domain’s media and techniques are adaptable to children (e.g., a child-sized violin must be available for a 6-year-old prodigy violinist). The largest proportion of child prodigies to date have been in chess and music performance. There have been, however, occasional writing prodigies (Feldman, 1986; Radford, 1990), child prodigy visual artists (Goldsmith & Feldman, 1989; Pariser, 1987) and, infrequently, a child prodigy in mathematics (Bühler, 1981).

As was mentioned previously, the idiot savant has its own research history. Following, some highlights of that literature are considered.

The Idiot Savant

There is a much larger base of research on the savant than on the prodigy. This is not surprising, inasmuch as the severe general impairments characteristic of savant functioning have historically resulted in savants being institutionalized, treated, and made the targets of medical intervention.

The term “idiot savant” was originally coined by Dr J. Langdon Down of London (Down, 1887) to refer

to severely mentally handicapped persons displaying advanced levels of learning in narrowly circumscribed areas. In Down’s time, *idiot* referred to individuals operating at the lowest level of retarded functioning based on an evaluation of speech and language capabilities (Scheerenberger, 1983).

With the development of IQ tests, idiocy became translated as encompassing the lowest portion of the IQ scale—extending over an IQ range of 0 to 20 (Craft, 1979). In reality, however, the IQs of all known tested idiot savants have been above 20—and usually fall in the range of 40 to 70 (Treffert, 1989). Somewhat more appropriate, but still a misnomer, is the second part of the term, “savant”—a straightforward adaptation from the French word meaning “to know” or “man of learning”.

Because of the failure of “idiot savant” to capture the essence of the savant phenomena and because of the pejorative connotations of the first part of the term, a number of alternatives have been suggested (Charness, Clifton, & MacDonald, 1988; Rimland & Hill, 1984; Treffert, 1989). Most recently, Treffert (1989), based on a thorough review of the research literature appearing over the last century, proposed a more precise classification terminology and suggested a theoretical explanatory framework. He also proposed an alternative term for the condition: *savant syndrome*—or, if one wishes simplify, just *savant*.

Savant Syndrome Defined

Savant syndrome is defined by Treffert as follows:

Savant syndrome is an exceedingly rare condition in which persons with serious mental handicaps, either from developmental disability (mental retardation) or major mental illness (early infantile autism or schizophrenia), have spectacular islands of ability or brilliance which stand in stark, markedly incongruous contrast to the handicap. In some, savant skills are remarkable simply in contrast to the handicap (talented savants or savant I). In others, with a much rarer form of the condition, the ability or brilliance is not only spectacular in contrast to the handicap, but would be spectacular even if viewed in a normal person (prodigious savants or savant II) (Treffert, 1989).

Treffert notes that savant syndrome can be either congenital or acquired by a normal person after injury or disease of the central nervous system. The skills can appear—and disappear—inexplicably and without warning (Selfe, 1977; Treffert, 1989).

Like prodigies, savants occur only within a limited number of areas. Documented savant skills include: calendar calculating (e.g., the ability to quickly calculate the answers to such questions as “On what day of the week will April 29 of the year 2245 A.D. fall?”); music (chiefly limited to the piano); lightning calculating (the

ability to do extraordinarily rapid mathematical calculations); art (painting, drawing, or sculpting); mechanical ability; prodigious memory (mnemonism); or, on rare occasion, unusual sensory discrimination (smell or touch) or extrasensory perception. Treffert (1989) notes that prodigious savants have occurred chiefly within the areas of music, mathematics (lightening and calendar calculating), and memory.

Incidence of Savants

The literature reveals two major populations from which savants emerge: (1) those who can be diagnosed as autistic,¹ and (2) those who are diagnosed as mentally handicapped, but not autistic. Rimland (1978) estimates the percentage of idiot savants in the autistic population as 9.8%; while the prevalence of savants in the mentally handicapped population has been estimated to be significantly less—0.06% (Hill, 1977). O'Connor (1989) notes, however, that as the incidence of autism itself is only 0.04% of births, autistic individuals are far less numerous in the general population than are mentally handicapped people. Consequently, in absolute terms, idiot savants appear to emerge from each source in approximately equal numbers. Savant skills occur six times as often in males as in females (Hill, 1977).

According to Treffert (1989), who is the first researcher to differentiate between *talented* and *prodigious* savants, there have been only about 100 known prodigious savants in the world literature—12 to 15 of whom are still alive.

Features of Savant Functioning

Research reveals a number of features common to the functioning of all savants.

CAPACITY FOR ABSTRACTION

Scheerer, Rothmann, and Goldstein (1945) first documented the "impairment of abstract attitude" typical of savant functioning. By this, they meant that savants are

characteristically unable to transcend immediate sense impressions, consider a situation from a conceptual point of view, and react accordingly. The researchers noted that, generally, savants display minimal abstract reasoning ability combined with almost exclusive reliance on concrete patterns of expression and thought. A savant on whom they conducted a case study, for example, memorized and sang operas in several languages, yet had no comprehension of the abstract conceptual and symbolic meaning of words.

More recent research suggests that the question of abstract reasoning in savants is more complex than originally thought. Studies show that savants have an immediate—seemingly intuitive—access to the underlying structural rules and regularities of their particular domain, be it music (Miller, 1989; Treffert, 1989), mathematical calculation (Hermelin & O'Connor, 1986a; O'Connor & Hermelin, 1984), or art (O'Connor & Hermelin, 1987a). It also seems that the rules intuitively "known" by savants are the same as those applied by practitioners of normal or high reasoning ability who are skilled in the same area. It appears, therefore, that although most savants lack the ability to use verbal abstractions to conceptualize about either their internal thought processes or the particulars of daily life, all can abstract to a degree—at least in circumscribed and domain-specific areas (O'Connor, 1989).

This form of circumscribed, domain-specific abstract functioning is intriguing and worthy of further study. It should be noted that it appears to be qualitatively different from the more pervasive and rational abstract reasoning originally discussed by Scheerer, Rothmann, and Goldstein. More research designed to tease out similarities and differences would be helpful.

METACOGNITION

Scheerer et al. (1945) also noted the general incapacity of savants for reflecting upon their internal thinking processes—what today would be called "metacognition". When asked to account for how they can do whatever it is that they do, savants frequently respond with something strictly irrelevant. One calendar calculator, when asked how he managed his remarkably fast responses to

¹We may yet discover that although there are strong resemblances in the way domain-specific abilities in autistic and non-autistic savants are expressed, the underlying patterns of brain functioning as well as the phenomenological realities of the two types of savants are different. For more specifics about autistic savants, the reader is referred to Rimland, 1978 and 1988. For research findings about "normally intelligent" or "high functioning" autistic children—many of whom, like the savant, show particular islands of unusual ability—see Schopler & Mesibov, 1992.

Advocates of "facilitated communication," a recent and still highly controversial innovation in the field, claim that through its use, some individuals previously presumed to be among the lowest intellectually functioning persons labeled

autistic were able to carry on high-level conversations, discuss abstract thoughts and feelings, and even tell jokes. To date, there are no documented cases of its use with autistic savants, although the idea is certainly an intriguing one. For more on facilitated communication, see Biklen (1990).

Several books have appeared in recent years recounting the emergence of children from autism (Barron & Barron, 1992; Grandin & Scariano, 1986; Stehli, 1991). The biographical accounts include fascinating glimpses into the children's inner experiences while imprisoned in their autistic worlds. Unfortunately, as of this time, we know of no incidences where an autistic savant has similarly recovered.

date questions, said "I make all sorts of mathematical calculations, don't I?" In fact, he was usually unable to add or subtract without pencil and paper (O'Connor, 1989).

SAVANT MEMORY

All savants are notable for their extraordinary memories (Treffert, 1989). Indeed, the mnemonist savant's sole talent consists of his or her impressive memory for miscellaneous or mundane happenings (e.g., some savants have been known to remember the weather conditions for each day of most of their lives). In other savants, it is the norm for extraordinary memory to be narrowly limited to their domains of achievement.

AFFECT

A frequently noted aspect of the savant is a restricted range of emotion generally appearing as flattened affect (Treffert, 1989). The performance of musical savants, for example, frequently manifests this deficit by coming across as shallow, imitative expressiveness lacking subtlety or innuendo.

A review of the literature reveals that music is seemingly the only domain where there is some controversy about the "flattened affect" observation (Howe, 1989; Miller, 1989; Treffert, 1989). There have been cases of musical savants demonstrating emotional connection with the music they were performing (Miller, 1989; Viscott, 1970). In one such case (Viscott, 1970), the savant possessed more expanded verbal abilities than is commonly the case in manifestations of savant talent. This seems to have allowed for a conceptually interpretive response to the music.

An additional consideration in the case of musical savants is the fact that emotional response to music may be, to some extent, the direct result of the physiological changes which it evokes (Winner, 1982). Music not only affects pulse, respiration, blood pressure, and the electrical resistance of the skin, but also delays the onset of fatigue (Mursell, 1937). These same types of changes occur during emotional experience. The question is raised whether the emotional response seen in musical savants may, therefore, be more a straightforward reflection of specific physiological effect than is the case with musicians more conceptually and interpretively involved with the music.

CREATIVITY

Research suggests that savants are incapable of being creative in the sense of producing totally original work. Treffert (1989) concludes, for example, that while a musical savant might imitate, improvise, or embellish based on pre-established constraining musical rules, he or she is generally incapable of composing.

There is indication, however, that musical savants with more highly developed language capacities may

be more likely to be able to compose music. Miller (1989) noted that when he began to study one adult musical savant, L.L., the savant's communicative language skills were minimal—limited to monosyllabic or echolalic responses to conversational attempts. L.L.'s music attempts during this period were skillful and expressive, but remained confined to renditions of songs and melodies of others, with very little inclination to improvise or compose. During the last several months of Miller's observations of L.L., the savant's language changed dramatically. He began to make requests, comments, and to respond in a much more sophisticated fashion to questions. Intriguingly, at the last session in which Miller saw L.L., the savant announced and played an original composition. This curious concordance of the development of expanded language skills and the onset of musical creativity has led Miller to speculate that music and language are not mutually exclusive.

The above sections provided a general overview of what is known about prodigies and savants. The following ones examine more closely some of what is known about their comparative functioning in two of the domains in which both have been found: Music and art.

Music

Music is the domain in which the largest number of both prodigies and savants are found. It is also the only domain in which there has actually been some detailed, though limited, systematic research regarding commonalities and differences between the performance of a prodigy and that of a savant (Miller, 1989). It is, therefore, worthwhile to consider the following.

A Case Study of A Musical Savant

Miller (1989) conducted a detailed case study of Eddie, a musical savant pianist, who was 5 years old at the time of first contact. In obtaining information about Eddie's development from the child's mother, Miller was unable to find out precisely when Eddie became interested in music. During one interview, the mother reported this as being before his first birthday, while at another time, she said it was at about 2 years of age. The occasion was marked by Eddie's having received a toy piano which quickly became his favorite toy. Eddie was also exposed to a musical instrument at church, where he was given the chance to pick out melodies on the piano in the room where his mother attended services. Thus, Eddie's exposure to music was casual and untutored. At the time Miller first saw the 5-year-old savant, the child had received no formal music lessons and there was no piano in the home. In addition, there was no history of a special musical talent in the family, and none of the other members of the family played an instrument.

Miller's study was a longitudinal one spanning a 4-year period during which Eddie, at the age of 6, began

taking formal music lessons. This allowed Miller, who was instrumental in securing Eddie's music teacher, to observe the savant's progress during the period of the formal lessons as well as to devise a number of research tasks geared toward testing Eddie's natural acoustical and musical skills.

The researcher gained a more complete picture of Eddie's musical abilities by exploring the literature on other historically documented musical savants and by selecting three groups of diverse musically talented living subjects with whom to compare Eddie's abilities. In addition—and of particular use to us here—Miller made a final studied comparison between Eddie's musical skills and those of the musical prodigy Erwin Nyiregyhazi, as had been documented by Revesz (1925). Below, we present a synopsis of Miller's impressions and research findings.

Researcher Meets Savant: First Impressions

Miller describes his first encounter with Eddie as unexpected and dramatic. All of the children at the day program for the multiply handicapped which Eddie was attending were legally blind, none had more than rudimentary language, and most were physically handicapped. Massive delays in social, emotional, and cognitive development were the norm. The school curriculum centered mainly around teaching basic daily living skills such as self-feeding and dressing. Consequently, Miller notes that he was skeptical when a teacher remarked that one of the new children at the school played the piano surprisingly well.

Upon first seeing Eddie, Miller reports that his skepticism increased. He describes the 5-year-old as "a very fragile child, bony thin and small for his age. His motor delay was apparent in his hesitant, splay-footed walking. He seemed to lack the fine muscle control needed for something as demanding as a piano" (Miller, 1989, pp. 1–2). Eddie's speech was almost exclusively echolalic, or a virtual repetition of what he heard, except for a few conversational clichés such as "How are you?", "I'm fine", and "Good-bye".

Nevertheless, when Eddie's teacher mentioned the word "piano", the child's face was transformed by a smile of excitement and he purposefully turned to the room containing the piano, needing no prompting to exhibit his talent. At the piano, Eddie's hands found the keys easily and he started to play some melodious chords, "his head tilted back, staring through his thick glasses at the ceiling with an intent expression on his face" (Miller, 1989, p. 2).

Eddie's first recital for Miller consisted of a rendition of the Christmas carol, "Silent Night". Miller describes the melody as well articulated, with an appropriate tempo, and a nice rolling broken chord figure in the bass. "Eddie's hands, which had difficulty holding a pencil, were clearly at home on the keyboard" (Miller, 1989, p. 2).

On Miller's second visit, he came prepared to test the range of Eddie's musical sensitivity. Realizing that technical facility across all major and minor keys on the piano is generally achieved only with considerable instruction and practice, Miller questioned how well Eddie could follow a simple melody through a series of transpositions on the keyboard. Was the child's facility limited to a few common keys, or would the particular key of the piece prove irrelevant?

Miller quickly discovered that Eddie responded happily to efforts to enlist his participation in a musical "game" in which Eddie would repeat a simple melody exactly as it had initially been played by the researcher. Miller played the simple melody line of "Twinkle Twinkle Little Star"—a melody familiar to Eddie—without harmonic accompaniment. First played in the key of C, Miller then repeated the melodic line in G, then in A[#], F[#], and back to C. To increase the challenge, each example was presented in a different pitch range from the immediately preceding one, either an octave higher or lower. Eddie's playing reflected the transposition to a new key with no hesitation. The child seemed equally at ease with any key signature, at least when playing simple melodies. The final trial, during which Miller returned to the original key of C, revealed something new, however. Upon hearing "Twinkle Twinkle" again in the key of C, Eddie's response changed. No longer content to play the simple melody, he instead added several left-hand chords. He also transformed the piece to a minor key with several unexpected modulations in the harmonic structure, using minor thirds rather than the major thirds of the original. Eddie was generating a new version of the piece.

Through this little experiment, Miller discovered that Eddie's talent was not limited to a few well-practiced patterns of movement on the keyboard. The boy had an impressive sensitivity to the tonal structure of a melody line, and he could follow that melody wherever it appeared in the pitch range represented by a piano keyboard. In addition, he was capable of improvisation—he could take a melodic line and produce renditions that were consistent with the conventions of musical composition.

Miller points out that such skill dramatically contrasts with musical abilities of average 5-year-olds. Normally, a 5-year-old could be expected to have, at best, a slim grasp of interval relationships in even a simple melody (Bartlett & Dowling, 1980); and their spontaneous songs often wander from one tonal center to another, with little sense of an overall tonal structure (Hargreaves, 1986). Thus, not only did Eddie demonstrate a much better grasp of the structure of music than one would expect from a normal 5-year-old, but his understanding was manifested naturally and concretely in his playing. Miller comments: "The piano seemed an extension of Eddie's body, and his fingers effortlessly explored its range of sounds as soon as he came in contact with its keyboard" (Miller, 1989, p. 3).

Eddie's extraordinary musical ability led Miller to wonder what it was, exactly, that Eddie knew about music. Of what was this incredible musical intelligence—so disparate with the rest of Eddie's abilities—comprised? The results of his case study revealed some answers to these questions. Below we outline some of Miller's major findings. As they are reported, we will discuss their possible implications for our understanding of music prodigies, as well.

Miller's Findings

ABSOLUTE PITCH: DEFINITION AND INCIDENCE

Absolute pitch is generally defined as "the ability to name the note of any tone heard without either seeing it played or the benefit of a reference note" (Miller, 1989, p. 15). *Extended absolute pitch* means that the ability extends over the whole musical scale and is independent of the instrument used. Miller's search into the savant literature alerted him to the presence of *extended absolute pitch* in all well-documented cases of musical savants. A 100% incidence within the population of well-documented idiot savants seems even more extraordinary when one considers that within the general population, the incidence is estimated to be less than one-hundredth of 1% (Bachem, 1955).

For Eddie, absolute pitch was a skill separate from knowledge of the verbal names of the notes: he was able to match tones to their equivalent piano notes before he had ever been taught the note names. Miller deduced that this same independence of the faculty of absolute pitch from the capacity to verbally identify notes would apply for other savants, as well, since their generally restricted language abilities make verbal association mechanisms an unlikely means of learning. It is interesting, however, that once Eddie learned the names of the notes, he delighted in pointing out the "names" of sounds. A passing police car's siren was F and G; while the bell in an elevator was identified as A#.

EXPLORING ABSOLUTE PITCH FURTHER

Miller tested Eddie and his comparison subjects on the identification of single tones as well as chord groupings. He reports that only the subjects who, like Eddie, possessed secure absolute pitch gave quick, accurate and confident judgments across the tasks presented—even when the chords contained dissonant notes.

Other subjects were able to use "relative pitch" in identifying the presented notes. In other words, after a reference tone was sounded, they were able to recognize a second tone as identical, lower or higher, and perhaps estimate a proportionate distance by which the two presented notes differed. Even so, individuals with relative pitch tended to identify notes more slowly, characteristically considering a number of options before settling on a "guess".

As Miller's absolute pitch subjects varied considerably in age, musical training, and level of general intelligence, the researcher concluded that the consistency of their results against this variability in background argued for absolute pitch as a distinctive skill with important consequences for music perception.

ABSOLUTE PITCH AND "MUSICAL SYNTAX"

Miller proposes that absolute pitch and the intuitive link which it represents between chroma (note name) and tonal frequency suggests the faculty may provide a foundation for the development of higher order structures and a basis for higher order pattern extraction. The beginning musician must learn to map or represent musical notes in a reliable way before he can construct higher order groupings in music. The savant, according to Miller, has a ready means of doing so by virtue of the "internal standard" which he possesses for each note of the chromatic scale, i.e., the faculty of absolute pitch.

Miller suggests that the concept of parallel distributed processing (PDP) (Rumelhart & McClelland, 1986) may prove helpful in explaining how a higher order musical structure or pattern emerges. PDP models characterize information processing as involving the activation of specific groups of units corresponding to aspects of information present in the stimulus array. In music performance, it might work like this: The presence of chroma information (e.g., hearing the note "C") activates several candidate key signatures—keys in which the note "C" naturally occurs, such as C, G, or F Major. At the same time, it inhibits orientation towards other keys in which "C" does not appear—such as D Major. This restricted range of key signatures affects subsequent patterns of activation at the chroma level. Chroma values consistent with the suggested key are augmented; whereas, those inconsistent with the key are inhibited. Thus, by its fundamental frequency, a note not only specifies central categories (chroma), but it also suggests another series of relations among sounds in terms of candidate keys for the musical piece in question. The "inevitability" of various frequency–chroma–scale links represents a pathway by which a young musician with a particularly good sense of chroma identification could start establishing a more complex system for extracting patterns in music—a hierarchical representation of the stimulus structure of music.

Eddie's musical performance, as well as that of other savants, does indeed reflect regularities and consistencies related to the structural rules embedded in musical composition. There is little evidence, however, that musical or other types of savants consciously apply a structured set of rules to their material of interest (Hermelin & O'Connor, 1986a; Howe & Smith, 1988; Miller, 1989). And the speed of savant response would seem to preclude the notion of some interposition of a complex formal rule structure. Miller concludes that, like the child whose language expression and comprehension reflects the rules of syntax, so does

the musical savant's performance show "musical syntax" rule use. In neither case is conscious knowledge of the system of rules necessary.

ABSOLUTE PITCH AND THE PRODIGY

Unfortunately, no one has completed a review of historically documented music prodigies to determine just what percentage has shown absolute pitch. (Certainly, given Miller's statistics with regard to the incidence of absolute pitch in the savant, it seems that such a study should be done.) Nevertheless, accounts of various prodigies' extraordinary faculties of absolute pitch do appear every now and then. . .

Revesz's prodigy, Erwin Nyiregyhazi manifested absolute pitch. Revesz noted the speed and confidence with which the prodigy identified the component notes of complex chords:

Erwin's verdicts were given immediately without reflection and with perfect confidence. One characteristic of the boy's performance was that during these experiments he always smiled in a superior manner, the tasks put before him being so easy to him that he did not take them seriously (Revesz, 1925, p. 75).

An article appearing in the *New York Times Magazine* (Winn, 1979, December 23) included a fascinating account by pianist Lorin Hollander of how his father first discovered that Hollander was a prodigy. . .

When I was 3½, I went with my father to a rehearsal and heard them play a Haydn quartet. I was profoundly moved by the music. When I came home, I wanted somehow to put down what I had heard. I found some drawing paper and began to draw spirals. My father asked me what I was doing, and I began to sing him back the piece, which I remembered perfectly, and told him that I was trying to write it down. My father said, "No, you silly boy, we already have a way of writing music", and he brought out the score to show me. I fell into the music; that's the only way to describe it. Within four minutes I knew the notes, the clefs, everything. A car horn sounded outside and, just for fun, my father asked me what note it was. I immediately answered, "F sharp". He took a spoon and clinked a glass. "B flat". I told him. Then he and my mother realized they had a prodigy on their hands and they started to run around to people to find out what to do" (Winn, 1979, December 23, p. 37).

Then, of course, there is Mozart. Marshall (1991) comments of the legendary child prodigy and musician/composer that his phenomenal musical memory, perhaps the most formidable in history, went far beyond absolute pitch. It included the ability to hear and remember entire compositions—motets, concertos, even operas—to such an extent that he could subsequently write them down. A letter from Mozart's father, Leopold, to his wife from Rome in April, 1770, attests

to the extraordinary abilities of the then 14-year-old Mozart:

You have often heard of the famous Miserere in Rome, which is so greatly prized that the performers in the chapel are forbidden on pain of excommunication to take away a single part of it, to copy it or to give it to anyone. *But we have it already.* Wolfgang has written it down and we would have sent it to Salzburg in this letter, if it were not necessary for us to be there to perform it. But the manner of its performance contributes more to its effect than the composition itself. So we shall bring it home with us. Moreover, as it is one of the secrets of Rome, we do not wish to let it fall into other hands, *so that we shall not incur the censure of the Church now or later* (Marshall, 1991, p. 5).

It may well be that absolute pitch operates in prodigies as Miller suggests it does in savants—to provide a foundation for the structure and higher level abstraction of patterns in music. It seems feasible that Mozart's extensive and precise musical memory allowed for a directly intuited abstraction of complex patterns which could then be set down on paper.

Given Mozart's extraordinary acoustical memory, could we expect him to recall equally well some extended set of random notes or sounds? While there is no data specifically on Mozart addressing this question, there are some additional findings of interest from Miller's case study. . .

MEMORY IN MUSICAL SAVANTS

Miller (1989) presented a series of chord, melody, and rhythm tasks to Eddie and his comparison subjects to assess short-term memory capacities. The findings suggested that savants did extremely well when the task required retention of harmonic information. When tasks involved tonal material presented sequentially, or "melody like" information, they also did quite well, though their performance was not quite so exceptional.

According to Miller's findings, savant musical memory was enhanced by increased structure or organization in the material to be remembered. Generally, the more the stimulus array was composed of "just notes" (e.g., unconventional chords, random tones, or irregular intervals), the less remarkable savant performance was. Miller concludes that savant performance resembles the selective memory found among those with expert knowledge in a domain. He points out that just as expert chess players remember chessboard configurations more easily when they are well-structured and meaningful (Chase & Simon, 1973), "so the savant's memory excels most when the more meaningful or structured aspects of music are present. In each case, it seems most parsimonious to assume that the excellence of immediate memory reflects a complex and well-structured representation of the domain in long-term memory" (Miller, 1989, p. 112). Tasks requiring reproduction

of portions of intact compositions suggested that this response to musical structure extended to a sensitivity to the implicit rules governing music composition in Western culture. For example, notes consistent with the underlying scale of a piece were more likely to be reproduced accurately.

MEMORY IN THE MUSIC PRODIGY

Revesz (Revesz, 1925) also assessed the memory of his young prodigy, establishing that Erwin easily memorized melodious pieces with simple harmony and had no difficulty remembering a large number of operatic arias, having learned them in a very short time. Revesz noted that as a rule, however, only the melodies without the harmonies were reproduced without error. This is interestingly in contrast to Eddie's superior performance in reproducing the harmonic dimensions of music as opposed to the melodic. In considering Revesz's findings, however, Miller (1989) states that in view of Erwin's proven ability to render complex chords with great precision, this conclusion about more extended musical excerpts may reflect an attentional bias or preference (Eddie loved operatic arias) rather than a particular performance limitation.

Erwin, like Eddie, found unconventional musical excerpts more of a challenge. Revesz notes: "In the case of musical pieces of a strange character, such as melodies with complicated accompaniment and peculiar harmonies, his memory did not prove itself equal to the task" (Revesz, 1925, p. 90). Whether this would have proven to be the case as well with Mozart, one cannot tell for sure. But one might speculate that even Mozart's phenomenal musical memory may have been facilitated by the presence of conventional structure in whatever material he was memorizing at the moment.

SIGHT READING SKILLS

Unlike Eddie, Erwin's extraordinary talent included a prodigious acquisition of sight reading capabilities. By the age of 6, Erwin already preferred optical exposure to the music rather than just hearing it; and he obviously benefited from seeing the written score while attempting to master a musical piece. Interestingly, while "reading" a new score without benefit of hearing the music, Erwin would hum the melody to himself while moving his fingers as if he were playing the theme on the piano, thereby fixing the theme in his memory by motor means. Revesz noted that the child appeared to be trying to imprint the treble on his memory by singing, and the lower parts by the action of playing.

LANGUAGE IN THE SAVANT

Only two characteristics are possessed by *all* musical savants. The first is extended absolute pitch. The second is some significant degree of language disability (Miller, 1989). The language deficit appearing in musical savants

has a specific form. Generally, savants show considerable facility in the phonetic (sounds of speech) and syntactic (rules for combining words into phrases and sentences) aspects of language, while manifesting severe deficits in semantics (the acquisition of words and the meanings associated with them) and pragmatics (using language to express one's intentions and for getting things done in the world). Echolalic speech, such as that manifested by Eddie, appears in the great majority of cases.

Miller argues that echolalia implies that the savant has considerable sensitivity to his or her surrounding language as a system of sounds. Additionally, there is some knowledge as to how these sounds are combined to produce extended sequences. What is missing is manifested awareness of the communicative function of language and its role in sharing meanings about environmental events and objects (Sigman & Mundy, 1987). The presence of this specific pattern of partial language ability tells us that development of extraordinary musical abilities in the savant does not require the *absence* of "competing" language. In fact, Miller continues, the most gifted musical savants are *not* mute.

Miller (1989) provides a brief recapitulation of Eddie's language development, noting that at age 5½, his language was monosyllabic and/or echolalic. During the earliest music sessions, Eddie spoke minimally, though by the end of the first month, he would greet the researcher by name. Conversations were generally one-way, with Miller reminding Eddie to listen while a piece was played, informing the savant of the names of the pieces, and responding with verbal approval to Eddie's playing. As time went on, Eddie began to reliably repeat the names of the tunes requested, although often not with the appropriate melody. Miller notes that the first notes of a song were more reliable cues for Eddie than was the song's title. With the advent of formal music lessons, Eddie's language use increased gradually with his learning to name notes and additional tunes. He also began to include comments on the pieces and simple requests or instructions to the teacher during the lessons.

LANGUAGE IN ERWIN, THE PRODIGY

The semantic, pragmatic, and conceptual impoverishment of Eddie's savant mode of speech contrasts dramatically with the pragmatically astute, conceptually rich, and emotionally colored language of Erwin, the prodigy. Revesz observed that the child often asked if what he was about to say would get "into the book", for in this case, Erwin noted, "I want to express myself correctly, and you must pay great attention to me; for a single wrongly-chosen word may alter the meaning of the whole thing" (Revesz, 1925, p. 42).

Revesz also noted that Erwin, unlike most musicians or artists, grasped with absolute precision questions asked of him about his own experiences or processes of consciousness during creative activity or interpretation,

and responded with incredible insight. For example, when Revesz asked him whether during the whole time he was composing a piece, he maintained the same state of feeling, Erwin replied that he did so as far as possible, adding "When composing, one must not always give way to one's heart, the head must also be consulted. Often it is necessary that the heart should be silenced, pushed into the background, otherwise the composition will become weak" (Revesz, 1925, p. 45).

A FEW FINAL NOTES ON THE PIANO

Overwhelmingly, the piano proves to be the instrument of musical savants. Why?

Miller (1989) points out that the piano keyboard maps its sound producing qualities onto the musical culture in a direct fashion. It contains, in effect, the alphabet of the musical language laid out in a coherent spatial organization. Octaves and various harmonies appear in a recurring, spatial pattern, making it relatively easy to explore sound combinations in both direct and extensive ways. Piano keys release pleasing tones readily—without the application of subtle bowing or fingering techniques such as are needed for string or wind instruments. Finally, the piano is a popular instrument—one which is more commonly available to the young child.

Having explored music a bit, we turn now to consider our second domain of interest: Art.

Art

Treffert notes, in his comprehensive review of the literature on savants, "Musical interest in children, whether they are of normal intelligence or are mentally handicapped, is universal. Musical ability is common. Musical genius is frequent. No so with artistic talent. . . It is not surprising then that among savants musical genius as the special ability is quite common, but phenomenal art ability is rare" (Treffert, 1989, p. 79). The same has been found to be true for prodigies (Goldsmith & Feldman, 1989). Nevertheless, there have appeared within the last two decades two young girls of extraordinary artistic ability: Nadia Chomyn, an autistic savant, and Wang Yani, a child prodigy. Following is a comparison and contrast of these two astonishing talents.

A Case of Savant Artistic Talent: Nadia Chomyn

Nadia was born in Nottingham, England, on October 24, 1967, "after a normal birth and uneventful pregnancy" (Selfe, 1977, p. 4). Although there were no unusual features about the immediate pre- and post-natal periods, development was noticeably slow. Her mother reported that the child was generally unresponsive, and seemed to have poor muscle tone—when sitting on her mother's lap she would lean against her as if she could not sit up.

Nadia's first words appeared at nine months, and she rapidly acquired about ten of them. Two-word utterances—which usually appear at about 18 months—never developed, however, and over time, the single words she had acquired at nine months appeared less and less frequently. Although she stood with support at one year, she did not walk alone until she was two years old.

When Nadia was 4½, she was placed in a special school for severely subnormal children in an attempt to remediate some of her developmental delays. At 6 years of age, however, she had still failed to make any progress, and her mother called the University of Nottingham Child Development Research Unit to seek help.

Thus, Nadia arrived with her mother three weeks later for a scheduled appointment with Elizabeth Newson, who states that Nadia appeared "without any warning of how she was to shatter our beliefs" about "what was possible for a 6-year-old, and what was not" (Selfe, 1977, p. 1). Newson describes the 6-year-old Nadia as "a slow-moving, solidly built little girl with a distant smile, who appeared to accept the novel experience of our playroom with passivity rather than interest" (Selfe, 1977, p.1). When the conversation turned to what Nadia liked doing at home, her mother rummaged in her bag and retrieved a small bundle of half-a-dozen ball-point drawings. Newson describes her reactions to this first exposure to Nadia's talent: "My first reaction to the drawings was to marvel; my second, I am ashamed to say, to doubt" (Selfe, 1977, p. 2). Nadia's case was assigned to Lorna Selfe, the psychologist on duty that day. Selfe began a case study of the child which extended over a period of 6 months, culminating in the remarkable book from which our description of Nadia is taken (Selfe, 1977).

It seems that at 3½ years of age, in the midst of all of her developmental deficits, Nadia suddenly manifested an extraordinary drawing ability marked by a manual dexterity lacking in any of her other activities. She would draw only with ball-point pen or, on occasion when encouraged, fine-tipped felt pen. Her earliest drawings were of horses—an unusual first subject for children, who more commonly choose humans or houses. She had only seen real horses on occasional visits to parks and zoos, and had actually ridden only once. Most of her familiarity with them came from pictures which she had seen. Nevertheless, the representational quality of the drawings was markedly advanced. Selfe notes that. . .

The drawings were in perspective; proportions between and within elements were accurate; she used occlusion or hidden line elimination, and the whole production was not only highly realistic but gave the adult viewer the impression of movement and vitality. The drawings were totally different from drawings produced by normal children of this age (Selfe, 1981, p. 50).

By the time she was 6½, Nadia's choice of subjects had expanded to include horses and riders, cockerels, birds,

pelicans, dogs, other miscellaneous animals, trains, and human figures. Nadia's drawings, although inspired by illustrations from children's books, newspapers, or wall prints, were not copies. Generally, when Nadia first saw the originals, she studied them attentively and perhaps scribbled back and forth on their outlines. Her reproductions usually appeared a day or so later and could be recognized as versions of the original, although her rendering of the image might be a different size or completely reversed. She had the incredible ability to imitate drawings seen only once as much as several weeks in the past. Amazingly, she was capable of reorienting an object's position so as to show a different angle or side of the original—without ever having experienced it as a real object in three-dimensional form. She drew only line drawings, showing no interest in color or shading, although the drawings which had originally inspired her were often highly colored.

As fascinating as were Nadia's artistic productions, equally fascinating was her method of executing them. Left-handed, Nadia would hold the pen between her thumb and index finger, using her second finger for support in a competent and experienced manner unlike what one would expect from a young child. She placed her face very close to the paper and drew swiftly and deftly, giving an animated appearance quite in contrast to her normally lethargic behavior. She would begin drawing anywhere on the paper and might continue to draw lines straight off the edge—never attempting to "squeeze" the object onto the paper, if there was not enough room. This sometimes resulted in the image's being cut at a vital spot, but she seemed more concerned with preserving the shape and appearance of the form than with completing it on the given sheet of paper. Her fine, quickly executed lines were firm, without sign of unintentional wavering. With apparently highly developed motor control, she could stop a line exactly where it met another, despite the speed with which the line was drawn. Occasionally, a line in one drawing would suggest another subject to her and she would transform it into the beginning line for another subject. Thus, two drawings would appear in the finished product—one on top of the other.

Nadia would signal the end of a drawing session by simply stopping abruptly and pushing the paper away. At times, the image would be but half finished, or she would lose interest because the continuation of her drawn image would lay off the edge of the paper.

Explaining Nadia: Selfe's Hypothesis

In seeking to explain Nadia's extraordinary talent, Selfe focused on the difference between "conceptually dominated" drawing (the type of drawing done normally by young children) and "perceptually dominated" drawing (the type of drawing which Nadia did). Normally, young children, when they draw, appear to be dominated by the need to set down what they *know* about their subject

rather than what they actually can see—a form of intellectual realism. For example, in drawing a car they will include four wheels—regardless of the viewpoint from which the car is supposedly being seen—in an effort to be faithful to their intellectual concept of what a car is. Nadia's drawing, on the other hand, was "perceptually dominated" in that it faithfully recorded the visual information which she received. Lacking any conceptual interpretation, it was a form of photographic realism.

Citing Vygotsky (Vygotsky, 1978), Buhler (Buhler, 1930), and other developmental psychologists, Selfe proposed that Nadia's perceptually dominated drawing was intimately related to her impaired language abilities. She postulated that the development of language in young children—leading to the generalization and categorization fundamental to thinking processes—results in the reorganization of mental life so that conceptual knowledge dominates over concrete images. Nadia's language deficits prevented her from developing concepts with which to interpret the world. She was left, by default, with a perceptually dominated reality—and drawings characterized by photographic realism (Selfe, 1977, 1981).

Since Selfe's analysis of Nadia's talent, there have been some other studies which shed light on artistic savant performance. It may be useful to see what they have to offer in the way of explaining Nadia, as well. . .

Teasing Out IQ-Independent Aspects of Artistic Talent

O'Connor and Hermelin conducted a series of intriguing studies geared toward determining what aspects of savant artistic ability are independent of general intelligence. Outlines of these studies and some of the resultant findings are presented below.

THE IMAGE LEXICON

In one study (O'Connor & Hermelin, 1987a), five savant subjects whose artistic output was judged to be at art school entrance standard were matched for performance and verbal IQ with five control subjects who had no special artistic talent. Subjects were tested on (1) copying a complex abstract design and then reproducing it from memory; (2) completing a short-term visual memory task requiring no drawing; (3) reproducing concrete representational and abstract non-representational line drawings from memory; and (4) identifying incomplete pictures.

For assessing identification of incomplete pictures, line drawings were inserted into a display box and line fragments one square centimeter in size were exposed one after another from different locations on the drawing until the complete picture was visible. Five drawings—a shoe, a sailboat, a cot, a bird, and a goat were included,

and the subjects were asked to identify each in the minimum possible number of exposures, each exposure adding more information. All of the drawings had been taken from the Peabody Picture Vocabulary Test on which all of the subjects had been previously tested. It was known, therefore, that all the subjects could name the test items.

Results suggested that the savants performed markedly better than the control group on those tasks in which the subjects depended on a stored "picture vocabulary" or visual lexicon. Performance levels were lower on tests dealing with non-representational and unfamiliar material. The researchers concluded that:

The superiority of the idiot savant artists, apart from any outstanding graphic representational skill, might, in the case of concrete and previously encoded images, depend on a richer or more easily accessible internal "image lexicon" (O'Connor & Hermelin, 1987a, p. 88).

The richer and more accessible this lexicon, concluded O'Connor and Hermelin, the more successful were the artists in identifying incomplete pictures through imaginative construction on the basis of a minimal cue. The results corresponded interestingly with an earlier study (Hermelin & O'Connor, 1986b) in which it was found that artistically gifted children could identify incomplete pictures on the basis of less information than was required by either mathematically gifted children or control groups matched for IQ level but without special mathematical or artistic talents.

The authors further concluded that savant artists were more efficient at extracting essential features from a design in order to reconstruct and reproduce it than were controls matched on performance and verbal intelligence.

MOTOR PROGRAMS FOR REPRESENTING IMAGES

Another finding emerging from the above study (O'Connor & Hermelin, 1987a) was that the savants performed more impressively when *copying* a design than they did when their visual memory alone was tested. Moreover, memory performance not involving drawing did not significantly distinguish the savants from the control group. The researchers concluded:

These findings taken together may suggest the importance of a motor manipulative or motor output facility in the artists, as well as a superior input analysis or picture lexicon superiority. The nature of the output skill may not be well understood, but the availability to the idiot savant artist of a rich variety of appropriate motor programmes for representing images must be assumed. It is possible that the superior ability of the artist group may lie as much in this motor programming capacity as in perceptual editing and analysis (O'Connor & Hermelin, 1987a, p. 89).

Following up on the motor programming notion, a further study (O'Connor & Hermelin, 1987b) compared the performance of normal artists and controls with savant artists and subnormal IQ controls. Findings suggested that testing visual recognition memory through tasks in which no motor manipulation was involved, resulted in group differences reflecting levels of intelligence, but not differentiating artistic competence. When graphic depiction was involved, however,—whether it was direct copying or reproduction from memory—savant artists performed more like artists of higher IQ's than they did like IQ-matched controls.

In explaining the results, the authors posited that "drawing partly depends on an encoded motor programme which can be primed by the sight of a model but may be relatively independent of visual memory for this shape". They concluded further that: "while visual images seem to be more readily evoked by subjects with high rather than low intelligence, the efficient accessing of graphic motor programmes depends more exclusively on artistic competence" (O'Connor & Hermelin, 1987b, p. 316).

In trying to reconcile these findings with their earlier ones in which it was shown that savant artists can identify incomplete pictures on the basis of minimal visual information (O'Connor & Hermelin, 1987a), the researchers propose that "both this identification skill, as well as drawing ability, depend on a generative process presumably based on ready access to the relevant representational systems. Accordingly, the identification of incomplete pictures and the generation of graphic reproductions would not result in separate input and output processes but would both be produced by the cueing of the appropriate representations" (O'Connor & Hermelin, 1987b, p. 316).

ACCURACY AND ARTISTIC MERIT

A final study (Hermelin & O'Connor, 1990) looked at *accuracy* of drawings (the extent to which the location, orientation, and veracity of elements within the reproduction remained faithful to the original), and *artistic merit*, (liveliness and sensitivity to the object drawn, vitality and character of line and texture, presence of distinct style, organization and composition, and the degree to which a compelling and interesting image is produced). Findings showed that while accuracy of drawings may be related to IQ level, the artistic quality of the graphic production is not.

The above findings provide a new framework within which to view the case study of Nadia. Following is a discussion of how they might apply.

A Brief Second Look at Nadia

THE IMAGE LEXICON

While Nadia's choices of subjects were somewhat limited, the concept of a lexicon may well apply. As

was noted previously, if in the midst of drawing a particular subject, a specific line seemed to remind her of a different subject, she was likely to take off and use it as the starting line for a second drawing. It may be that the line in question tapped into her internal lexicon and precipitated an imaginative construction whereby she completed what was, to her mind, an incomplete picture. Such a lexicon would, of course, also allow her to expertly extract from an original picture the major features necessary for a later reproduction.

MOTOR PROGRAMMING CAPACITY

The physical intensity, swiftness, and deftness with which Nadia executed her drawings would support the notion of a motor programming capacity which was cued by the representation to be drawn.

ACCURACY AND ARTISTIC MERIT

As Selfe pointed out, Nadia's reproductions were *not* copies of the originals. Alterations in orientation or size of the subject were frequent. They did, however, have artistic merit. Thus, the research findings relating accuracy to general intelligence, and artistic merit to some IQ-independent ability is supported by Nadia's performance.

Interestingly enough, none of this necessarily detracts from Selfe's earlier arguments that Nadia's drawings were perceptually rather than conceptually dominated. An intriguing contrast is presented by a young artist whose work might well be seen as a delightful melding of the perceptual and the conceptual—the child prodigy, Wang Yani.

Wang Yani: An Artistic Introduction to a Child's World

5 March. It has drizzled all week, preventing Yani from playing outside. This evening she said to me in a serious tone of voice:

"Post a letter for me, (Daddy)."

"(To whom?)" I enquired.

"I'll paint a picture to be sent to the sun."

"The sun?" I repeated in surprise

"Yes. He'll follow my advice and go with me. And so will the moon: didn't it go with me to Shanghai?" Yani went on: "the sun will take me up with him to play in heaven. He'll carry me on his shoulder and fly at great speed!"

"What is heaven like?" I asked.

"White everywhere. Do you want to go there, too, (Daddy)?"

"I wouldn't dare to."

"But I will! And I'll come back, too." Then she whispered in my ear: "The lazy sun! He only cooks his meals at night, and makes the sky black with the

smoke. He cleans it up in the morning, and it becomes light again."

On hearing this, I roared with laughter, but Yani gazed at me in amazement and insisted, "Yes, (Daddy), that's how it is." (As recorded in Ho, 1989, p. 13; Changes from original diary text bracketed by Ho.)

The above conversation between Wang Yani at the age of four and her father, Wang Shiqiang, was recorded by the father in his diary. It allows a glimpse of this visually perceptive and extraordinarily imaginative child.

Born on May 2, 1975, Yani was raised in one of the most scenic areas of China and introduced to the enchantment and complexity of the natural world at a very young age. She would ride on her father's shoulders, roaming with him among mountains and fields or along the riverbank. They also frequented the zoo to admire the sleeping tiger, the fierce lion, or the beautiful plumage of peacocks and storks. But she fell in love with the busy and lively monkeys who were to become the subject of most of her paintings from the time she was 3 years old until she was 6.

It was from her father that Yani first learned to appreciate the sensuous colors and textures of the natural world. It was also from Wang Shiqiang, who was an oil painter, that she learned to capture them on canvas. Yani started painting rather by accident when she was 2½ years old and accompanying her father on a trip to Nanning, the capital of the province where they lived. While Wang Shiqiang was working in his studio with some colleagues, Yani amused herself by looking through some children's books. Becoming bored after a while, she picked up a piece of charcoal and began to draw on the wall. Then, in imitation of her father, she stepped back with her eyes half-closed, left arm akimbo, and surveyed her work with satisfaction. Everyone present laughed.

From that day, with the support of her father, Yani began her painting career with paper and brush. She painted the flowers and pine trees surrounding her house and the chickens, ducks, dogs and cats in the yard. She also painted portraits of her father. These first paintings, however, were symbolic. They consisted only of dots, circles, and unintelligible lines. Her father noted in his diary that in Wang Yani's paintings, "A circle might represent a person, a still-life, a bird, or some other animal, while an apple could stand for fruit in general" (Ho, 1989, p. 14).

Yani's father decided not to give Yani formal lessons for fear of stymieing her creativity. Instead, he let her learn by herself through observation and trial and error, thereby developing her own style. So as not to influence her work and artistic development, he gave up his own painting career in 1983.

Painting became a passionate involvement for Yani. Everyday she painted ceaselessly until she was completely satisfied. Once, when she was four, she worked

nearly until midnight, refusing to go to bed until she got “the best painting”. She was not willing to go to sleep until she had completed more than ten paintings.

By the time she was 6, Yani had produced four thousand paintings, and her work had won international acclaim (Ho, 1989).

Yani at Her Art

Yani possessed an astounding visual memory. Wang Shiqiang taught her Chinese characters by writing them in the air once with his finger. When Yani, on one of her trips to the zoo became charmed by the beauty of the peacocks, her father told her to figure out why they were so lovely. She studied them for several hours, and upon arriving home, produced beautiful renderings of the birds (Ho, 1989).

Yani began her paintings without any sketch or predetermined theme. Ho describes her method of execution:

Depending on the color of the paint that she picks up on her brush, she then decides what subject is most appropriate, executes her first stroke, and develops a story simultaneously as she paints. It is a wonderful experience to watch Yani paint. She keeps the brush moving unhesitatingly, with occasional pauses only to inspect the overall composition (Ho, 1989, p. 16).

Ho (1989) also talks about the “poetic improvisations” which Yani could create on the spur of the moment. For example, once she accidentally tipped over the brush washer, staining most of her paper with the spilled water. Emptying the rest of the water onto the wet paper, she painted pumpkins and vines over it while making use of the blurring effects to suggest that the pumpkins and vines were lost in a morning mist.

Yani’s varied types of brush strokes, carefully chosen colors, and skillfully planned compositions are used to infuse her images with movement, life, and feeling. Contrasting tones of light and darkness serve to emphasize facial expressions or movements and gestures. Her monkeys are realistically presented. They are covered with soft brown fur and appear capable of imminent action, seemingly caught in the middle of swift movement. Yet they, like her other images, are conceptual, abbreviated, and expressionistic (Ho, 1989).

Ho notes that, like most Chinese artists of the past, Yani does not paint directly from life or try to record any particular peacock, monkey, or tree. Instead, by absorbing, analyzing, and synthesizing sensory impressions from nature, she develops in her mind a store of universalized images from which she then draws in creating her paintings. Yani’s painting, Ho notes, “is a result not only of a praiseworthy mastery of the medium but also of her ability to capture the essentials observed in nature and have them so fixed in her mind that she can re-create them in her painting, endowing them with life,

emotions, and personalities and projecting into them her thoughts, feelings, and dreams” (Ho, 1989, p. 18).

Revealing the Magic of Childhood Through Art

Yani does, indeed, project into her creations her own thoughts. This is one of the most enchanting aspects of her art—Yani’s adult-like mastery of artistic techniques are used to reveal a child’s world. The themes of her paintings are centered around childhood issues. One which she painted at age five, shows a baby monkey kneeling on his mother’s back and feeding her a piece of fruit. It is entitled “This Is For Mommy”. Another painted at that same age shows a single monkey looking straight at the viewer with a determined look on its face, its feet planted solidly as if waiting defiantly. He is flanked by two other monkeys caught in incipient motion, holding stylus-shaped objects and about to intrude into the space of the first monkey. It is entitled “I Am Not Scared! (Inoculation)”. Other paintings show monkeys having parties or playing tug-of-war.

Yani’s imagination plays a pervasive role in her creative process. Part of that imagination consists of language-shaped concepts which serve to formulate the story line and relationships between her figures as the painting develops. She is, in this respect, unlike either savants whose drawings emerge isolated from the influence of language, or even normal children, whose drawings are often created in an effort to illustrate a previously developed story or experienced event (Selfe, 1983). Instead, Yani enters the world of her creatures and lives with them the experience she is creating with paper and brush. Thus, Goldsmith and Feldman (1989) write:

... she “fed” her beloved ink monkeys with fruit, in the process creating wonderful compositions of monkeys plucking, scrambling, and yearning for food. Sometimes her father would even hear her chiding the painted images to behave, because she was about to share (that is, paint) their fruit. So, too, her paintings became populated with peacocks, cranes, and butterflies to amuse and befriend the monkeys . . . according to Wang Shiqiang, these companions appeared in her compositions only after Yani’s own social world had expanded to include friends and experiences beyond the family constellation (Goldsmith & Feldman, 1989, p. 57).

Conceptual and Perceptual Influences

The interplay of the conceptual and the perceptual in Yani’s creations is beautifully illustrated by the tale of the leafless trees originally told by her father:

Noting that Yani omitted leaves from her paintings of fruit trees, Wang took his daughter to an orchard so she could observe trees from nature. Yani, however, casually dismissed the arboreal reality, claiming

that she did not paint leaves on her trees because monkeys did not like their taste. Some time later Yani listened carefully as a botanist explained how leaves help supply energy to the tree, thereby allowing its fruit to grow. This sensible explanation was apparently sufficient for Yani to reconsider leaves on her trees. Despite her familiarity with how real fruit trees looked, the botanist's explanation was so compelling that she painted the fruit growing directly from the leaves themselves (Goldsmith & Feldman, 1989).

In her earlier paintings, her monkeys served as playmates or even substitutes for Yani and her family. As Yani grew older and more capable of seeing the world more objectively, however, the subjects of her paintings began to reflect more specific and realistic explorations of the social world. By age seven or eight, she no longer had to rely on psychological activity among her figures to generate interest and coherence, as she had become able to create an integrated composition using only formal elements (Goldsmith & Feldman, 1989).

In thinking about Yani, one senses a number of intriguing likenesses and differences between her artwork and the creative process producing it and the formerly discussed productions of Nadia. Below, these likenesses and differences are considered with a more critical eye.

Yani and Nadia: Comparison and Contrast

Following, a number of likenesses between the work of Yani and that of Nadia are discussed.

THE IMAGE LEXICON, UNIVERSAL IMAGES, AND "ARTISTIC SYNTAX"

Neither Nadia nor Yani painted predominantly from life nor duplicated exactly what was seen. Instead, each drew upon "an image lexicon" (O'Connor & Hermelin, 1987a) or an accumulated store of "universal images" (Ho, 1989) in creating her artwork. This basic store of images provides the elements with which each constructed her artistic creations. Reminiscent of the role played by absolute pitch for Eddie and Erwin (Miller, 1989), these images provide a foundation for the development of higher order visual structures and a basis for higher order pattern extraction from the visual world.¹

We thus find at the core of both music and art a syntactical structure functionally equivalent to the one we find in language. Both Yani and Nadia seem to

have assimilated it intuitively—just as Eddie and Erwin assimilated "musical syntax" (Miller, 1989), and just as the language comprehension and expression of normal children the world over reflects an intuitive grasp of the syntactical rules of language.

Both Nadia and Yani also showed the capacity for imaginative construction on the basis of minimal cues: Nadia would use a line originally drawn to define one subject to begin the outline of a totally different subject. Yani, on the other hand, used the after-effects of spilled water on her paper to give the impression of mist-enveloped pumpkins and vines. While Nadia worked within the confining framework of the structural possibilities inherent in line relationships (White, 1988), Yani included more varied dimensions of visual experience (e.g., color, shading, etc.) as potential "cues".

MOTOR PROGRAMS FOR REPRESENTING IMAGES

Ho's description of the sureness and quickness with which Yani paints—"She keeps the brush moving unhesitantly" (Ho, 1989, p. 16)—suggests that Yani, like Nadia, efficiently accesses a variety of appropriate motor programs for representing images (O'Connor & Hermelin, 1987a, 1987b).

There are, however, important differences between Nadia and Yani.

ARTISTIC DEVELOPMENT

Yani's artistic development began with the symbolic drawings typical of the young child. Her developmental progression in the production of artwork was a normal one, although it took place at a much more rapid pace than we would expect for a young child. This pattern is a typical one for young prodigies (Feldman, 1980, 1986). Nadia's images, however, were depicted with photographic realism from the beginning.

Yani's imaginative intellect and conceptual keenness permeate her artwork. Art becomes a medium through which she expresses her feelings and understanding—interpreting and sharing her inner world with the viewer. And as her own world grows and develops, we find that her artwork reflects these changes in her. Although we are impressed with the technical renderings of Nadia, her inner world remains a mystery. Selfe points out that although Nadia's cockerels might appear fierce and eloquent, there is no indication that Nadia drew them with that intention. The viewer may choose to imbue Nadia's creations with such concepts and interpretations, but it still remains that one has no basis on which to impute such sophisticated notions to her (Selfe, 1983).

¹Just as absolute pitch may have formed a foundation for Mozart's extraordinary musical memory, so an unusually rich and accessible store of universal images may have aided the memory of the artist Michelangelo, who, according to historical accounts, was most probably a child prodigy. In 1550, Giorgio

Vasari, who knew the great Renaissance artist personally, wrote that Michelangelo had such an outstanding visual memory that he could retain in detail the works of other artists which he had only seen once. Since he also remembered everything he had ever produced, he never repeated himself (Vasari, 1957).

THE ARTIST IN ACTION

Finally, of course, seeing each of these children in action is a strikingly different experience. Each involves herself in the art experience with intensity and focus; but each does so in a very different way. Young Yani steps herself in the conceptual story line-in-progress, evoking feelings from her own experience to transfer to canvas, and providing animated on-going commentary. Nadia, on the other hand, is concentrated and mute—seemingly dominated by the perceptual aspects of the task at hand. She is apparently impervious to the external world with its extended meanings, emotions, and metaphors. Not even the edge of her paper can intervene in her fidelity, to perceptual reality and the strangely necessary production of her line drawings.

Each of these young children manifests a sort of perfectionistic involvement with their art. It is evident in the incident where four-year-old Yani, swept up in the passion of her art, refused to go to bed until she produced “the very best painting”. Yani’s perfectionism has to do with trying to reach a self-set conceptual goal: “the very best painting”. Nadia’s “perfectionism” is of a different type—more fundamental, less interpretive, bound up with her fidelity to perceptual rather than conceptual reality—and perhaps less removed from some underlying generative neurological substrate. When faced with the edge of the paper on which she is drawing, she will either continue the lines of her image past it or will stop, thereby abruptly terminating and truncating the image. She *will not* (or *cannot*) compromise by distorting the image so that it fits onto the paper.

ROLE OF ENVIRONMENTAL INFLUENCES

Here is another difference: Nadia’s talent appears suddenly and mysteriously—unevoked by external stimuli, unconnected with family history. It seems driven by biological necessity and constrained and shaped by forces within Nadia. Her mother, who provides paper and ball-point pen at appropriate moments, is a supportive influence, of course. But because of Nadia’s basic impermeability, her mother remains at best a tangential one. Not so with Yani’s father. Like most parents of prodigies, he is a central catalyst for the development of Yani’s talent. He introduces her to the world of art—a world with which he is intimately acquainted—and he sensitively supports and nurtures her growth.

Yani is also subtly—or not so subtly—influenced by the artistic traditions of her culture. Her artwork is executed with traditional Chinese brush and paper. And the animation and vitality characteristic of her figures typifies the Chinese ideal of art (Ho, 1989). Of course, it is clear that Yani’s talents are as rooted in biology as are Nadia’s. But Yani is, as well, enthusiastically responsive to the influences of her society and culture.

Having looked more carefully at Yani and Nadia, it is time to consider the possible neurological substrates giving rise to the talents of prodigious savants and

prodigies. This is necessarily a speculative discussion, since there is not sufficient research to allow for definitive conclusions. Nevertheless, one can make some educated inferences. Perhaps an appropriate place to begin is with Treffert’s analysis of what creates the prodigious savant. . .

The Prodigious Savant: A Possible Explanation

Drawing upon the research of Geschwind and Galaburda (Geschwind & Galaburda, 1987), Treffert (Treffert, 1989) posits an intriguing explanation for the prodigious savant. He suggests that pre- or post-natal injury to the left hemisphere of the brain stimulates compensatory growth in the right hemisphere. This is manifested through deficits in language and analytic thought (both of which are dominated by the left hemisphere) and increased capacity for functions dominated by the right hemisphere (e.g., musical and spatial abilities).

Treffert proposes further that savant memory is the manifestation of compensatory brain circuitry. Injury to the cerebral cortex, which normally manages conscious associative memory, results in memory functions being shifted to the *corticostriatal system*, a more primitive area of the brain. Memory consequently becomes non-associative, habitual, emotionless, and non-volitional. It becomes a conditioned response.

Treffert points out, however, that these alterations in brain function and circuitry still fail to explain the prodigious savant’s extensive access to the structural rules of domains. He speculates that such access may be based on an inherited ancestral memory transmitted across generations. Domain-specific in nature, it is inherited separately from general intelligence. Once the groundwork is laid for savant skills, concludes Treffert, intense concentration, obsessive repetition, external reinforcement, and an unstoppable drive to exercise the special ability combine to produce the prodigious savant.

It would appear from what we have seen of Erwin and Yani, that the prodigy shares with the savant certain underlying neurological characteristics allowing for their “intuitive” connection with specific domains. Perhaps, like the savant, the prodigy enjoys heightened right brain functioning. The prodigy, however, differs in that he or she possesses a well-functioning fully integrated brain. The left hemisphere remains intact. Based on what is known about the savant and on what can be gleaned from accumulated brain research, can one come any closer to understanding the brain functioning of the prodigy? Perhaps one can. And perhaps a short digression into some research on the split-brain is a good place to start.

Insights From Split-Brain Research

It was in the early 1960s that the first in-depth psychological studies of “split-brain patients” were conducted. The individuals being studied had undergone surgery

to treat incapacitating epilepsy by severing the corpus callosum, the bridge of nerve fibres connecting the two hemispheres of the brain. Post surgical studies revealed that after the hemispheres were divided to control intractable epilepsy, each half brain behaved independently—and without knowledge—of the other. Moreover, each half brain seemed specialized for particular kinds of mental activity. The left was specialized for language, while the right seemed more able to deal with other functions (e.g., visuo-spatial tasks) (Gazzaniga, 1992; Gazzaniga & LeDoux, 1979). Some chose to elaborate these differences into a delineation of the verbal left hemisphere as functioning in a sequential, logical, analytic, and rational manner; whereas, the functioning of the non-verbal right hemisphere began to be seen as simultaneous, spatial, holistic, synthetic, and intuitive (Springer & Deutsch, 1981).

As the work has evolved, it appears that only the left hemisphere can make causal inferences, apprehend complex linguistic constructions, or provide the underlying brain organization allowing for high-level consciousness and belief formation. The left brain also serves an integrating and interpreting function for what we now know are the numerous modular subsystems comprising the human brain (Gazzaniga, 1992). The results of one particular study will clarify what this implies. . . .

In the early 1970s, Michael Gazzaniga and his associates devised a simultaneous concept test to be used with split-brain subjects (Gazzaniga, 1992). In the task, the subject is shown two pictures, one exclusively to the left hemisphere and one exclusively to the right, and then asked to choose from an array of pictures placed in full view of him the ones associated with the pictures lateralized to the left and right brain.

In one such test session, a picture of a chicken claw was flashed to the left hemisphere, while a picture of a snow scene was flashed to the right hemisphere. The appropriate selections, of course, would be a chicken for the chicken claw and a shovel for the snow scene. The subject responded by choosing the shovel with the left hand (the left hand is controlled by the right hemisphere) and the chicken with the right hand (the right hand is controlled by the left hemisphere). Thus, the non-verbal right hemisphere matched the shovel with the snow scene. When the subject was asked why he chose these items, his left hemisphere replied, "Oh, that's simple. The chicken claw goes with the chicken, and you need a shovel to clean out the chicken shed." Thus, the left brain, observing the left hand's response, interpreted that response into a context consistent with its sphere of knowledge—which did not include information about the snow scene shown only to the right hemisphere.

The left hemisphere also integrates emotional responses into conscious awareness, providing an interpretive framework for understanding them. For example, in one test, a film of one person throwing

another into a fire was shown to the right hemisphere of a subject. She reacted "I don't really know what I saw. I think just a white flash. Maybe some trees, red trees like in the fall. I don't know why, but I feel kind of scared. I feel jumpy. I don't like this room, or maybe it's you getting me nervous." She then commented to a colleague out of earshot of the researcher "I know I like Dr Gazzaniga, but right now I'm scared of him for some reason." The emotional valence of the stimulus had crossed over from the right to the left hemisphere. While the left hemisphere remained unaware of the content producing the emotional change, it still experienced and had to deal with and interpret the emotion (Gazzaniga, 1992).

The Split-Brain, Savants, and Prodigies

The split-brain research revealing the interpretive and integrative functions of the left hemisphere perhaps provides an expanded vision of brain functioning in savants. The damage to the left hemisphere which Treffert sees as precipitating right hemispheric compensation with resultant savant functioning is seen also as impairing—or destroying (depending on the degree of damage)—the left hemisphere's capacity to interpret and integrate activity within the brain. The result is a lack of metacognitive ability, an example of which is the savant calculating twins who, when asked how they did what they did, simply replied "It's in my head and I do it" (Hamblin, 1966, p. 107). This is a stark contrast to calculating prodigies, who consciously recall exploring the relationships between numbers (Treffert, 1989), and who can often recount rule-based strategies for calculation (Aitken, 1954), and even feel differential emotional responses toward various numbers (Smith, 1983).

Awareness of the left brain as interpreter and integrator also provides a better appreciation of what may be going on in Yani when she paints. In her ongoing verbal commentary accompanying the act of painting, one can see the left brain deftly integrating Yani's recollections of her own experiences and her emotional responses to them with her sensory responses to the possibilities of the media. Meanwhile, the right brain is contributing to the process by accessing Yani's store of universal images and her range of motor programs to allow for the execution of the artwork. As Yani's images appear on the paper, the left brain is simultaneously interpreting the process through an ongoing story about what is going on in the painting. It is a complex multi-dimensional interaction involving the dialectical interplay of right and left-brain functions.

Domain-Specific and General Intelligence: A Reintegration of the Dichotomy

Seeing Yani at work is seeing artistic functioning at its fullest. The infusion of referential meaning and emotion into her work lends it a richness and depth

which touches our hearts while the images please our eyes. While domain-specific skills are involved in the creation of the artwork, the end result is much more than the activation of such skills. It is the expression of the totality of Yani.

We are thus brought back to an original issue: the issue of recasting our beliefs about general intelligence and giftedness in the light of what we know about domain-specific talents. Possibly, the savant provides us with an opportunity to observe domain-specificity in its purest form. Perhaps the purest essence of domain-specific talent is the ability to holistically intuit the syntactic core of rules and regularities lying at the heart of a domain of knowledge: the pattern of relationships between numbers, the pattern of tones in a musical scale, the pattern of images in the visual world, the pattern of words in a language. Other aspects may be necessary, depending on the domain in question—a repertoire of motor programs for the expression of artistic—or musical (Bamberger, 1982)—themes, for example.

In the prodigy, we see this same domain-specific talent. But through the facilitation of general intellectual capacities, it becomes enlarged, embellished, imbued with meaning, intimately connected with both the phenomenological reality of the child (Morelock, 1992, in press; Silverman, 1992) and the materialistic reality of the external world. The gift lies within Yani, and its expression is the product of an integrated brain. This is what real giftedness is all about.

Afterword: Directions for Possible Research

Comparative studies of prodigies and savants may well yield much enlightening information about human cognition. More case studies, such as the one conducted by Miller (1989), need to be completed in music as well as in other domains which spawn both prodigies and savants. Additional longitudinal case studies tracing long-term development of prodigies and savants and aiming for a comprehensive contextual understanding are needed (e.g., Feldman, 1980, 1986). Laboratory research of the type originally designed by O'Connor and Hermelin (Hermelin & O'Connor, 1986a, 1986b, 1990; O'Connor, 1989; O'Connor & Hermelin, 1984, 1987a, 1987b, 1990) needs to be expanded to include prodigies as well as savants and normal gifted individuals. New research designs need to be developed so that domain-specific abilities within a wider variety of domains can be explored.

The use of brain-imaging techniques for the comparative assessment of brain activity, brain anatomy, and behavioral performance in savants and prodigies, as well as in children of extraordinarily high IQ (Morelock, in press) and other gifted individuals (Crist, 1990) could be instrumental in replacing some of our speculative inferences with hard data.

And finally, research into the structural cores of various domains may shed light on the human capacities

which both create those structures and respond to them (Goldsmith & Feldman, 1988).

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PART III

Identification of Giftedness and Talent

Procedures for Identifying Intellectual Potential in the Gifted: A Perspective on Alternative “Metaphors of Mind”

ROBERT J. STERNBERG

Department of Psychology, Yale University, New Haven, Connecticut, U.S.A.

Introduction

What do we mean by “giftedness”, and how do we assess it? Why is a child who scores in the top 1% on the Wechsler Intelligence Scale for Children much more likely to be labeled as gifted than a child whose 100-meter sprinting time places her in the top 1% of her age cohort? Why is a physicist who is considered number 1 in the country by his peers or another panel of judges considered gifted, whereas the criminal who is number 1 on the FBI’s most-wanted list is not? Why do contestants in major beauty contests have to answer questions about issues perceived to be of domestic or international importance, whereas contestants in the major scientific competitions do not have to submit to judgments of their personal attractiveness?

In this chapter, I will deal with the questions of how we decide what to assess in the identification of the gifted, and with alternative approaches to such assessment. The chapter is divided into three main parts. In the first,

I will consider the criteria used to assign the label of “giftedness”. In the second part, I will consider alternative perspectives on intellectual giftedness, and the kinds of measures that derive from each. In the third part, I will draw some conclusions.

The Criteria of Giftedness

I have proposed that the label of “giftedness” is assigned on the basis of five criteria (Sternberg, in press). According to this “pentagonal implicit theory of giftedness”, to be judged as gifted, a person needs to meet five criteria (Fig. 1): (1) the excellence criterion, (2) the rarity criterion, (3) the productivity criterion, (4) the demonstrability criterion, and (5) the value criterion.

(1) *The Excellence Criterion.* The excellence criterion states that the individual is *superior in some dimension or set of dimensions relative to peers.*

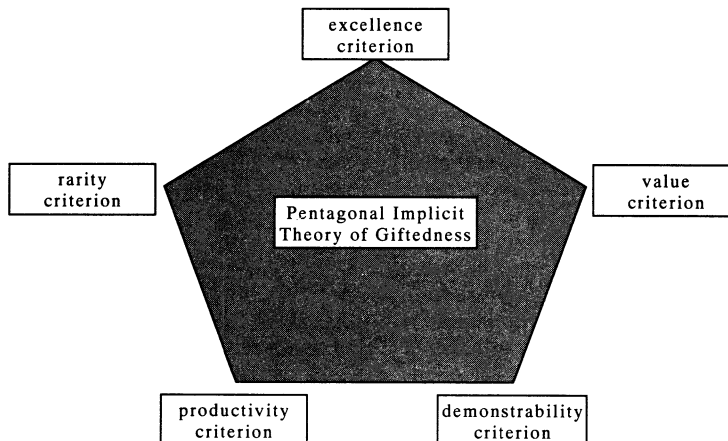


FIGURE 1. The five individually necessary and jointly sufficient criteria of the pentagonal implicit theory of giftedness

To be gifted, one has to be extremely good at something—in psychological terminology, high in a judged dimension or dimensions. How high is “extremely high” may vary from one context to another, but the gifted person is always perceived to be abundant in something, whether it be creativity, wisdom, or another skill or construct. In the present view, excellence relative to peers is a necessary condition for an individual to be labeled as gifted.

The qualification “relative to peers” is necessary because the designation of excellence depends upon the skills of those against whom one is judged. A 10-year-old’s raw score on an intelligence test might convert into a very high score relative to age peers, but would seem unexceptional relative to children five years older than he is. Similarly, a musical performance that would be exceptional for an eight-year-old taking weekly music lessons at school might be quite undistinguished for an eight-year-old who has been trained at a conservatory since age four.

At times, more than one peer group might be relevant. For example, consider all of the children in a class for the gifted. They were all judged as gifted relative to their general age peers, perhaps within a given grade. But relative to each other, the weakest of them might not seem very gifted. Indeed, anyone who has taught a class of gifted children knows that many of them start having self-esteem problems quite quickly when they discover, sometimes for the first time, that they are no longer at the top of the class.

One potentially important issue is that of which direction on a linear scale constitutes excellence, an issue which is usually consensually defined by those making judgments about what kind of work qualifies as “high level”. Most of us have had experiences in which we were scored low in a dimension, though we suspected that the judges had somehow gotten the direction of the scale backward. For example, a painting we believe to be highly creative might be viewed as pedestrian by judges. Or a conservative business might give promotions and raises to employees who toe the company line and never actually do anything on their own initiative. It is worth remembering that judgments may differ as to which direction indicates superior performance, and as to who exhibits it.

(2) *The Rarity Criterion.* The rarity criterion states that in order to be labeled as gifted, an individual must possess a *high level of an attribute that is rare relative to peers.*

The rarity criterion is needed to supplement the excellence criterion because a person may show an abundance of a given attribute, but if a high evaluation of that attribute is not judged to be rare, the person is not viewed as gifted. Suppose we give a test of mastery of the basics of the English language to a class of college seniors at a good university. They should all score very highly on the test, because all are fully proficient in the basics of English. But even if all received perfect scores, we would not say they are all therefore gifted. Even if

one scores very well, unless high scores are rare, the high scorer is not likely to be viewed as gifted.

Consider, for example, a highly platykurtic score distribution, which is flat and spread out. Thus, there are more high scores and low scores than would be typical of the mesokurtic (bell-shaped) normal distribution. Someone with a high score on the platykurtic distribution is less likely to be evaluated as gifted than someone with an equally high score on a mesokurtic and especially a leptokurtic distribution, in which scores are bunched in the middle. What matters here is not just the superior performance, but its frequency relative to peers. Ultimately, we are led back to the old saying that in the kingdom of the blind, the one-eyed man is king. What is high and rare in terms of ability in one milieu may be undistinguished and even below average in another.

(3) *The Productivity Criterion.* The productivity criterion states that *the dimension(s) along which the individual is evaluated as superior must lead to or potentially lead to productivity.*

Consider again the contestants in the beauty contest. Why is it that they must answer questions about issues of the day, rather than merely being judged solely on their appearance? In fact, appearance probably is the major determinant in the contest, so why is it not sufficient? Despite the fact that the contest is really about beauty, beauty in itself is not perceived as productive or potentially productive. The contestant needs to demonstrate that she can *do* something beyond just looking good. In contrast, the contestant in a scientific competition is not judged on other dimensions such as personal appearance, because the scientific work itself—the basis of the contest—is viewed as productive.

The productivity criterion generates disagreements over exactly who should be labeled as gifted. Some, for example, believe that a high score on an intelligence test is not sufficient grounds for labeling a person as gifted. These people see the tests as meaningless (e.g., Gardner, 1983). The high-scoring person hasn’t shown that he or she can “do” anything. To others, getting a high score on the test is viewed as doing something in and of itself. At worst, the high score shows the person’s potential for productivity.

In childhood, of course, it is possible to be labeled as gifted without having been productive. In fact, children are typically judged largely on potential rather than actual productivity. As people get older, however, the relative weights of potential and actualized potential change, with more emphasis placed on actual productivity. Any number of gifted children become rather ordinary adults whom no one thinks of as exceptional. Renzulli (1986) has referred to such adults as “schoolhouse gifted”. At cocktail parties, one may find out their high school standardized test scores in short order, but little by way of accomplishment afterward.

However, the importance of potential probably never disappears as a consideration. For example, when one hires a senior manager, or a senior scholar, one does

so partly on the basis of past accomplishments, but largely on the hope that these past accomplishments are predictors of future performance.

An interesting example of fulfillment of the productivity criterion is Marilyn Vos Savant, who is listed in the Guinness Book of World Records for having the highest recorded IQ. Did this make her a gifted adult? Perhaps not, according to conventional standards of adult giftedness. But Vos Savant has shown that she is a rather gifted entrepreneur, turning a high score in childhood into a small business of sorts, using it to obtain fame and a column in *Parade* magazine. So according to the pentagonal theory, she has shown productivity as an adult, as a quiz-column entrepreneur.

People who do not realize their potential through some kind of productive work may still be labeled as gifted; but with qualifications. They are seen as gifted individuals whose gifts somehow failed to materialize, or stopped materializing at some point. Or these people may ultimately be viewed as having been mislabeled. From our point of view here, the critical issue is that at some time they were being labeled as gifted because of their potential for producing something. They may continue to be labeled as gifted so long as that potential exists, realized or not. If they are viewed as having utterly lost that potential (e.g., through the results of a stroke), they will probably no longer be referred to as gifted, except in the past tense. One is more likely to say of a brain-damaged physicist, for example, that "she was a gifted physicist, but . . .".

In sum, to be labeled as gifted, a person must have the potential for productive work in some domain. People without such potential, no matter how excellent they are in some aspect or how rare that aspect is, are not labeled as gifted.

(4) *The Demonstrability Criterion.* The demonstrability criterion states that the *superiority of the individual on the dimension(s) which determine giftedness must be demonstrable through one or more tests that are valid assessments.*

The individual needs to be able to demonstrate, in one way or another, that he or she really has the abilities or achievements which led to the judgment of "giftedness". Simply claiming giftedness is not enough. Thus, a person who scores poorly on all measures used in assessment, and who is unable to demonstrate in any compelling alternative way that he does indeed have special abilities, will not be viewed as gifted.

The assessment instrument(s) used, however, must be both valid and reliable. Consider the importance of validity and reliability.

Validity means that each instrument is believed to measure what it is supposed to measure. If, for example, a child presents a high score on a new intelligence test that requires only that the child dot i's, the result will not be valid. Dotting is not an acceptable measure of intelligence. Or suppose that a job candidate gives a brilliant job talk, suggesting unusual gifts both in research and in presentation. But then, when asked

about the content of the talk, he is unable even to answer the simplest of questions. Gradually, members of the audience conclude that the job candidate was somehow programmed, probably by his advisor. In fact, he has no idea of what he was talking about. The job talk would then be invalid as a measure of the candidate, because it did not actually reflect his gifts (or lack thereof).

Validity is also critical in cases in which outside factors are taken into account when judging responsibility for a performance or demonstration of ability. For example, personal background is sometimes taken into account in interpreting what scores on an assessment mean. Admissions and scholarship offices often consider the kind of environment a person comes from in making decisions about admissions and financial aid. Two people with exactly the same demonstrated abilities and achievements would very likely not be judged as equal if one comes from an inner-city ghetto providing virtually no opportunities, and the other hails from a very wealthy, upper socio-economic class suburb with practically unlimited opportunities. The extent to which the two individuals may be treated differently is a reflection of the view that identical scores on the same assessments in fact do not necessarily mean the same thing because of external factors.

The validity issue has become extremely important in recent years in the identification of intellectually gifted schoolchildren. In the past, many schools were content to use standardized intelligence tests, and perhaps grades in school and scores on achievement tests, as bases for identifying children as intellectually gifted. As the focus of testing has been shifting more and more toward an emphasis on performance- and product-based assessment, however, some have questioned the validity of the traditional measures (e.g., Gardner, 1983; Renzulli, 1986). Someone who would have been labeled as gifted under traditional measures before might not now be so labeled. The implicit theory of giftedness may not have changed, but what is considered valid as a demonstration of giftedness may have.

Reliability of measurement implies that the same person should receive the same score on a test time after time under similar conditions. It guarantees against strokes of luck or even a rare confluence of circumstances that leads to a high measurement of ability. If an individual performs at a superior level on a multiple-choice military entrance exam, but is never able to repeat anything close to that performance, one is likely to conclude that he simply had a lucky day. Perhaps his guesses just happened to pay off that day. Or perhaps the circumstances of testing were just right and every possible factor that could work in his favor did, something that will never happen again. In the latter case, the test result might even have been valid for that moment, but because the result is not replicable, he does not meet the demonstrability criterion.

(5) *The Value Criterion.* The value criterion states that for a person to be labeled as gifted, *the person must show superior performance in a dimension*

that is valued for that person by his or her society.

The value criterion restricts the label of giftedness to those who hold attributes that are valued as relevant to giftedness. An academic considered to be brilliant may publish papers prolifically, churning out a new article every few months. These papers, however, are rarely cited by other academics. They are being read, but they are not causing any ripples in the surface of the academic pond. Is she gifted? This professor has a rare intelligence and knowledge which she has devoted her life to developing. Certainly she is quite productive. To the outside world she may appear quite gifted. But a hallmark of the significance of an academic journal article is its stimulating effect on other researchers—does it spark fresh perspectives on their own work, or open up new areas of inquiry? If not, then the work may not be valued by peers, and in this case, the academic will not be considered gifted by them.

The individual who is number 1 on the FBI's most wanted list might be superior in one or more dimensions, rare in his ability to perform certain malevolent acts, and able to demonstrate his skills upon demand. He may even be highly productive, if in a criminal way. But because what he is so good at is not valued by society at large, he is not likely to be labeled as gifted by the American populace. Still, it is quite possible that he would be labeled as gifted by a pack of thieves; the pentagonal theory allows that what is prized as a basis for giftedness may differ from one culture or even subculture to another.

Some readers will be uncomfortable with the relativism of this stance. Was Hitler gifted if neo-Nazis believe him to have been? How about Stalin? Is there not some absolute moral basis for screening them out? And what about changing esthetic tastes? We occasionally look back and see cases of unappreciated giftedness. Johannes Sebastian Bach was not viewed as eminently gifted in his day, but now he is; many artists only achieve fame and recognition posthumously. Furthermore, there are cases of people viewed as gifted in their time who ultimately made little mark in history of their field; the composer Salieri, for example. And who is qualified to judge giftedness, anyway?

There is an answer to these problems, but it is not an absolute one.

The pentagonal theory allows us to say that people of another place or time have erred in their evaluations of a person's gifts. If we do so, it is true that we are claiming a privileged position with regard to the identification of someone as gifted. We are arguing that our values are right because those of certain others were wrong, or because these others did not have access to information we now have. In either of these cases, we are claiming the privilege of being in a superior position to judge. What we must realize, of course, is that others may do the same with respect to us in some other time or place.

Implicit theories by nature are relativistic; there is never any guarantee that people's personal values will

match across time and space. But implicit theories, as noted above, provide the best practical form or structure by which to identify the gifted. For a judgment to occur according to strict standards, one needs to add content to implicit theories. This is the role of explicit theories, considered next.

Alternative Views of Intelligence and Giftedness

The remainder of the chapter is divided into two major parts. In the first, I will consider two main historical traditions in the testing of intelligence, both in terms of the theories of intelligence upon which much later work was based, and in terms of the tests that emanated from these theories. In the second part, I will consider alternative metaphors of mind and how they have influenced the testing of intelligence.

Historical Views of Intelligence and Giftedness

If current thinking about the nature of intelligence owes a debt to any scholars, the debt is to Sir Francis Galton and to Alfred Binet. These two investigators—Galton at the end of the nineteenth century and Binet at the beginning of the twentieth century—have had a profound impact on our thinking about intelligence, an impact that carries down to the present day. Many present conflicts regarding the nature of intelligence can be traced to conflicts between Galton and Binet. To understand contemporary thinking about and measurement of intelligence and giftedness, one needs to know how Galton and Binet conceived of intelligence.

Sir Francis Galton's View of Intelligence

GALTON'S THEORY

Galton (1883) believed two general qualities distinguished the more from the less intellectually able. The first was *energy*, or the capacity for labor. Galton believed that intellectually gifted individuals in a variety of fields were characterized by remarkable levels of energy. His second general quality was *sensitivity*. Galton observed that the more sensitive the senses are with respect to differences in luminescence, pitch, odor, or whatever, the larger is the range of information on which intelligence can act. Galton also believed that intellectual gifts were inherited rather than environmentally determined.

GALTON'S TESTS OF INTELLIGENCE

For seven years (1884–1890), Galton maintained an anthropometric laboratory at the South Kensington Museum in London where, for a small fee, visitors could have themselves measured on a variety

of psychophysical tests. One such test was weight discrimination. The apparatus consisted of a number of cases of cartridges, filled with alternative layers of shot, wool, and wadding. The cases were all identical in appearance, and differed only in their weights. Subjects were tested by a sequencing task. They were given three cases, and with their eyes closed, had to arrange them in proper order of weight. The weights formed a geometric series of heaviness, and the examiner recorded the finest interval that an examinee could discriminate. Galton suggested that similar geometric sequences could be used for testing other senses, such as touch and taste. With touch, Galton proposed the use of wire-work of various degrees of fineness, whereas for taste, he proposed the use of stock bottles of solutions of salt of various strength. For olfaction, he suggested the use of bottles of attar of rose in various degrees of dilution.

James McKean Cattell brought many of Galton's ideas across the Atlantic to the United States. Cattell (1890) proposed a series of fifty psychophysical tests, such as the greatest possible pressure one could achieve by squeezing one's hand and the distance on the skin by which two points must be separated in order for them to be felt as separate points. Thus, Cattell took Galton's theory and refined the measures that could be used to assess intelligence, based on this theory.

Psychophysical tests find little or no place in modern-day tests of intelligence as administered in schools and in industry. The coup-de-grace was administered by a student in Cattell's own laboratory. Clark Wissler (1901) proposed that Cattell's tests should correlate both with each other and with external criteria of academic success, such as grades in the undergraduate program at Columbia University. Wissler found a sample of Cattell's tests to correlate with each other only at the level that would be expected as a result of a distribution corresponding to the laws of chance. Moreover, he found that whereas students' grades in college correlated with each other at a very high level, they showed only trivial correlations with the mental tests of Cattell, as based on the work of Galton. Wissler concluded that his tests told us nothing about the general ability of college students, and indeed, he interpreted his results as casting doubt on the notion that there even exists such a thing as general intelligence. Ironically, the relative intellectual giftedness of the students tested (Columbia was and still is a highly selective university) may have restricted range and resulted in correlations lower than the true ones.

Let us approach the Galtonian view from the standpoint of the pentagonal implicit theory discussed earlier. According to Galton's theory, the *excellence* and *rarity* criteria discussed earlier were in terms of psychophysical skills. *Demonstrability* was easy: Subjects took psychophysical tests that measured these skills. But was Galton (and later Cattell) *valuing* the kind of skill that would later give rise to intellectual *productivity* (the two other criteria of the pentagonal

implicit theory)? Many people thought not, among them Alfred Binet.

Alfred Binet's View of Intelligence

BINET'S THEORY

Binet and Simon (1916) theorized that intelligent thought is composed of three distinct elements: direction, adaptation, and criticism. Direction consists of knowing what has to be done and how it is to be accomplished. When we are required to add two numbers, for example, we give ourselves a series of instructions on how to proceed, and these instructions form the direction of thought. The direction need not be conscious. Adaptation refers to one's selection and monitoring of one's strategy during the course of task performance. Criticism, or control, is the ability to criticize one's own thoughts and actions. Binet and Simon (1916) believed much of this ability to be exercised beneath the conscious level. The above formulation should make clear that, contrary to the contemporary conventional wisdom, Binet was not atheoretical in his approach to intelligence and its development. On the contrary, he and Simon conceived of intelligence in ways that were theoretically sophisticated—more so than much of the work that followed theirs—and that resembled in content much of the most recent thinking regarding metacognitive information processing. Whatever may be the distinction between the thinking of Binet and that of Galton, it is not that Galton was theoretically motivated and that Binet was not. If anything, Binet had a more well-developed theory of the nature of intelligence than did Galton. Instead, the distinction was in the way these scientists selected items for the tests that they proposed to measure intelligence, and in the degree of correspondence between theory and test.

BINET'S TEST OF INTELLIGENCE

The Binet tests, as revised in the United States by Lewis Terman, consisted of a variety of exercises that measure higher order thinking abilities. For example, at the two-year-old level, children might be required to put circular, square, and triangular pieces into holes on a board of appropriate shape, or to identify parts of the body. At age eight, tests include defining words, recognizing why each of a set of statements is foolish, and requiring children to say how each of two objects is the same as, and different from, the other. By age fourteen, tests have become more complicated, and include, beside vocabulary, tests such as reasoning, requiring solution of arithmetic word problems, and ingenuity, requiring individuals to indicate the series of steps that could be used to pour a given amount of water from one container to another.

Galton chose test items so that they would correspond quite closely to his theory of intelligence in terms of

psychophysical ability. Binet chose items to measure the judgmental abilities upon which his theory focused, but these items were also chosen so that they would differentiate between the performance of children of different ages or mental capacities as well as be intercorrelated with each other at a reasonable level.

Binet's tests were not as closely allied to his theory as were Galton's. Binet valued and sought *excellence* and *rarity* in judgment. Although the items do measure judgmental abilities, the judgments that need to be made are somewhat artificial, and are generally removed from real-world judgmental tasks. At best, they mimic simple school tasks, but they capture little of the richness of the kinds of judgments we need to make when we make important business or life decisions, such as whether to buy a house or a car. Thus, the *demonstrability* of judgment was in a relatively limited domain. Binet's theory was much closer in its conception to real-world intelligence than was Galton's. His test items, distant as they were from real-world problem solving and decision making, were better predictors of these things than were Galton's test items. But it wasn't clear that people who produced top-quality responses to his test items would necessarily be those who produced top-quality work in their lives outside a testing situation.

Modern Metaphors and Their Implications for Testing

In this section of the chapter, I consider various alternative modern metaphors of mind, and their implications for the testing of intelligence and giftedness. I will consider seven metaphors: the geographic, the computational, the biological, the epistemological, the anthropological, the sociological, and the systems metaphors. Each views the mind in a different way, and has somewhat different implications for how intelligence should be tested.

The important message in the consideration of these metaphors is that intelligence tests are no more a unitary phenomenon than is intelligence itself. Boring's (1923) view that intelligence is what the tests test, an operational view that has been oft-repeated since Boring suggested it (e.g., Jensen, 1969), is meaningless. The way in which intelligence is tested will depend upon a theory of intelligence, and this theory will in turn depend upon a metaphorical theory of mind. Boring's view of intelligence being what the tests test was probably based on theories generated by the geographic metaphor (i.e., a metaphor of intelligence as a map of the mind). But there are alternative metaphors that can generate theories and tests of intelligence, and none of these metaphors is privileged with respect to the others in terms of any kind of validity for the tests so generated. Most tests have been based upon the geographic metaphor, but this is an historical accident rather than a logical or psychological necessity. Any metaphor is capable of generating theories and tests,

and indeed, most have done so. Thus, the message of the metaphorical approach is that our conceptualization of intelligence needs to be broader than it has been, and more receptive to alternative viewpoints. The alternative metaphors are not mutually exclusive, but rather, in large part, complementary. They deal with different aspects of intelligence, as seen from different points of view. Metaphors are not right or wrong, but rather more or less useful for a particular purpose. A full understanding of intelligence needs to embrace multiple metaphors.

Metaphors Viewing Intelligence as Internal to the Individual

The Geographic Metaphor

The geographic metaphor views a theory of intelligence as providing a map of the mind. This view extends back as least to Gall, perhaps the most famous of phrenologists. Gall implemented the metaphor of a map in a literal way, investigating the topography of the head. The measure of intelligence, according to Gall, resides in a person's pattern of cranial bumps.

During the first half of the twentieth century, the metaphor of intelligence as something to be mapped dominated theory and research. However, the metaphor of the map became more abstract, and less literal, than it had been for Gall. The psychologist studying intelligence was both an explorer and a cartographer, seeking to chart the innermost regions of the mind. Visual inspection and touching just would not do. The psychologists needed tools such as factor analysis to understand the mind's structure.

GEOGRAPHIC THEORIES

Geographic theories of the mind are, for the most part, factor based. They view intelligence in terms of factors, which Vernon (1971) likened to lines of longitude and latitude. The factors produce a space that comprises the various mental abilities proposed to constitute intelligence.

The earliest of the major geographic theories, that proposed by Charles Spearman (1927), proposed a "two-factor" theory of intelligence. The theory posits a general factor, common to all tasks requiring intelligence, and one specific factor unique to each type of task. Godfrey Thomson (1939) later criticized Spearman's theory, arguing that it was possible to have a general factor in the absence of a general ability in the head. To Thomson, *g* was not a statistical reality but a psychological artifact resulting from the workings of an extremely large number of what Thomson called "bonds", all of which are sampled simultaneously in intellectual tasks.

Later, Thurstone (1938) proposed the theory of primary mental abilities, according to which intelligence

comprises seven such abilities: verbal comprehension, verbal fluency, number, memory, perceptual speed, inductive reasoning, and spatial visualization. Thurstone was antagonistic to Spearman's theory of *g*, because he believed that Spearman's general factor was obtained only because Spearman failed to rotate his factorial axes upon obtaining an initial solution. Thurstone suggested that the general factor was merely an epiphenomenon of the correlations among the primary mental abilities.

Some of the more recent theories of intelligence based on the geographic metaphor have been hierarchical. For example, Vernon (1971) proposed a hierarchical theory, with *g* at the top of the hierarchy and two major group factors, verbal-educational ability and spatial-mechanical ability, below general ability. Cattell (1971) proposed a theory similar to Vernon's, although the theory is much more detailed. The two abilities of greatest interest for present purposes are what Cattell referred to as crystallized and fluid abilities. Crystallized ability is essentially the accumulation of knowledge and skills throughout the life course, whereas fluid ability is flexibility of thought and ability to reason abstractly. Gustafsson (1984) has used confirmatory factor analysis to study the model of Cattell, and has come to the conclusion that the general factor of Spearman is essentially identical to Cattell's fluid ability factor.

Not all recent theorists have taken the hierarchical approach. Guilford (1967; Guilford & Hoepfner, 1971) posited 120 distinct abilities (increased to 150 by Guilford, 1982), organized along three dimensions. These dimensions are operations, products, and contents. As there are five operations, six products, and four contents, at least in an earlier version of the theory, there are a total of $5 \times 6 \times 4 = 120$ abilities.

Yet a different organization of abilities was proposed by Guttman (1954), whose radex, or radial representation of complexity model, consists of two parts. The first part is what Guttman refers to as a simplex. If one imagines a circle, then the simplex refers to the distance of a given point (ability) from the center of the circle. The closer an ability is to the center of the circle, the more central it is to human intelligence. Thus, *g* could be viewed as being at the center of the circle, whereas the more peripheral abilities, such as perceptual speed, would be nearer to the periphery of the circle. The second part of the radex is called a circumplex. It refers to the angular orientation of a given ability with respect to the circle. Thus, abilities are viewed as being arranged around the circle, with abilities that are more highly related (correlated) nearer to each other in the circle. Snow, Kyllonen, and Marshalek (1984) have used non-metric multidimensional scaling in order to demonstrate that the Thurstonian primary mental abilities can actually be mapped into a radex.

GEOGRAPHIC TESTS

Intelligence testing has been dominated almost exclusively by the geographic metaphor. Indeed, intelligence testing and the main methodology through which the

geographic metaphor has been operationalized—factor analysis—grew up hand in hand. Not only is it difficult, historically, to separate testing from the geographic metaphor, but for many if not most of the people who do testing, there is no other way with which they are familiar. The goal of testing, for these people, is to obtain one or more scores corresponding to levels of ability with respect to each of the regions of the mind posited by a given theory, whether it is just a single region or multiple regions. Even those who do not subscribe to the geographic metaphor often end up using tests generated under the geographic metaphor as the criterion by which the validity of their tests will be judged.

Although geographically-based tests bear some resemblance to each other, the content of a given test will depend on the theory from which it is derived. For example, tests based upon Spearman's (1927) notion of *g* tend to measure what Spearman (1923) called "apprehension of experience", "eduction of relations", and "eduction of correlates". In more modern terms, these might be called encoding of stimuli, inference of relations, and application of relations. They tend to be measured by test items such as analogies, number series, classifications, and matrix problems. Frequently, figural (abstract) content is used in order to minimize effects of knowledge. Tests based on Thurstone's (1938) theory, including Thurstone and Thurstone's (1962) own test of primary mental abilities, measure skills relevant to each of the seven posited abilities, such as vocabulary (verbal comprehension), mathematical computation in problem solving (number), and mental rotation (spatial visualization). Consistent with the notions of Gustafsson (1984), tests based upon Cattell's (1971) notion of fluid ability tend to look very similar to tests of Spearman's *g*, including Cattell and Cattell's (1963) own test. Tests that measure crystallized ability as well, such as the Stanford-Binet or Wechsler, are likely to be more heavily loaded with items measuring vocabulary and general information.

In terms of the pentagonal implicit theory, geographic tests *value* the kinds of abilities emphasized by Binet, including judgment, reasoning, and problem-solving abilities. *Excellence* and *rarity* are measured by Binet types of items, with the exact items used determined by the theory. I would argue that there are good reasons for *valuing* abilities and having tests based on metaphors other than the geographic one.

First, it is not clear that the tests generated under the geographic metaphor really should serve as the standard against which other tests are measured. The fact that such tests have been in existence for a number of years does not in itself make them a (or *the*) viable standard. Second, new tests might provide an operational basis for expanding our concept of intelligence—for valuing other abilities that might lead to greater *productivity* in a variety of domains. To the extent that the tests do not correlate highly with conventional ones, we need at least to be open to the possibility that the new tests

are measuring an aspect of intelligence that the old ones do not measure. There may be kinds of giftedness that conventional tests do not identify.

Third, new tests can give us kinds of information that are not yielded by conventional psychometric tests, regardless of the correlation of the new tests with the conventional ones. They cannot only give us new information, but can help us conceive of individual people's intelligence in new ways. Let us therefore consider other metaphors, and both the theories and tests that they have generated.

The Computational Metaphor

During the last decade, the predominant metaphor for studying intelligence has probably been that of the computer program. Researchers have sought to understand intelligence in terms of the information processing that people do when they think intelligently. Information-processing investigators have varied primarily in terms of the complexity of the processes they have sought to study. They have taken rather widely differing approaches.

Computational theorists tend to be highly critical of geographic approaches and especially of the individual who is seen as the originator of the geographic approach, Charles Spearman. It is therefore ironic, as few computational theorists realize, that the computational approach to intelligence, like the geographic one, dates back to none other than Charles Spearman.

COMPUTATIONAL THEORIES

Spearman (1923) proposed what he believed to be three fundamental qualitative principles of cognition (mentioned earlier). These principles—apprehension of experience, education of relations, and education of correlates—are mental processes that Spearman believed to be components of general intelligence. Programs devised under the banner of artificial intelligence have used these processes heavily, and in some cases have even been built around these processes (e.g., Evans, 1968).

Historically, the greatest impetus for the computational approach to understanding intelligence can be traced to the pioneering work of Newell, Shaw, and Simon (1958) and others who constructed computer programs that could perform "intelligently". These AI programs are summarized in books such as Boden (1977) and Stillings et al. (1987), and will not be reviewed here. Rather, I will concentrate on more recent human-experimental work that has had more direct implications for the testing of intelligence.

Hunt, Frost, and Lunneborg (1973) suggested that one way to understand intelligence would be to test subjects in their ability to perform tasks that contemporary cognitive psychologists believe measure basic human information-processing ability. The proximal goal in this research would be to estimate parameters

(characteristic quantities) representing the durations of performance for information-processing components constituting each task, and then to investigate the extent to which these components correlate across subjects with each other and with scores on measures commonly believed to assess intelligence. Sternberg (1977) later expanded upon this logic in his approach called "componential analysis". The overall purpose of componential analysis is to identify the component mental operations underlying a series of related information-processing tasks and to discover the organization of these component operations in terms of their relationships both to each other and to higher order constellations of mental abilities. The fundamental unit of analysis in componential analysis is the component, which is an elementary information process that operates upon internal representations of objects or symbols (see also Newell & Simon, 1972). The components may translate a sensory input into a conceptual representation, transform one conceptual representation into another, or translate a conceptual representation into a motor output. Componential analysis can be used to decompose task performance into (a) the component processes that combine to produce it, and (b) the strategies into which these component processes integrate themselves. Using componential analysis, the investigator can determine the length of time a given person spends on each mental process and the susceptibility of the process to an error.

Various information-processing theories of intelligence have been proposed, based on the computational metaphor. Brown (1978; Brown & Campione, 1978) has divided processes of cognition into two kinds: metacognitive processes, which are executive skills used to control one's information processing; and cognitive processes, which are nonexecutive skills used to implement task strategies. She suggests that five metacognitive processes are of particular importance: planning one's next move and executing a strategy, monitoring the effectiveness of individual steps in a strategy, testing one's strategy as one performs it, revising one's strategy as the need arises, and evaluating one's strategy in order to determine its effectiveness.

Sternberg (1980) distinguishes among metacomponents, which are similar to Brown's metacognitive processes, performance components, and knowledge-acquisition components. Thus, Brown's cognitive processes are subdivided into two categories in Sternberg's theory. Whereas performance components are lower order processes used in the execution of various strategies for task performance, knowledge-acquisition components are processes involved in learning new information and storing it in memory.

Hunt (1980) has distinguished between mechanical processes that are relatively content-free and processes that are more knowledge-based. Hunt has emphasized mechanistic processes as, in many cases, being rather general across information-processing tasks.

Baron (1985) has proposed a theory of intelligence whereby rational thinking is the cornerstone of intelligence. Baron defines intelligence as the set of properties that make for effectiveness, regardless of the environment a person is in. Although intelligence is based on rational thinking, it goes beyond rational thinking in including personal endowments such as capacities of knowledge that can lead to success.

COGNITIVE TESTS

Computationally based tests, regardless of their particular content, give information that is quite different in kind from the information obtained from geographically-based tests. Typical information yielded by such computational tests would be the processes used to solve problems; the strategy or strategies into which these processes are combined; the amount of time spent on each process, and, in some cases, the susceptibility of each process to errors; and also, in some cases, the form of representation of information in the mind (see, e.g., Hunt, Lunneborg, & Lewis, 1975; Sternberg & Gardner, 1982). Geographically-based tests do not give us these kinds of information, except perhaps in a confounded fashion. Indeed, psychometric factors are often a combination of process and content that makes it difficult to separate the effects of the two. In this view, a gifted individual may be gifted in one or more of several aspects of information processing: strategy selection, speed of strategy execution, formation of effective mental representations, and so on.

The tasks that are used in the computational approach depend upon the particular computational theory under consideration. Jensen (1982), for example, emphasizes very low levels of information processing in attempting to understand the computational bases of intelligence. He will typically present subjects with a choice reaction-time task, which requires subjects to select among various buttons upon the presentation of the choice stimulus. Jensen is a believer in the notion that intelligence largely derives from sheer mental speed, and his use of relatively simple tasks reflects this theoretical disposition. Hunt (1978) uses somewhat more complex tasks, believing that intelligence involves more complex operations. For example, he relates verbal ability to the speed of retrieval of lexical information from long-term memory. In order to measure this speed, he uses tasks such as the Posner and Mitchell (1967) Letter-Matching task, in which subjects are asked to state as quickly as possible whether the letters in a pair such as "A a" constitute a physical match (which they don't) or (in another condition) a name match (which they do). As a measure of speed of memory scanning, Hunt uses the S. Sternberg (1969) memory-scanning task, in which subjects are asked to state as quickly as possible whether a target digit or letter, such as 5, appeared in a previously memorized set of digits or letters, such as 3 6 5 2. Individuals are usually tested in these situations either via a tachistoscope (a machine that provides rapid stimulus

exposures) or a computer terminal, and the principal dependent measure of interest is response time.

Sternberg (1977; see also Sternberg, 1983) has used more complex tasks to measure intelligence (see also Simon, 1976). Indeed, the tasks are generally those that are found on conventional psychometric intelligence tests, such as analogies, series completions, classifications, and syllogisms of various kinds. In his information-processing work, Sternberg emphasized the difference from the geographic approach not in the tests used, but in the way in which test performance was analyzed. Thus, the computational approaches have in common not any one particular content that might appear on the tests, but rather their allegiance to understanding the computational processes involved in intelligence—how a person processes a problem requiring intelligence, from when she first sees that problem to the time that she reaches a solution.

In terms of the pentagonal implicit theory, computational tests *value* quality of information processing, and not just the products of such processing. *Excellence* and *rarity* are assessed in terms of aspects of processing (such as speed of strategy selection) rather than in terms of products of various kinds of judgments. Quality of information processing is *demonstrated* through measurement of speed and profiles of errors in various kinds of information-processing tasks, which tend to be simpler than those found in geographically-based tests. Because of the simplicity of many of these tasks, *productivity* on the tasks may be even less related to everyday performance than is the case for the geographically based measures.

The Biological Metaphor

The biological metaphor provides a basis for understanding intelligence by studying the brain and the operation of the central nervous system. It is the most reductionist of the various metaphors, in that one seeks understanding of intelligence directly in terms of biological function, rather than indirectly through molar levels of processing. According to these views, the gifted individual is biologically superior to others. However, I will argue that the inferences that can be made from the biological approach, both about intelligence in general and about giftedness in particular, are often as indirect and even, at times, more indirect than are the inferences that are made from alternative approaches. Although adherents to the biological metaphor have in common their interest in studying intelligence in terms of the brain and central nervous system, they differ fairly widely in the approaches they take for studying intelligence.

BIOLOGICAL THEORIES

Biological approaches are of three main kinds: neuropsychological approaches, which seek to understand intelligence in terms of the size and structure of the brain; electrophysiological approaches,

which seek understanding of intelligence in terms of electroencephalographic measurement; and blood-flow approaches, which seek to understand intelligence in terms of the flow of blood to various portions of the brain during thinking. I will consider each of these approaches briefly in turn.

Neuropsychological approaches to intelligence are often traced back to Hippocrates, who in the fifth century BC suggested that the brain might be the basis of human intelligence. In more recent times, one of the earlier general theories of brain function was proposed by Halstead (1951). He suggested four biologically-based abilities: the integrative field factor (C), the abstraction factor (A), the power factor (P), and the directional factor (D). More influential in recent times has been Hebb's (1949) theory. Hebb proposed the concept of the *cell assembly*. Repeated stimulation of specific receptors slowly leads to the formation of an assembly of cells in the association area of the brain. These cells can act briefly as a closed system after stimulation is stopped. Hebb assumes that the process accompanying synaptic activity makes the synapse more readily traversed. Any two cells or systems of cells repeatedly active at the same time tend to become associated. If collections of cells become associated, they form cell assemblies. An individual cell or other unit of transmission may enter into more than one assembly at different times. Moreover, over time, it may enter into new cell assemblies or drop out of old ones. The cell assembly acts on an all-or-none basis. In other words, it fires or it does not. Hebb uses the concept of a cell assembly to account for many different psychological phenomenon, among which is intelligence.

Another theory that has had great impact on the field of intelligence research and testing has been that of a Russian psychologist, Alexander Luria (1973, 1980). Luria believed that the brain is a highly differentiated system whose parts are responsible for different aspects of a unified whole. In other words, separate cortical regions act together to produce thought and action of various kinds. Luria (1980) suggested that the brain comprises three main units. The first, a unit of arousal, includes the brain stem and midbrain structures. Included within this first unit are the medulla, reticular activating system, pons, thalamus, and hypothalamus. The second unit of the brain is a sensory-input unit, which includes the temporal, parietal, and occipital lobes. The third unit includes the frontal cortex, which is involved in organization and planning.

Some of the most interesting theorizing within the neuropsychological approach has been done by those who study hemispheric specialization. This work goes back to Marc Dax, an obscure country doctor in France, who in 1836 presented a little-noticed paper to a medical society meeting in Montpellier. Dax had treated a number of patients suffering from a loss of speech as a result of brain damage. He noticed the connection between loss of speech (aphasia) and the side of the brain in which damage had occurred. Indeed, having

studied more than forty patients with aphasia, Dax noticed that in every case there had been damage to the left hemisphere of the brain. The paper aroused no interest. In more recent times, the father of split-brain research has been Roger Sperry, who has argued that each hemisphere behaves in many respects like a separate brain (e.g., Sperry, 1961). It would be hard to overstate the contribution of Sperry to modern split-brain research, especially because so many of the people working in the area have been graduate students of Sperry or have worked at one time or another in his laboratory.

Although there are arguments as to the exact functioning of each hemisphere, it is generally agreed that visual and spatial functions are primarily localized in the right hemisphere, and language functions in the left. One of the most interesting experiments demonstrating this localization was done by Jerre Levy and her colleagues (Levy, Trevarthen, & Sperry, 1972). They showed that when split-brain patients (those with their corpus callosum severed) are shown so-called chimeric faces—faces that have one appearance in the left half and another appearance in the right half—they are unaware that the information in the two halves of the picture conflicts. When asked to respond vocally to what they see, they choose the picture from the right-field half of the chimeric stimulus, because the left hemisphere controls language processing and controls the body contralaterally. But when asked to point, subjects choose pictures from the left-field, indicating right-hemispheric control of their movement. In other words, the task that the subjects are asked to perform is crucial in determining what face the subject will believe him or herself to have seen.

Gazzaniga (1985) has argued that the brain is organized modularly, into relatively independently functioning units that work in parallel. His view is in the spirit of present connectionists models of human performance (McClelland & Rumelhart, 1986). There exist many discrete units of the mind, each operating relatively independent of the others. Moreover, many of these modules operate at a level that is not conscious. They operate in parallel to our conscious thought, and contribute to conscious processing in identifiable ways. In particular, the left hemisphere assigns interpretations to the processing of these modules. Thus, the left hemisphere may perceive the individual operating in a way that doesn't make any particular sense or that is not particularly understandable, and its job is to assign some meaning to that behavior. This view is also largely consistent with that of Fodor (1983), who also believes that information processing is largely determined by independent modules operating in parallel.

A very different biological approach is the electrophysiological one. Early studies tended to use electroencephalogram (EEG) measurements. The idea was to relate patterns of EEG activity to intelligence or other cognitive functions. For example, Galin and Ornstein (1972) showed a link between amount of EEG

activity in each of the hemispheres and the type of tasks performed by a subject. In particular, they found that the ratio of right to left hemisphere EEG processing was greater in verbal than in spatial tasks. This pattern of results might seem to be the opposite of what would be expected. However, Galin and Ornstein were measuring alpha activity, which tends to be associated with the brain at rest. Therefore, higher ratio indicates less active processing by the hemisphere of the brain being measured at a given time.

Some of the most interesting electrophysiological work has been done by Emanuel Donchin and his colleagues at the University of Illinois. Much of this work has utilized the P-300 wave form. The label P-300 refers to a positive component of evoked potentials that has a latency of anywhere from 300 to 900 milliseconds after the presentation of a stimulus. P-300 has been linked to processes of stimulus identification and classification (McCarthy & Donchin, 1981). The amplitude of P-300 seems to reflect the allocation of cognitive resources to a given task. P-300 seems to be stronger, the greater the amount of surprise that a subject experiences as a result of the presentation of the stimulus.

Schafer (1982) has suggested that a tendency to show a large P-300 response to surprising stimuli may be an individual-differences variable. Schafer believes that a functionally efficient brain leaves fewer neurons to process a stimulus that is familiar and more to process a stimulus that is novel or unfamiliar. In other words, according to Schafer, more intelligent individuals should show a greater P-300 response to novel stimuli than would less intelligent ones. At the same time, more intelligent individuals should show smaller P-300 to expected stimuli than should less intelligent ones.

Hendrickson and Hendrickson (1980) have conducted a program of theory and research attempting to link electrophysiological responses to observed intelligence. Their measurements are obtained while the subject is at rest. Their basic theory suggests that errors can occur in the passage of information through the cerebral cortex. These errors are alleged to be responsible for variability in evoked potentials. Thus, it would follow that individuals with normal circuitry that conveys information accurately will form correct and accessible memories more quickly than individuals with "noisy circuits", who will make errors in transmission. Moreover, the Hendricksons have suggested that individuals with low IQs will have noisy channels of information processing. When evoked potentials are averaged out, the potentials will have a smoother appearance (because of averaging over the noise) than those produced by individuals with more consistent and less noisy channels.

The third of the biological approaches relates cerebral blood flow to intelligence. The idea is that blood goes to portions of the brain that are being used in the processing of a task. It is possible to use radioactive tracers that are inhaled in order to monitor flow of blood during information processing. Using this approach, one could monitor blood flow as a function

of the task being performed and who is performing it.

BIOLOGICAL TESTS

Biologically-based tests provide information that is different in kind from either geographically-based or computationally-based ones. Biological tests may indicate specific neuropsychological deficits, patterns of hemispheric specialization, performances of different regions of the brain, or in the case of evoked-potential measurement, patterns of brain waves. The interpretability of this information, as in the case of any test information, will depend upon the quality of the theory upon which the test is based. But biologically-based tests are, for the most part, the only ones that really map onto brain functioning, whether directly or indirectly.

Halstead constructed a test of functioning based upon his theory, and more recently, J. P. Das and Jack Naglieri have been working on a test based on Luria's theory. Das and his colleagues have constructed an impressive array of tests that measure all three aspects of functioning in Luria's theory, namely, attention-arousal, planning, and mode of processing. With respect to the last, Das's tests measure both simultaneous and successive processing. Simultaneous processing refers to the parallel processing of multiple chunks of information at a time. Successive or sequential processing refers to serial processing of chunks of information, one following the other. Tests such as Raven Matrices and Gestalt Closure would measure simultaneous processing, whereas serial-recall tests would measure successive processing.

Das and Naglieri are not the first to construct a test based on Luria's theory. Two other such tests are the Luria-Nebraska Neuropsychology Battery (LNNB) (Golden, 1981) and the Kaufman Assessment Battery for Children (K-ABC) (Kaufman & Kaufman, 1983). This latter test does not measure the attention-arousal and planning function separately, but it does measure simultaneous and successive processing and provides separate scores for each. I have reviewed this test elsewhere in some detail (Sternberg, 1985). The K-ABC also has a separate achievement section, which is similar to what one would find on other tests of verbal intelligence, such as the Stanford-Binet.

Measurement of evoked potentials has been especially popular among adherents to the biological metaphor who are interested in testing. For example, Schafer reported a correlation of 0.82 between an individual-differences measure of evoked potential and IQ. In line with his theory, the higher the IQ, the greater the difference in evoked potential amplitude between expected and unexpected stimuli. This result suggests that more intelligent individuals are more flexible in responding to novel stimuli than are less intelligent individuals. The Hendricksons (1980) have published pictures of what they reported to be typical wave forms for subjects with high and low IQ. The wave forms for subjects with high IQs are more complex than the wave

forms for subjects with low IQs, consistent with their theory. The Hendricksons used a string to measure the length of the wave forms over a given period of time, on the view that greater string length would reflect greater complexity in the wave form and hence higher IQ. Somewhat oddly, given the reliabilities of the measures, they obtained a correlation of 0.83 between an evoked potential measure and scores on the Wechsler Adult Intelligence Scale. A replication of this study has been reported by Blinkhorn and Hendrickson (1982), using Raven's Advanced Progressive Matrices as well as a variety of verbal intelligence tests. In this study the correlation was 0.84, corrected for restriction of range. These correlations are so high as to be troubling to some, myself included.

Blood flow has also been used in the measurement of intelligence (see Horn, 1986). It is actually possible to relate blood flow to different regions of the brain for tasks requiring crystallized versus fluid abilities. This approach is more direct than the evoked-potentials approach, because it is possible to determine in just what portion of the brain processing is taking place.

The biological metaphors have generated a substantial amount of research relating functioning of the brain to cognition, in general, and to intelligence, in particular. The relation between biological measures and psychometrically assessed intelligence is by no means straightforward. For example, what does it mean to show a relationship between average evoked potentials and psychometrically-derived intelligence test scores? Do the evoked potentials somehow cause intelligent cognition? Or equally plausibly, does intelligent cognition lead to certain patterns of evoked potentials? Or do both intelligent information processing and evoked potentials depend on some aspect of the brain, whether conceived biologically or cognitively? As one reflects on the correlation, one is reminded of the rule one learns in school that one cannot infer causation from correlation.

Despite the striking magnitude of some of the correlations, we are a long way from understanding the neural mechanisms that are actually responsible for them. Indeed, it is possible that when given instructions simply to sit and not perform any particular task, the more intelligent subjects may be busy thinking about issues that are on their minds, whereas the less intelligent subjects may be less likely to be thinking in this way, or at all! This difference might generate a correlation. Indeed, the evidence suggests that the correlation between evoked-potential measures and conventional intellectual measures goes down as subjects perform more and more complex tasks. In other words, when subjects are actually doing a complex task, one no longer obtains so easily a correlation between average evoked potentials and scores on that test. I believe that biologically-based measures have a bright future, but we need to avoid jumping to premature, and often reductionist conclusions. At the present time, biological approaches provide another means for obtaining dependent measures. They do not provide a means

that is somehow privileged with respect to every other kind of measure. Returning to the pentagonal implicit theory, we find that what is *valued* by biological tests are *excellence* and *rarity* of various forms of psycho-physiological functioning, *demonstrability* via means such as evoked-potential wave forms that are complex, or increased P-300 amplitude in the face of novel stimuli. The geographic tests emphasized products, the computational tests, the presumed processes underlying these products, and the biological tests, the presumed brain activity underlying the processes. Thus, each approach goes one step further back down the actual *productive* behavior in everyday life. Indeed, in many of the biological tests, the test-taker produces nothing at all! A measurement may be made while the individual is at rest, as in the case of the evoked-potential studies.

The Epistemological Metaphor

The epistemological metaphor draws very heavily upon philosophy, and especially the philosophy of knowledge, for its conceptualization of intelligence. Epistemological theorists, influenced heavily by Jean Piaget, tend to be developmental in the range of issues they consider.

EPISTEMOLOGICAL THEORY

Piaget (1952) thought there were two interrelated aspects of intelligence: its function and its structure. Piaget, a biologist by training, saw the function of intelligence to be no different from the function of other biological activities. That function is adaptation, which includes assimilating the environment to one's own structures (be they physiological or cognitive) and accommodating one's structures to encompass new aspects of the environment.

Piaget further proposed that the internal organizational structures of intelligence and how intelligence will be manifested differ with age. It is obvious that an adult does not deal with the world in the same way as does a neonate. For example, the infant typically acts on his or her environment via sensory-motor structures and, thus, is limited to the apparent, physical world. The adult, on the other hand, is capable of abstract thought and, thus, is free to explore the world of possibility. Much of Piaget's research was a logical and philosophical exploration of how knowledge structures might develop from primitive to sophisticated forms. Guided by his interest in epistemology and his observations of children's behavior, Piaget divided the intellectual development of the individual into discrete, qualitative stages. As the child progresses from one stage to the next, the cognitive structures of the preceding stage are reorganized and extended to form the underlying structures of the equilibrium characterizing the next stage (Piaget & Inhelder, 1969).

In Piaget's theory, there are four main stages. The first stage is the sensory-motor one, which occupies

birth through roughly two years of age. The new-born baby exhibits only innate, preprogrammed reflexes, such as grasping and sucking. Intelligence begins to exhibit itself as the innate reflexes are refined and elaborated. The second stage is the pre-operational one, which takes place roughly in the ages two through seven. The child is now beginning to represent the world through symbols and images, but the symbols and images are directly dependent upon the immediate perception of the child. In the third stage, that of concrete operations, the child becomes able to perform concrete mental operations. In this stage, lasting approximately between the ages of seven through eleven, the child can now think through sequences of actions or events that previously had to be enacted physically. It is now possible for the child to reverse the direction of thought. The child comes to understand subtraction, for example, as the reverse of addition, and division as the reverse of multiplication. The period is labeled one of "concrete operations", because operations are performed for objects that are physically present. In the last stage, that of formal operations, the child learns to think abstractly and hypothetically, not just concretely. In this stage, which begins to evolve at around the age of eleven, the individual can view a problem from multiple points of view, and can think much more systematically than in the past.

Other, neo-Piagetian theorists have built on the ideas of Piaget while at the same time not accepting all of his assumptions and contentions. For example, Case (1984, 1985), like Piaget, believes that cognitive development proceeds through four general stages that take place between age one month and adulthood. Case's stages are not exactly the same as Piaget's, however. In his recent work, Case has been particularly concerned with the control structures for thought, that is, how problem situations are represented and how these representations are acted upon. In his earlier work, Case drew heavily on Pascual-Leone's (1970) concept of the *M*-space for understanding the amount of mental processing space that can be allocated to various cognitive tasks at different ages.

Another of the neo-Piagetian theories is that of Fischer (1980; Fischer & Pipp, 1984). Fischer assumes that development can be understood primarily in terms of two key concepts, which provide instantiations for the notions of competence and performance as they have been discussed by others. The first concept is that of optimal level, which specifies the upper limit on the complexity of skill that an individual can bring to bear upon a problem. The second concept is that of skill, which appears to be a set of processes that can be brought to bear upon problems. Skills differ in complexity, and indeed, the complexity of skills that can be brought to bear upon a problem is a key source of development in Fischer's theory.

Other neo-Piagetian theories include those of Siegler (1981, 1984, 1987) and Pascual-Leone (1970, 1987).

EPISTEMOLOGICAL TESTS

The epistemological metaphor has lent itself to a number of assessment devices, most of them based upon the thinking of Piaget. Indeed, Tuddenham (1970) constructed a Piagetian test of cognitive development that is roughly analogous to an intelligence test, except that it is based upon the kinds of tasks Piaget used in his research. What are some examples of such tasks?

Some of the most well-known tasks are those used to measure conservation, a test of concrete-operational function. In one task, children are shown a jar of liquid. The liquid is poured from this first jar into another jar, which is higher and narrower. The child is then asked whether the second jar contains more liquid than the first jar, less liquid, or the same amount. A conserver would recognize that the amount of liquid has not changed. A non-conserver would typically label the second jar as containing more liquid, because the liquid in the second jar reaches a higher level. Conservation of liquid is only one of several kinds of conservations. For example, clay might be molded into different shapes, and children asked whether the amounts of clay in each shape are the same. Children who do not conserve view the different shapes as containing different amounts of the clay substance.

Another task that has been extensively used, especially by Siegler (1978), is the balance-beam task. In this task, children are presented with a balance beam that contains differing numbers of weights at differing distances from the center of the beam. The children must indicate whether the beam will balance, or whether instead one side or the other will be higher. Siegler has done an elegant and elaborate analysis of different stages in the development of information processing in the performance of the balance-beam task. Yet another related task is that of class inclusion. Children might be shown three green marbles and eight blue marbles, and then be asked whether there are more blue marbles or more marbles. The idea is to assess whether the children are concrete-operational in the sense of being able to recognize that blue marbles are a subset of marbles as a whole.

This last task highlights one of the difficulties with Piagetian measurements. At least in some cases, children may not understand the task in the same way that examiners do. For example, it may seem odd to be asked whether there are more blue marbles or more marbles, and children may reinterpret the question to mean: Are there more blue marbles or green marbles? They would then answer this second question appropriately, but be marked as incorrect. Of course, this problem of misinterpretation applies to other approaches as well.

An example of a task used to measure formal operations would be the permutations task. Examinees might be given four or more objects or sets of numbers, and be asked to generate all possible permutations of these objects (or numbers). The question here is whether they go about performing this task in a systematic way.

Formal-operational children will generate all possible permutations by systematically varying the positions of items in the array.

The epistemological approach provides a fourth kind of theoretical framework for assessing intelligence. The scoring of epistemologically-based tests is theory-based, and relates to developmental stages in a child's mental growth. Note that one is asking different kinds of questions about mental functioning than would be asked in typical tests. Here one is attempting to assess stages of the development of schemas for organizing the world, rather than seeking to assess how one child compares to another of the same age. As has been true with each approach, the epistemological approach provides a unique perspective on the individual's intellect, with this perspective determining both the kinds of questions one would ask and the way in which responses to the questions would be scored.

In terms of the pentagonal implicit theory, the epistemological approach shifts the *valuing* criterion more toward competence, especially logical competence, and more away from that performance emphasized by the other approaches. *Excellence* and *rarity* are largely *demonstrated* through performance on logic-based tasks. Whereas psychometric tests have more of an inductive character, many Piagetian ones have more of a logical-deductive character. There is more of a *productive* orientation on these tasks than on some of the others we have considered. The problems require more thought, say, than is required in some of the simple information-processing tasks. The problems, however, are still not those encountered in everyday life.

Metaphors Viewing Intelligence as External to the Individual

The Anthropological Metaphor

The basic idea of the anthropological metaphor is what Irvine and Berry (1988) refer to as the law of cultural differentiation. It is based on a statement by Ferguson (1954): "Cultural factors prescribe what shall be learned and at what age; consequently different cultural environments lead to the development of different patterns of ability" (p. 121).

ANTHROPOLOGICAL THEORIES

Anthropologically-oriented psychologists differ in the extent to which they believe that culture affects the nature of intelligence. There are four positions of varying degrees of extremity, each of which will be considered in turn.

The most extreme position, radical cultural relativism (Berry, 1974), entails the rejection of assumed psychological universals across cultural systems, and requires the generation from within each cultural system of any behavior concept that is to be applied to it. Specifically, for the concept of intelligence, this position requires

that indigenous notions of cognitive competence be the sole basis for the generation of cross-culturally valid descriptions and assessments of cognitive capacity. According to this view, a person who is gifted in one culture may literally be an idiot in another one.

In this approach, it is essential to understand how context shapes intelligence. Berry and Irvine (1986) have described four levels of context that can affect intelligence and the way it is evaluated. At the highest level is ecological context. This kind of context comprises all of the permanent or almost permanent characteristics that provide the back-drop of human action. It is the natural cultural habitat in which a person lives. A second kind of context is the experiential context, or the pattern of recurrent experiences within the ecological context that provides the basis for learning and development. When cross-cultural psychologists try to determine independent variables that affect behavior in a particular habitat, they are usually dealing with the level of experiential context. A third kind of context is the performance context, which is itself nested under the two kinds described above. This context comprises the limited set of environmental circumstances that account for particular behaviors at specific points in space and time. Finally, nested under the above three levels of context is the experimental context. This context comprises environmental characteristics manipulated by psychologists and others to elicit particular responses or test scores. Although this context should be nested within the three described above, it often is not, in which case the experimental context will not represent appropriately the conditions under which a given set of people lives.

A less extreme form of anthropological theorizing is what might be called conditional comparativism. Those who adhere to this point of view believe it is possible to do some kind of conditional comparison in which an investigator sees how different cultures organize experience to deal with a single activity such as writing, reading, or computing. This comparison is possible, however, only if the investigator is in a position to assert that performance of a task or tasks under investigation is an achievement that is attained in every culture being compared.

This is the view taken by, among others, Michael Cole and his colleagues in the Laboratory of Comparative Human Cognition (1982). Cole and his colleagues assert that the radical cultural-relativists' position does not take into account the fact that cultures interact. They assume that learning is context-specific, and the context-specific intellectual achievements are the primary basis for intellectual development. They state specifically that they do not deny the existence of any intercontextual generality of behavior. But they further state that such intercontextual generality is a secondary phenomenon, and one in which the cultural organization of experience plays a major role. The idea in this view is that each experience within a cultural context can be linked to a specific task performance. There is no central

process or general ability intervening between experiences and behavior. Learning is viewed as primarily event- or context-specific. A gifted individual, then, is one who successfully acquires culture-based knowledge and skills.

A still less extreme position is what might be referred to as a dualistic one. Dualistic positions generally do not rely exclusively on the anthropological metaphor. Theorists such as Keating (1984), Jenkins (1979), Baltes, Dittmann-Kohli, and Dixon (1984), and Charlesworth (1979) have in one way or another attempted to incorporate both cognitive and contextual elements into their models of intelligence.

In his ethological approach to studying intelligence, Charlesworth (1979) has focused on what he refers to as the "other part" of intelligence—intelligent behavior as it occurs in everyday life rather than in test situations—and how these situations may be related to developmental changes. Keating (1984), in his research, has investigated how intelligence can be studied through a number of cognitive-psychological paradigms, but more recently has suggested that these paradigms are more or less vacuous when it comes to understanding how cognition interacts with culture. Baltes (e.g., Dixon & Baltes, 1986) argues that it is necessary to look at both the mechanics and the pragmatics of intelligence. For example, his studies of wisdom suggest that wisdom cannot be understood outside the context of the environment in which one develops.

At the opposite extreme from radical cultural relativism is universalism. Its primary tenet is that there are significant commonalities in the nature of intelligence and of the mind in general across cultures. For example, Levi-Strauss (1966) argued that there are no differences between how the mind works in one culture and how it works in another culture, or even in how it works from one time to another. Primitive and Western systems of thinking merely represent different ways by which people try to understand nature and make it susceptible to rational inquiry. According to Levi-Strauss, cultures do not differ in their levels of mental development. All seek knowledge about the universe, and seek to order and systematize. What differs across cultures is the content of thought. Primitive systems of classification are more likely to be based on attributes that are readily perceived or otherwise experienced. Modern scientific classification systems rely on attributes that are inferred from relations in the structures of objects. Thus, structurally there are no differences among cultures. What differs is content. In this view, there should be universal abilities underlying giftedness, although exactly how they are measured might vary from one culture to another.

ANTHROPOLOGICAL TESTS

Adherents to the anthropological metaphor tend to eschew tests in the traditional sense. Rather, they try to devise cognitive tasks that are culturally relevant.

Their attempts at cultural relevance go beyond the naive attempts of many psychometricians and their so-called "culture-fair tests" (Cattell & Cattell, 1963), which are often more culturally loaded than the tests they are designed to replace. An example of an investigator using the anthropological approach is Berry (1974). Berry conducted a study of ten subsistence-level groups to test the hypothesis that people in a hunting culture should possess good visual discrimination and spatial skills. Their cultures are expected to support the development of such skills through the presence of many geometric and spatial concepts. To test this hypothesis, Berry ranked cultural groups according to the importance of hunting to their existence, and compared these rankings with test scores for perceptual discrimination and other related skills. For example, he used the embedded-figures test, often used as a measure of psychological differentiation. He found, as predicted, that the more central the role of hunting to a culture, the better the psychological test scores.

Anthropologically oriented psychologists often suggest that the differences in performance across cultures are based on enculturation practices rather than on any internally-based "intelligence". For example, Super (1976) found evidence that African infants sit and walk earlier than do their counterparts in the United States and Europe. But Super also found that mothers in the cultures he studied made a self-conscious effort to teach babies to sit and walk as early as possible. Other motor behaviors were not more advanced. For example, infants found to sit and walk early were actually found to crawl later than did infants in the United States.

In another follow-up of this kind of logic, Serpell (1979) tested a notion of McFie (1961) that lack of toys and construction games encouraging accurate standards of orientation and imitation might lead to inferior perceptual abilities on the part of African infants. Serpell designed a study to distinguish between a generalized perceptual-deficit hypothesis and a more context-specific hypothesis. He selected four perceptual tasks that, by a general-process interpretation, should result in lower performance for Zambian than for English children. But he suggested that performance would depend on enculturation practices. Serpell hypothesized that whereas English children would have more experience with two-dimensional representations of pen-and-paper tasks, Zambian children would have more practice molding wire into two-dimensional objects. Serpell therefore predicted that English children would score higher on a pen-and-paper task, but not as high on a wire-shaping task as Zambian children. Serpell's data supported his prediction.

Another study showing the effects of the kind of training one receives on how one performs was done by Greenfield (Bruner, Olver, & Greenfield, 1966). Greenfield and her colleagues studied children of the Wolof Tribe in rural Senegal. Children received sets of pictures mounted on cards. The cards were designed so that within each of the sets, a child could form pairs

based on various attributes—color, form, or function. The child was first asked to show the investigator which of the two pictures in a given set were most alike. The child was then asked why they were most alike. Subjects were selected from children in three populations: Bush children who had not attended school, children in school from the same town as the Bush children, and school children living in Dakar, the capital of Senegal. Greenfield found that children who had attended school, regardless of where, performed much as American children did. Preference for color decreased sharply with grade, whereas preference for form and function increased. Moreover, an increasing proportion of older children justified their classifications in terms of subordinate categories. Children who had not attended school and lived in the Bush responded quite differently. They showed a greater preference for color with increasing age, and rarely justified responses in terms of subordinate language structure.

Even when the objects to be dealt with are familiar, the way they were typically used or thought about may have once helped people perform with them. When Cole and his colleagues (Cole, Gay, Glick, & Sharp, 1971) asked adult Kpelle tribesmen to sort twenty familiar objects into “groups of things that belong together”, the subjects separated the objects into functional groups (a knife with an orange, for example), as children in Western societies do. The researchers had expected to see taxonomic groupings (tools and foods, for example) from these adults, because Western adults typically sort taxonomically. The Kpelle proved to be perfectly capable of taxonomic sorting: When the subjects were asked to sort the objects the way a fool would do it, they immediately arranged them into neat piles of tools, foods, clothing, and utensils. Taxonomic sorting of these objects seemed stupid to the Kpelle because it was inconsistent with the way they deal with these objects in everyday life, that is, functionally. In another classification task, the Kpelle sorted leaves taxonomically (as either “tree” leaves or of “vine” leaves) with ease. In this case, the taxonomic approach seemed completely appropriate. As farmers, the Kpelle are frequently called upon to make such discriminations, and hence were comfortable adopting the taxonomic sorting strategy.

In sum, tests based upon the anthropological metaphor need to be tailored, not just translated or adjusted, to the culture in which the testing is taking place. Tests based upon the internally-oriented metaphors have been used with almost no modification across cultures, under the assumption that what they measure should be universal. But this is a big assumption. Changing the content vehicle or the format of a test, or even the location in which the test is given, can have a major effect upon test scores. Thus, children who might look quite stupid on tests based upon metaphors that view intelligence as inside the head, might look quite smart on tests based on metaphors that are oriented toward the outside. What is of greatest interest is that adherents of

the anthropological metaphor, who make a living out of studying intelligence across cultures, almost all believe that mere translation or minor modifications do not adequately control for cultural differences in intelligence testing, whereas adherents to the geographic metaphor, most of whom do not specialize in cross-cultural work, are happy just to translate or make minor modifications in their tests. So the metaphor under which one works can have profound implications for how intelligent a person will appear when tested, because the metaphor determines what will be tested and how testing will be done.

From the standpoint of the pentagonal implicit theory, *valuing* is quite different under the anthropological metaphor. Indeed, what is valued may differ radically across cultures. What one culture considers excellent, another may consider unacceptable. The *demonstrability* of intelligence must be in terms of culturally valued products. The behavior that is *rare* and *excellent* in one culture may be rare but eccentric in another. The anthropological approach does consider this issue seriously. Indeed, those who follow this approach will not consider seriously any test that does not directly relate to *productivity* within the culture.

The Sociological Metaphor

The sociological metaphor differs only subtly from the anthropological one. Whereas the anthropological metaphor deals with the effects of enculturation, the sociological metaphor deals with the effects of socialization. Adherents to the anthropological metaphor concern themselves primarily with how culture affects intelligence. They deal with the question of whether intelligence is the same thing across cultures, and if it is not, how it is different. Adherents to the sociological metaphor care about cultural effects, but tend to be less interested in the question of how intelligence differs from one culture to another than in the question of how socialization within any culture affects the development of intelligence. Although they may look at socialization across cultures, their main interest is in the socialization process itself, and especially how it is similar across cultures even though the content of the socialization may vary quite substantially. In this view, the gifted individual is a product of superior socialization in the environment.

SOCIOLOGICAL THEORIES

The sociological approach is due largely to Lev Vygotsky. Vygotsky (1978) made several important contributions to the theory of intelligence, the two most important of which are probably his theory of internalization and his concept of the zone of proximal development.

In his theory of internalization, Vygotsky turned the views of Piaget on their head. Although Piaget

and Vygotsky were both interactionists, they were interactionists who believed that individual intelligence started at essentially opposite points. Piaget believed that intelligence matured from the inside, and directed itself outward. Vygotsky, in contrast, believed that intelligence begins in the social environment, and directs itself inward. The process of the direction of intelligence from the outside to the inside is what Vygotsky refers to as internalization.

Internalization is the internal reconstruction of an external operation. The basic notion is that we observe those in the social environment around us acting in certain ways, and we internalize their actions so they become a part of ourselves. For example, we might learn how to teach young children by watching how our parents teach us; or we might learn how to speak or ride a bicycle or even read a book by watching how others do it. Internalization does not occur, for the most part, simply as the result of mimicry of a single action. Rather, it is a process that continues over time. First, the action may be perfectly imitated, or its meaning not quite understood. Moreover, even after an action is internalized, its linkage to other internal acts may take quite some time. Some functions are never internalized: They remain forever as external signs. According to Vygotsky, the internalization of socially based and historically developed activities is what distinguishes humans from animals.

Perhaps Vygotsky's most exciting contribution to the psychology of intelligence is his notion of the zone of proximal (or potential) development. Consider a situation posed by Vygotsky.

Take two children whose chronological age is ten years and whose mental age is eight years. Ask whether one can characterize them as being of the same age mentally. On the face of it, of course, one can. But this means that both children can deal with tasks up to the degree of difficulty characterized by what eight-year-olds can typically do. One could say that the actual developmental level of the two children is the same. But, Vygotsky asked, can one thereby ascertain that the subsequent course of their mental development and their school learning will be the same, because both depend on their intellect? Naturally, there are nonintellectual factors that may influence their school learning or their mental development. But for the time being, consider these nonintellectual factors as being comparable for the two children. Most people would assume that one could make comparable predictions about each of the children, and indeed, the whole predictive use of intelligence tests in the United States is based on this assumption. Vygotsky argues that this view is incorrect.

Suppose that a teacher-examiner provides guided assistance to each of the two children in order to help them solve a given problem. It turns out that, with this guided assistance, the first child can deal with problems up to the level of a twelve-year-old, whereas the second child can only deal with problems up to the level of a

nine-year-old. Would we still want to conclude that the two children are mentally the same? Vygotsky suggests that we would not, for the first child has been shown to be better able to profit from instruction than the second child. Hence, it is reasonable to suppose that with regard to future as opposed to past development, the first child is superior to the second child and has a better prognosis. The difference between mental age twelve and mental age eight, for the first child, and between mental age nine and mental age eight, for the second child, is what Vygotsky refers to as the zone of proximal development. It is the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers. According to Vygotsky, there may be many gifted children who are not so identified because, although they have the potential, they have yet to realize it.

Another sociological theorist is Reuven Feuerstein, whose basic premise is that intelligence is modifiable. The key concept in Feuerstein's conception of intelligence and its development is *mediated learning experience* (Feuerstein, 1980). Mediated learning experience is

the way in which stimuli emitted by the environment are transformed by a "mediating" agent, usually a parent, sibling, or other caregiver. This mediating agent, guided by his intentions, culture, and emotional investment, selects and organizes the world of stimuli for the child. The mediator selects stimuli that are most appropriate and then frames, filters, and schedules them; he determines the appearance or disappearance of certain stimuli and ignores others. Through this process of mediation, the cognitive structure of the child is affected. The child acquires behavior patterns and learning sets, which in turn become important ingredients of his capacity to become modified through direct exposure to stimuli (Feuerstein, 1980, p. 16).

Feuerstein believes that mediated learning experience can occur either through the intervention of a particular individual, such as the parent, or through general cultural transmission. Children who are culturally deprived—who have inadequate exposure to their own culture—will tend to receive inadequate mediated learning experience. Feuerstein believes that cultural deprivation is not in terms of a mainstream or host culture, but in terms of the culture of the child and his family.

SOCIOLOGICAL TESTS

The concept of the zone of proximal development is clearly related to mediated learning experience, as mediated learning experience seems to be what helps children achieve their level of potential development. Brown and French (1979) give a fairly detailed example

of how the zone of proximal development can be measured, and Ferrara, Brown, and Campione (1986) illustrate the use of the zone of proximal development in considerable detail. Brown and her colleagues have devised tests that use the Vygotskian concept in order to measure the zone of proximal development.

Feuerstein (1979) has developed a test called the Learning Potential Assessment Device (LPAD), which follows directly from his ideas about mediated learning experience. The test also fits very well with Vygotsky's notion of the zone of proximal development. In the test, an examiner gives children rather difficult tasks to solve. Initially, he or she looks at how the children solve the tasks without any intervention on the part of the examiner. Then, children receive carefully graded, sequential hints, and the examiner observes the children's ability to profit from these hints. In this way, it becomes possible to observe the children's zone of proximal development.

Although I initially had some doubts as to whether the tests of the zone of proximal development measure what they are supposed to measure, the results of Brown and her colleagues and of Feuerstein are very encouraging. I remain concerned, however, that the operationalization of the zone of proximal development may not sufficiently take into account individual differences in abilities and styles of learning. The instruction that works well for one child might work only poorly for another child, with the result that the first child might appear to have a larger zone of proximal development than the second. In order for the measure to be fair, we would have to make sure that the form of instruction used was equally suitable for all children receiving that instruction, and it is unlikely that any form of instruction will be equally suitable for all. Hence, I believe that we do have to be careful in our interpretation of results of tests that measure the zone of proximal development. Moreover, we need to recognize that there may be zones of proximal development that are domain-specific rather than domain-general, and that may differ not only as a function of domain but as a function of how learning takes place. For example, some children might learn quite well with the kind of direct instruction given in tests of the zone of proximal development, whereas other students might learn better on their own.

These concerns notwithstanding, the zone of proximal development is one of the more exciting concepts in the psychology of intelligence, because it gives us a way of addressing the question of what will happen in the future, not based just upon retrospective measurement, but based upon simulations of prospective processing of information. The dynamic form of testing is quite different from the static form used under the geographic metaphor. Dynamic testing may well be the wave of the future in terms of understanding not only to what point people have arrived, but also to what point they are going.

In terms of the pentagonal implicit theory, the sociological metaphor emphasizes the *value* of socialization,

both in theory and in assessment. For example, the assessment paradigms of both Vygotsky and Feuerstein involve mini-socialization procedures in which an examiner interacts extensively with an examinee. *Excellence* and *rarity* are in terms not just of performance, but of the ability to improve one's performance with guided instruction. Whereas tests under other approaches use *productivity* in the testing situation as a predictor of productivity in life, tests under this approach use potential productivity *demonstrated* in the testing situation (the zone of proximal development) as a measure of potential productivity outside testing situations.

Intelligence as Viewed Internally and Externally to the Individual

The Systems Metaphor

The systems metaphor is an attempt to bring together various other metaphors by viewing intelligence in terms of a complex interaction of various cognitive and other systems. I will describe here two attempts to understand intelligence in terms of interactioning systems: Gardner's (1983) theory of multiple intelligences and Sternberg's (1985, 1988) triarchic theory of human intelligence. Both theories imply that a gifted person is not gifted by virtue of just high levels on one or more abilities, but also by virtue of the way these abilities interact as a system.

SYSTEMS THEORIES

The two systems theories to be considered here are similar in viewing conventional theories of intelligence as too narrow, but are different in the way they propose to expand our conception of intelligence. Consider each theory in turn.

Howard Gardner's (1983) theory of multiple intelligences may be viewed as having three fundamental principles. First, intelligence is not a single thing, whether viewed unitarily or as comprising multiple abilities. Rather, there are multiple intelligences, each distinct from the others. The multiple intelligences Gardner proposes in his 1983 book are linguistic, logical-mathematical, spatial, musical, bodily-kinesthetic, interpersonal, and intrapersonal. In some ways, the distinction between positing one intelligence comprising multiple abilities and positing multiple intelligences, each distinct from the others, is subtle. But the positing of multiple intelligences emphasizes the separateness of each set of skills, and also emphasizes Gardner's view that each intelligence is a system in its own right, rather than merely one aspect of a larger system, namely, what we traditionally call "intelligence". The second fundamental principle is that these intelligences are independent of each other. In other words, a person's abilities as assessed under one intelligence should not, in theory, be predictive of that person's abilities as assessed under another intelligence.

Obviously, the claim of independence is a strong one, but Gardner believes that it is justified by what we know about the mind. The third fundamental principle is that the intelligences interact. Although they are distinct from each other, no one could ever get anything done if their distinctness and independence meant that they could not work together. In such an instance, a mathematical word problem requiring, say, the application of both linguistic and logical-mathematical intelligences would be insoluble.

Gardner defines an intelligence as “an ability or set of abilities that permits an individual to solve problems or fashion products that are of consequence in a particular cultural setting” (Walters & Gardner, 1986, p. 165). How do we know what constitutes an intelligence? In other words, what criteria can one use to identify the multiple intelligences in Gardner’s theory, or other possible intelligences that have not yet been identified? Gardner proposes eight criteria for distinguishing an independent intelligence: potential isolation by brain damage; the existence of idiots savants, prodigies, and other exceptional individuals; an identifiable core operation or set of operations; a distinctive developmental history, along with a definable set of expert “end-state” performances; an evolutionary history and evolutionary plausibility; support from experimental-psychological investigations; support from psychometric findings; and susceptibility to encoding in a symbol system.

Sternberg’s (1985, 1988) triarchic theory, as its name implies, has three parts. The first, “componential subtheory”, relates intelligence to the internal world of the individual, or the mental mechanisms that underlie intelligent behavior. It specifies three kinds of information-processing components: metacomponents, which are higher order executive processes used to plan what one is going to do, to monitor it while one is doing it, and to evaluate it after it is done; performance components, which are lower order processes that execute the instructions of the metacomponents in order to perform tasks; and knowledge-acquisition components, which are used to learn how to do what the metacomponents and performance components eventually do.

Components of information processing are always applied to tasks with which one has some level of prior experience (including the null level) and in situations with which one has some level of prior experience (including the null level). Hence, these internal mechanisms are closely tied to one’s experience. The second, “experiential subtheory”, specifies that the components are not equally good measures of intelligence at all levels of experience. Assessing intelligence requires one to consider not only the components, but the level of experience with which they are applied.

According to the experiential subtheory, intelligence is best measured at those regions of the experiential continuum that involve application of information-processing components to tasks or situations that are either relatively novel, on the one hand, or in the process of becoming automatized, on the other. If a task is too unfamiliar, such as a trigonometry problem presented to a first-grader, it

will not measure intelligence because the individual will have virtually no mental resources to bring to bear on the problem. If the task is already automatized, one will have no sense of the history of how efficaciously that automatization was accomplished—whether it took one week or one year. The ability to deal with novelty and the ability to automatize information processing are interrelated. If one is well able to automatize, one has more resources left over for dealing with novelty. Similarly, if one is well able to deal with novelty, one has more resources left over for automatization. Thus, performance at the various levels of the experiential continuum are related to one another.

These abilities should not be viewed in a vacuum with respect to the componential subtheory. The components of intelligence are applied to tasks and situations at various levels of experience: coping with novelty is via the components, and what is automatized is a set of components of information processing.

According to the third, “contextual subtheory”, intelligent thought is directed toward one or more of three behavioral goals: adaptation to an environment, shaping of an environment, or selection of an environment. These three goals may be viewed as the functions toward which intelligence is directed: Intelligence is not aimless or random mental activity that happens to involve certain components of information processing at certain levels of experience. Rather, these components are purposefully directed toward the pursuit of these three global goals, regardless of the level of experience at which the components are executed. The nub of the triarchic theory of intelligence is that intelligence involves recognizing and capitalizing on one’s strengths, and recognizing and either compensating for or remediating one’s weaknesses. Thus, people may differ widely in how they are intelligent, but they find some way in which they excel, and then make the most of it.

SYSTEMS TESTS

In the systems approaches, the actual testing that is done will depend on the way the system of the mind is conceived. Howard Gardner and David Feldman, in their project Spectrum, are developing tests based on Gardner’s (1983) theory of multiple intelligences. These tests, unlike the conventional ones, are not paper-and-pencil, but rather measure children’s thinking skills in an enriched classroom environment where children are performing criterion activities. Thus, linguistic intelligence might be measured by having children write a poem, or bodily-kinesthetic intelligence by having them dance or play a sport.

Sternberg is currently developing a test based on his triarchic theory of intelligence, which measures each of the componential skills, coping with novelty skills, automatization skills, and practical-intellectual skills in verbal, quantitative, and figural domains. The test, for kindergarten through adulthood, is at multiple levels,

and is a group test. The componential items are most similar to those on a standard intelligence test, including things like learning meanings of words from context, number series, and figural analogies. The coping with novelty tests require subjects to solve problems that are based on a novel premise. For example, novel verbal analogies have students solve analogies that are preceded by a premise that may be either factual (e.g., canaries sing songs) or counterfactual (e.g., canaries play hopscotch). In each case, the subjects would have to solve the analogies as though the premise were true. The novel number matrices, used to measure coping with novelty in the quantitative domain, require subjects to complete number-matrix problems in which numerals and symbols that have been set equal to various numbers are freely interchanged. The figural coping with novelty task requires solving figural series in which the series show a discontinuity in the middle, and the subject must infer how to extrapolate from the first domain in the series to the second. All three automatization subtests—verbal, quantitative, and figural—require subjects rapidly to indicate whether two different symbols are of the same class or not, for example, whether two numbers are both even or both odd. Practical verbal problems require everyday inferences, practical math problems require everyday math, and practical figural problems require planning of routes in a way that is time-efficient and effective. In the triarchic approach, the testing of intelligence is closely linked to the teaching of intelligence, and there exists a program at the high school-college level, *Intelligence Applied* (Sternberg, 1986), which can be used in conjunction with testing in order to enhance intellectual skills.

Returning to the pentagonal implicit theory, we find that the *valuing* of the systems theories is not so much of one ability or another, but of how the abilities work together. The *excellent* person is someone who can make his or her abilities work together in harmony, and such persons are *rare*. The systems theories are very concerned with the relation between *productivity* in tests and in everyday life, and indeed, Gardner has been a leader in the so-called “authentic-testing” movement, which seeks to evaluate children’s gifts in terms of the products they produce. In this movement, children must *demonstrate* their abilities not just by the potential to produce significant products, but by actually producing them.

Conclusion

The testing of intelligence can be as diverse and multifaceted as is intelligence itself. One cannot beg the question of “What is intelligence?” by saying, as did Boring, that intelligence is what the tests test, because there are as many different kinds of tests as there are metaphors for understanding intelligence. “Giftedness” can be viewed as quite broader than a high score on a conventional intelligence test. There can be different

sorts of tests within each metaphor, depending upon the particular theory within the metaphor that generates the test. The conventional individual and group tests we use to measure intelligence represent only a small sampling of the ways in which intelligence might be tested. Almost all of the conventional tests are based upon the geographic metaphor, but there is no reason in principle why we need to test intelligence on this basis. Other metaphors could help us assess aspects of performance that heretofore have been neglected.

It is worth emphasizing again that metaphors are not right or wrong, but more or less useful for particular purposes. Similarly, the theories within the metaphors can be more or less useful for particular purposes. Theories, unlike metaphors, can be proven to be wrong, although, of course, we cannot prove them to be right, but can only gather evidence that is consistent with them. In comparing theories, we need to keep in mind whether or not they were generated under the same metaphor, because theories generated under different metaphors do not readily lend themselves to comparison, any more than apples and oranges do. They deal with different aspects of intelligence and accomplish different goals, and hence are not, strictly speaking, comparable. Even within the same metaphor, noncomparabilities can exist. For example, within the biological metaphor, there were three distinct approaches that were viewed—neuropsychological, electrophysiological, and blood flow—and it would not be possible directly to compare across these procedures of measurement. Each deals with a different class of phenomena.

The direction that most applied research has taken over the past decade or so has been toward successively more refined psychometric theories of measurement, and successively more refined delivery systems for measurement. Thus, we now have tailored tests, which typically use computer technology to present existing tests in more efficient ways. I am all in favor of psychometric and technological development. But I personally believe that we need to apply more resources to questions of what we want to measure before we apply resources to how we are going to measure it. Historically, the link between theories and tests of intelligence has not been as strong as I believe it should be. The link is always there, to some extent, but even when it is there, we have often not been conscious of it. We need more explicitly to state what we are assuming about intelligence when we measure it through a given vehicle, and more seriously to consider the alternatives to the vehicles we are using. The metaphorical approach to understanding intelligence helps chart the universe of possibilities for more informed and self-conscious testing of intelligence.

Ultimately, the “metaphorical approach” combined with the pentagonal implicit theory shows the importance of *valuing* to the identification of the gifted. What is valued by one approach to theory and assessment may or may not be by another. In identifying the gifted, we

need to pay much more attention than we have to the question of what we mean by "giftedness".

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Methodological Problems and Issues Concerning Identification

ERNST A. HANY

University of Munich, Germany

Introduction

The paradigm of the special education of the gifted in the school years involves the classification of individual members of a limited sample as “gifted” and then their participation in a giftedness nurturing program. The identification of gifted individuals therefore takes a place of considerable importance for the establishment of programs, alongside program design. The first part of this contribution will be an overview of recommendations on identification design made by experts on gifted education. In the next step these recommendations will be considered scientifically. To this end, the decision theoretical model of selection decisions will be presented. Its properties and methodological consequences for practice will be discussed. Finally, insights on the construction of social judgments and group decision making will be presented because the available research on this topic has often been neglected when identification procedures are designed.

This contribution is restricted by and large to formal aspects of identification. Questions on the nature of giftedness and on concrete measuring instruments are dealt with in other contributions to this handbook and in further publications (e.g., Davis & Rimm, 1985; Gallagher, 1985; Khatena, 1982). A special mention should be made of the contribution from Feldhusen and Jarwan (Chapter 13), since there theoretical considerations and practical applications are effectively combined.

Overview of Recommendations on Identification

Most authors writing on the identification of gifted school students (e.g., Clark, 1992; Feldhusen & Baska, 1985; Hagen, 1980; Swassing, 1985; Tannenbaum, 1983) agree on the following points:

(1) The identification of gifted school students is a goal-driven process for locating students whose potential is not sufficiently challenged by regular teaching.

(2) The indicators and measuring instruments used for identification must reflect the contents of the proposed nurturing program. Tannenbaum (1983, p. 366) puts it

like this: “the identification procedures have to conform to the scope and objectives of the curriculum”.

(3) The identification of gifted children should begin in such a way as to include as many candidates as possible. Many different kinds of information should be gathered in order to reduce the chances of incorrectly excluding suitable school students. Special attention should be paid to members of special groups (members of different cultures, disabled children, underachievers, and girls—in the case of programs in mathematics and sciences). This attention is facilitated by use of different sources of information (Hadaway & Marek-Schoer, 1992).

(4) Admission to a nurturing program should be regulated by a committee of experts after discussion of the individual case and consideration of all available documents. The giving of different weights to different kinds of data in respect of the final decision cannot be avoided, but should at least be justified and made explicit.

(5) The learning progress made by the program participants should be repeatedly investigated (Feldhusen & Baska, 1985, suggest as often as every two months) in order to assess the admission decision on the one hand and to validate the decision strategy on the other.

Hagen (1980) suggests that these recommendations can be realized by following the steps given below in the planning of an identification procedure: First, the school should determine which concept of giftedness is to be adopted. Indicators are selected for this concept, and in the next step information sources (school records, teachers, parents, the school students themselves) and measuring instruments (tests, checklists, observation protocols, product ratings) are identified for them. Rules governing how the resulting information is to be applied should be specified before the beginning of data collection. This is particularly important for the guidelines concerning the combination of information for the final admission decision.

According to B. Clark's (1992) recommendations, a co-ordinator should be appointed for the carrying out of the identification procedure. His or her task is to initiate the search for talent and to structure it with a multidimensional screening procedure. After as much information as possible has been gathered, the

co-ordinator combines this data to give a profile of the individual child's abilities, performance and interests, his or her strengths and weaknesses. A preselection of the candidates is then presented to the selection committee in the form of case studies. A selection decision is made which in some cases may only have provisional status. Sometimes a trial period may be necessary in order to assess the suitability of the student for the program unequivocally. After admission to the program, further diagnostic steps are necessary. The child's individual interests and learning style must be recorded in order to be able to tailor the individual support as closely as possible to his or her learning needs and learning skills.

There is some dispute about some aspects of the identification procedure. One such problem is the choice of indicators and instruments. Some authors recommend using general indicators (e.g., intelligence and creativity) for the selection, whereas others speak out for specific indicators directly related to the program which follows. Feldhusen and Baska (1985) argue that the search for generally gifted children and their identification using intelligence tests is acceptable when numerous varied activities for general intellectual stimulation are planned, as is often the case in elementary school or kindergarten. Hagen (1980) points out that general and specific indicators can often be assigned to the dimension "fluid-crystallized". General intelligence tests represent a "fluid" feature, which is however, according to Hagen, often no less suitable as predictor of success in a nurturing program as specific "crystallized" achievement prerequisites such as existing knowledge on a particular area of the program. Mention is often made of the value of ability tests when the identification of gifted underachievers is under discussion (Peters, 1992). B. Clark (1992) and Swassing (1985) point out the advantages of criterion-referenced measuring procedures when concrete prerequisites for coping with course demands are to be defined.

Another point of dispute alongside the use of general intelligence tests is the utility of the teacher's opinion. Richert (1991) lists numerous studies on the weaknesses of teacher judgment and advises largely against their use. In contrast, Tannenbaum (1983) praises the unique advantages of teacher judgment. We will deal with this topic later in more detail.

The question of how the collected data should be combined to form the overall judgment on a school student is also controversial. What is clear is that in practice data are often carelessly and irresponsibly combined (Alvino, Richert, & McDonnell, 1981). One reason for this problem is that recommendations are often made to gather as much data as one possibly can in order to eliminate the possibility of missing even one gifted child (B. Clark, 1992; Richert, 1991). Contrasting this, Perrone and Male (1981) and Tannenbaum (1983) warn against unmanageable floods of information and against the overinterpretation of subtest results whose significance cannot be persuasively empirically certified. Feldhusen, Baska, and Womble (1981) make

an urgent call for the sample-related standardization of the information on the basis of z or T values before measurements are compared or processed. In the literature there is little help on the design of the final decision or on the mathematical combination of data. For this reason, the present chapter is concerned above all with these questions.

In the surveyed literature there is little discussion of the fact that the identification of gifted school students for the admission to a nurturing program is accompanied by the rejection of less gifted students. Some recommendations seem to suggest that nearly all available school students should be considered for giftedness nurturing (Richert, 1991). In order to avoid having to make rejections, the taking of decisions in any form is called into question; suitable candidates are supposed to select themselves (Gourley, 1984; Shore & Tsiamis, 1986). If unsuitable children then do indeed take part in a program and fail, they are themselves held responsible. This argument overlooks the fact that special programs for the gifted are only effective when a child meets the conditions set by the program. The admission of a child to a program which is really too difficult can lead to frustration and feelings of inadequacy and negatively influence personality development.

Many authors indeed focus the problem that suitable students could be incorrectly rejected or that only partly suitable students take part in a nurturing program for too long. The solution offered by Renzulli (Renzulli, 1984; Renzulli, Reis, & Smith, 1981) to this problem seems especially effective. The *Revolving Door Identification Model* combines the construction of a broad Talent Pool with a limited period of nurturing. The admission to special programs takes place on the basis of very effective indicators of the process of learning and performing, called "Action Information". This procedure offers a number of advantages: (1) a large number of gifted children are nurtured; (2) process oriented behavior data, which Hagen (1980), Lupart (1992) and Tannenbaum (1983) assess as especially revealing, is collected about the members of the Talent Pool; (3) the short nurturing periods offer a lot of children the chance to receive special support during a school year; (4) the nurturing of an individual school student is based on the current individual needs. Renzulli's model has because of its popularity often been discussed and criticized. A recent overview of the state of the discussion is provided by MacRae and Lupart (1991) who conclude with a mainly positive evaluation of this model. This identification model assumes that a considerable proportion of the whole sample can be considered gifted and therefore requires nurturing; in addition, the assumption is made that sufficient personnel and other resources are available for the continuing diagnostic measurements.

Alternative models start from completely different assumptions: The *Talent Search model* which is presented, e.g., by George (1979) and VanTassel-Baska (1984) assumes that there is a large number of possible

applicants and a relatively small number of qualified applicants. It also assumed that there are restricted resources for applying individual-centered diagnostic measures. In addition, this approach focuses on a very high level of a narrowly defined talent. Therefore, it is more important to use a standardized and relatively difficult measurement instrument which sufficiently differentiates at the highest levels of ability than to collect a huge number of "soft" data in order to assist to the selection process (Keating, 1975; Stanley, 1984).

The concrete form that the identification procedure takes depends on the definition of the concept of giftedness and on the restrictions of the practical situation of the selection process. In the next section, elements of this situation shall be introduced which generally constitute the selection decision. Before that, the previously described recommendations are reflected on a theoretical and methodological basis. In addition, reflections about a typology of identification procedures are presented.

Methodological Basis for The Identification of Gifted School Students

The Individual Approach in Giftedness Nurturing

In the first part of this chapter, recommendations were presented on how the identification of gifted children as a prerequisite for, and a part of, gifted education has to be designed. These recommendations all assume that giftedness is a phenomenon which can be observed in the individual. Giftedness is a label for people and not for groups of people or for a particular learning situation. This assumption leads to the attempt to measure aspects of the individual and then to derive a statement on his or her giftedness. The planning and design of nurturing programs are also carried out with individual features in mind. Topic specific knowledge, learning potential, creativity, etc., are considered during planning, execution, and evaluation of programs to be properties of the individual. The fact that giftedness nurturing often takes place in groups (courses or classes), i.e., in a social context, is explained purely on grounds of organization (the number of available teachers).

This view of the education of the gifted, which takes the individual as its measure, would seem to be a consequence of the educational philosophy of the Western world: The individual's potential for self-actualization and for shaping his or her environment, i.e., individual freedom and independence, is a very important educational goal. That gifted people should also apply their talents to the benefit of society which educated them is a demand which is often subordinate to the aim of self-fulfilment. This requirement, that talent should also be used to benefit society, implies

a partnership between individual and society, i.e., it already accepts that individual and society are to be seen at least as equals.

At first glance, this preoccupation of giftedness nurturing with individual features seems to be perfectly natural. After all, the call for special nurturing for the gifted arose after individual differences (between children) were given a firm measurement methodology, and were thus made verifiable, by the development of psychological tests. A further argument was provided by the observation that the putting together of children into (heterogeneous) groups and giving them all the same lessons did not always take individual learning differences into account. So the establishment of special programs for the gifted arose out of the observation of individual differences.

Precisely these two arguments can however be interpreted differently: Giftedness only becomes a problem where a feature relevant to giftedness shows a large variance in the group in question (cf. the criteria for subjective theories of giftedness according to Sternberg, in Chapter 12) and where the school cannot adequately respond to this high variance. B. Clark (1992, p. 204) stresses that the need for nurturing must always be seen in relation to the nurturing resources available: "We are especially concerned about gifted children who show their intelligence through high performance in abilities in the cognitive, specific academic, creative, leadership areas, or ability in the visual and performing arts, *when such ability cannot be furthered in the program ordinarily provided by the schools*" (emphasis added). Feldhusen and Baska (1985) also seem to assume that regular lessons are not sufficient for gifted students. They explain (Feldhusen & Baska, 1985, p. 81): "The purpose of the identification process in gifted education is to identify youth whose abilities, motivation, self-concept, interests, and creative talents are so far above average that special education program services are needed to meet their needs."

For this reason, a need for identifying gifted individuals arises only when the existing educational measures are overtaxed. A consequence of this point is that identifying the gifted is useful only when other, better suited educational programs are available. This is reflected in Feldhusen's remark (Feldhusen, 1992, p. 10): "The identification process then serves to select youth who should receive and *will profit from special educational experiences* (. . .)" (emphasis added). Two conditions have to be met if identification measures are to be justified: Firstly, the regular educational program is not helping gifted students to develop in an optimal way, secondly, there is an alternative program to hand which does more justice to the developmental potential of those students. However, the performance of the regular educational program can only be measured with an investigation design which focuses the interaction of characteristics of the person and features of the program. It follows that identification of gifted students would ideally not start with the characteristics of the students

but with the features of the interaction between student and instruction.

In conclusion, the concept of "educational needs", and therefore the concept of giftedness, proves from a theoretical point of view to be constituted by a number of factors: (1) the heterogeneity of the characteristics of the population which are relevant for learning; (2) the ability of the regular instruction to respond to different levels of learning aptitude; and (3) the suitability of the special educational program to address the learning needs of those students who are not optimally supported by regular instruction. However, in practice, only personal characteristics are used for the identification of gifted students. The consideration of these three constituting factors leads to different approaches to identification. These approaches are presented in the next section. This discussion attempts to make clear the different assumptions on the nature of giftedness on which existing programs are based.

A Typology of Concepts of Giftedness From an Educational Perspective

The most widely used approach toward the identification of gifted students is based on the heterogeneity of the reference group (first constituting factor). Those characteristics of students which are relevant for the learning progress are assumed to be variable; usually they are modeled with normal distributions. There are accordingly only a few people with very high and very low values of the characteristic. If these characteristics represent individual potentials which are valued by society (as is the case with intelligence or creativity) because they are (statistically or causally) correlated with achievement in later life, the extreme values of these characteristics are labeled "giftedness" (cf. Sternberg, in the previous chapter).

Characteristics of this kind most often do not give clear information about the future development of individuals showing high values; in the same way, concrete evidence about these persons' behavior in special programs cannot be deduced from these characteristics. However, definitions of this kind, based on abstract characteristics of persons, are met frequently. An arbitrarily chosen percentage of the population is then named "gifted". A giftedness threshold, e.g., 2% or 5% of the population, can however never be justified on an empirical basis because continuous variables do not offer any obvious cuts.

It is difficult to design adequate education for a group of gifted students when giftedness is defined in such a way. High intelligence, for example, does not allow any conclusion about whether a student with high scores is appropriately challenged by regular classroom instruction or about which learning setting may be better suited to realizing and developing his or her reasoning ability. Conclusions of this kind must be derived from empirical investigations. Such

a distribution-related (norm-referenced) definition of giftedness does not have a direct relation to existing educational programs. Of course, this is a disadvantage if a prognostic statement has to be made on whether or not the gifted will be successful in the programs offered. On the other hand, this may be an advantage because existing programs can be evaluated on how well they fit the characteristics of the gifted. For this reason, a definition of giftedness which is constructed independently of existing programs can contribute to the optimization of the program. This was expressed by Renzulli (1984, p. 163) in the following way: "the way in which one views giftedness should be a primary factor in both constructing a plan for identification and providing services that are relevant to the characteristics that brought certain youngsters to our attention in the first place".

A second method of defining giftedness explicitly refers to existing educational programs (this corresponds to the third factor constituting the concept of giftedness as described earlier). A person is classified as gifted if he or she fits well into a concrete educational program, that is, if he or she best reaches the goals of the program. This strategy for conceptualizing giftedness follows the example of aptitude assessment as practiced in personnel selection. The use of a strategy of this kind is intended to guarantee that the persons selected profit most from being accepted for the position or the training. This paradigm of personnel selection is widely accepted. At the same time it is conceded that this kind of definition of giftedness can vary from program to program: "We have emphasized that the identification procedures themselves operationally define exactly who is gifted and talented for any particular program. Furthermore, the strategies described in this chapter do not always agree, that is, they will not identify the same students as 'gifted' or 'talented.' Therefore, it is important that identification be related not only to one's definition of giftedness, but to the purpose and goals of the program" (Davis & Rimm, 1985, p. 82f.).

This concept of giftedness is based less on the abilities of the individuals than on the demands made by the program. Labeling of the program participants as having special (relatively permanent and generally valuable) characteristics can be avoided because the participants show only features which are relevant in relation to the nurturing program. To establish an adequate methodology for selecting program participants requires comprehensive empirical studies of those features of the participants which allow the best prognosis of success in the program. Only features with high criterion validity are included in the selection strategy.

If one proceeds in this way, two problems arise. The first problem is the determination of a criterion of individual success in the program. Renzulli and Delcourt (1986, p. 20) argue that in the field of gifted education there is no generally accepted criterion: "The essence of the problem is the absence of an ultimate criterion to which any predictor variable can be compared." The

authors distinguish between creative productivity in the field covered by the program and long-term creative productivity in areas which individuals enter only in later life. Considered more specifically, cognitive or affective learning goals or the full development of one's personality can be emphasized as effects of the program and taken as a criterion. Generally, the development of learner characteristics which are already present at the beginning of the program or the compensatory nurturing of developmental deficits can be used as criteria depending on the goals of the program. A criterion or several combined criteria which represent the successful completion of the program must come first. Then suitable predictors and the combination of variables to form a complex predictor variable (e.g., to a linear combination; cf. Feldhusen & Jarwan, in this book) can follow.

The second problem arises if the program does not optimally correspond to the characteristics of children with high learning potential. It can happen, for instance, that children with very high intelligence do not benefit as much as children with average intelligence from completing the program. A consequence of empirical results indicating such a tendency would be a decision procedure which rejected children with very high intelligence from attending the program.

If there is no way of improving the program, this result has to be accepted. However, in general one should try to combine the norm-referenced definition and the definition based on an outside criterion. In this case, the participants of a program are initially selected according to their abilities or suitability. Then, during the formative evaluation of the program, the selection procedure which has been empirically determined on the basis of the external criterion is examined to see if it does select the same children who seem to be best suited for special nurturing on the basis of a norm-referenced definition of giftedness. In a nutshell, an investigation is carried out on whether the highly intelligent (or creative or otherwise talented) children are those who are nurtured best through the program.

A third identification strategy is possible, but it is hardly used in its purest form. This method is based on the criterion-referenced approach to the assessment of learning results (Hambleton & Novick, 1973; Klauer, 1987). This approach examines in relation to an internal criterion whether or not children have mastered a certain domain of knowledge. Criterion-referenced testing was developed as a method to evaluate the effects of instruction based on the mastery teaching approach: "In many of the new instructional models, tests are used to determine on which instructional objectives an examinee has met the acceptable performance level standard set by the model designer. This test information is usually used immediately to evaluate the student's mastery of the instructional objectives covered in the test, so as to locate him appropriately for his next instruction" (Hambleton & Novick, 1973, p. 160). This methodological approach is often applied when

internal differentiation is used during regular classroom instruction, that is, when students are assigned to small learning groups for a short period of time. After completion of a teaching or learning unit, the teacher can determine which children have mastered the learning goals and which have not. Children who have already mastered the contents are provided with additional learning material which can enrich or reinforce the knowledge acquired. The other children who have failed to master that domain are assigned to repetitions and additional exercises. In this case, where the mastery of a knowledge domain (which can be labeled expertise) is used as a basis to define giftedness, the second constitutional factor of the concept of giftedness (see earlier presentation) is being used.

At a macro-level, this approach seems to be that applied by *The Study of Mathematically Precocious Youth* despite that the tests which are used there have not been strictly designed in a criterion-referenced way. However, Stanley (1984, p. 179) explains that the premature mastery of a content domain serves as the actual criterion for the selection to continuous nurturing: "For example, the best way to 'enrich' Algebra I for students who already know it, or could learn the rest of it in a few hours, is probably to help them get smoothly into the best-available Algebra II class." The assessment of the mastery of a content domain serves two functions: Firstly, it demonstrates that these children would not profit from repetitions and exercises of the same topics; this kind of instruction would be less than optimal for them. Secondly, this assessment points out the direction which the subsequent education should take—be it enrichment/reinforcement of the knowledge or be it a continuation of the accelerated learning speed. Stanley (1984) and his coworkers seem to implicitly apply a procedure which was demonstrated by Bart and Read (1984). The participants of a special educational program were given a test on completion which served as an external criterion. Then the children who passed and who failed this final test were compared on the basis of the test which was given as the final examination of the unit preceding the special program. A cut-off score in this test was found which best separated the children who succeeded in the subsequent program from those who failed. This procedure combines that approach to the definition of giftedness which focuses on an internal criterion (second constituting factor) with that which focuses on an external criterion (third constituting factor). From a methodological point of view, the most important thing is that the content validity of the measurement instruments is guaranteed. This content validity can be determined by expert judgment (see Harty, Adkins, & Sherwood, 1983/84, and the following sections).

As we have seen, identification and nurturing of the gifted always takes place in a triangle formed by the characteristics of the person, features of the available classroom instruction, and properties of the special program of the gifted. If characteristics of

the person are regarded as particularly important, a distribution-oriented (norm-referenced) model is given which most often results from a percentage-based definition of giftedness. The emphasis put on features of the available classroom instruction leads to content-related conceptions which are methodologically mirrored by criterion-referenced testing procedures. If most emphasis is given to properties of the nurturing program which is intended or realized, identification of the gifted takes the form of personnel selection with relation to criteria of success given by the program.

It is just as fruitless to search for a criterion of truth for the different approaches to identification as it is to search for one for the definition of giftedness in general. Sternberg and Davidson (1986, p. 3f.) express this problem very precisely: "Ultimately, usefulness may be the only test we have of what makes for a better or worse conception of giftedness. Giftedness is something we invent, not something we discover. It is what one society or another wants it to be, and hence its conceptualization can change over time and place."

If we want to judge the utility of a selection procedure in the field of gifted education, we need first of all to know what features and consequences selection procedures have. In the next section a general model of selection is presented on the basis of decision theory. When compared to this general model, selection procedures used in practice can be evaluated and suggestions for optimization can be discussed. As we will see, many of the recommendations which were presented in the first part of this chapter are supported by theoretical considerations.

Procedures of Identification and Selection, Considered from a Decision Theoretical Point of View

The structure of the decision which underlies the selection of gifted students will be generally described in the following section. Concepts like validity and correlation are assumed to be familiar to the reader. Short explanations of these and other concepts are given by Swassing (1985) and by Murphy and Friedman (1991).

A GENERAL MODEL OF THE DECISION SITUATION

Every situation in which decisions on individuals have to be made is determined by the following characteristics:

(1) The individuals concerned possess a feature Θ which allows for a classification of the individuals into two (or more) groups. Either there are only two values of the feature (θ_0 and θ_1) which simply separate the two groups of individuals, or the feature has more values, in which case it is divided into two domains of values ($\theta_0 < c$; $\theta_1 \geq c$). In the context of the identification of gifted persons, θ_1 can be regarded as the existence of a high level of ability or of a need for special education,

or as suitability for the program in question. θ_0 can be seen as the lack of this ability, of this need, or of this suitability.

(2) The decision to be made takes the form of one of two (or more) available alternatives: a_1 : the person is gifted (or: the person should be taken into the program; or: the person has mastered the content of a certain domain), and a_0 : the person is not gifted (should not be taken into the program; has failed to master the content). Using the terminology of personnel selection, one can say that a person is "accepted" (a_1) or "rejected" (a_0).

(3) The feature Θ is not known (otherwise all decisions would be clear and error-free). However, there is a variable X available which can be observed. On the basis of these observations certain assumptions about the value of Θ can be made. The relation between X and Θ is probabilistic because X can be afflicted with measurement errors (lack of reliability) and because X is usually only an approximate measure of Θ (imperfect validity).

(4) Both values θ_0 and θ_1 of the feature Θ can occur together with both decisions a_0 and a_1 (Table 1). However, the four possible events $e_{ij}=(a_i, \theta_j)$ are not uniformly preferred by the person who has to make the decision. The events e_{00} (person who does not fulfill the criterion is correctly rejected) and e_{11} (person who fulfills the criterion is correctly accepted) are generally welcome but the events e_{10} (person who does not fulfill the criterion is mistakenly accepted) and e_{01} (person who fulfills the criterion is mistakenly rejected) would be regretted. A particular decision strategy, that is a rule specifying which values of X are to lead to the decisions a_1 or a_0 , can only be justified in the case where a preference order on these four events is given. If all four events are seen as equally advantageous or disadvantageous, the decision may be made randomly or on the basis of irrelevant aspects.

(5) The advantages and disadvantages of a decision strategy must be evaluated in order to arrive at a decision on the value of a particular decision strategy. Practically speaking, the utility resulting from the four events e_{ij} has to be quantified. However, decision makers often refuse to quantify utilities especially in the field of education. They believe that they decide without such a quantification. However, in most cases it can be demonstrated by a close inspection of their decision strategy that they implicitly use a certain quantification

TABLE 1

Table of results for correct and incorrect decisions

		Value of the feature		
		θ_1	θ_0	Sum
Decision	a_1	A	B	A + B
	a_0	C	D	C + D
		A + C	B + D	S

of utilities without being conscious of it. This problem will be discussed in more detail later.

(6) If values for the utility of the possible events are given, the decision procedure should then be designed to maximize expected utility, or to minimize expected loss. (In decision theory, utility is usually quantified as gains and losses. Statistical computations consider only losses because the losses are determined in such a way that the gains can be set to zero.) However, additional information is still required concerning the probabilities of the occurrence of θ_0 and θ_1 , and concerning the relation between Θ and the observable variable X . Putting all this information together, a domain of values $x_l < x_i < x_u$ can be statistically defined. The decision a_1 is made if an observed x_i lies within this range; if not, the alternative a_0 is preferred. If this "field of acceptance" of a_1 is located at the upper end of the scale of X , so that the scale is divided into two parts, the value x_c which divides the scale into the two areas for a_0 and a_1 is named "cut-off score". If $x_i < x_c$, a_0 is chosen. If $x_i \geq x_c$, a_1 is chosen. x_c (or the boundaries x_l and x_u) is chosen in such a way that the average utility which results from the application of a decision strategy is maximized.

(7) Once a particular decision strategy has been accepted, one can determine how many correct and how many incorrect decisions would be made on the basis of theoretical assumptions about the distribution of the variables and on the basis of empirical data. The events which result from the application of a particular decision strategy can be displayed using a table with four fields (Table 1).

The proportion of persons (with θ_0) unsuitable (for the program) but mistakenly classified as suitable to the total number of unsuitable persons, $B/(B+D)$, is named "alpha error", the proportion of suitable persons (with θ_1) who were mistakenly classified as unsuitable to the total number of all suitable persons, $C/(A+C)$, is named "beta error". The proportion of correctly classified suitable people to the total number of all suitable persons, $A/(A+C)$, is named "effectivity" (Pegnato & Birch, 1959) or "predictive value" of the procedure (Fineman & Carran, 1986). The proportion of selected suitable persons compared to all accepted persons, $A/(A+B)$, is named "efficiency" (Pegnato & Birch, 1959) or "sensitivity" of the strategy (Fineman & Carran, 1986).

(8) Each of the four events A to D results in a certain utility. The total utility of a decision strategy is obtained by summing the utilities (or losses; not necessarily in dollar units) over all S persons as has been described. There are, however, alternatives to this procedure: Some authors do not take into account all of the four cells in Table 1; it is possible for instance only to select the value of $(A+D)/S$ and then to try to maximize it. An overview of different forms of evaluation is given by Hollmann (1991). Several authors (e.g., Hany, 1991; Hollmann, 1991) point out that the value of a newly established decision strategy has to be determined in comparison to decisions made by chance

or in comparison to the decision strategy previously in use. A decision strategy which allows only for a β error of 5% can be judged as very good if the probability of being suitable $p(\theta_1) < .50$. However, if $p(\theta_1) = .90$, a reduction of the β error from 10% (when selecting by chance) to 5% (when selecting on the basis of the decision strategy) cannot be judged as very positive.

An overall consideration of the basic model of decision theory presented here leads to the following requirements on a decision strategy:

- Quantitative utilities have to be determined for correct and false decisions.

- A variable X which shows a relation as close as possible to the unknown feature Θ has to be determined.

- The values of the variable X have to be separated in two ranges by a cut-off score. These two ranges correspond to the alternative decisions a_0 and a_1 . The cut-off score has to be determined mathematically so that the application of the decision strategy minimizes the overall loss.

- Measures which help to minimize decision errors have to be applied. The fewer false decisions are made, the lower the resulting overall loss when it is summarized over all false decisions.

- When a certain decision procedure has been established, its characteristics and the consequences of its application should be investigated and disclosed to all participants. Special attention should be given to the number of false decisions which cannot be avoided.

These settings are discussed in more detail in the following sections. Recommendations for the design of procedures for the identification of gifted students will be made with reference to the relevant research literature.

SETTING THE LOSS FUNCTION

Decisions are only of importance if the consequences of the decision are of different value. Accepting or rejecting a child for a giftedness program can result in different, serious, consequences. Thus the best possible decision has to be made. Direct costs, psychological costs, and costs for the society can be distinguished (Emrick, 1971; Klauer, 1987). Direct costs for the participant consist of the time invested for taking a special course and of the money invested for the learning material, particularly if the child has been mistakenly selected for the course, i.e., if the child fails to master the demands. Costs can be time and money invested for remedial or compensatory instruction which the student does not require, following a mistaken admission decision. Long-term costs include lower chances of being admitted to good and renowned institutes of higher education which may result for a child erroneously rejected from a sought-after giftedness course. As a consequence, this child may suffer a relative income loss in the future. The psychological costs for missed career opportunities are certainly more severe than the material losses because the total arrangement of life,

including the choice of a partner and the choice of later residence, may depend on the professional career. In the same way, the psychological costs of rejecting a capable child from a program for the gifted also have to be taken into account. The child's self-concept may be negatively affected. However, this consequence can also result if the child is erroneously accepted for the educational program and fails to complete the course.

Costs to the institution which offers the educational program are, to begin with, the costs for carrying out the program which, however, shall not be considered here. Costs for carrying out the selection procedure (for testing material, travelling costs for the participants, reimbursement for the members of the selection committee) and for the recruitment of the applicants (advertising efforts) can be important factors which influence the decision regarding the establishment of the selection procedure (Brodgen, 1949; Cronbach & Gleser, 1956; Martin & Raju, 1992). Avoidable costs result when unsuitable applicants are mistakenly accepted. These costs are material (fees for the teacher and the course materials) and psychological (conflicts for the teacher on how to proceed didactically, delay in the course of instruction for all students). Costs for society emerge if an educational program for the gifted works ineffectively, i.e., if it contributes only slightly to the "educational productivity" of the local school system (Walberg, 1981), if it discriminates against minorities, or if unsuitable individuals get unjustified access to privileges provided by society due to their having been accepted for the educational program. The positive effects of correct decisions could be constructed in a similar way.

When evaluating the consequences of using a decision strategy in the field of education, one cannot proceed in the same way as in the model for personnel selection because there the only issue considered is utility for the selecting institution; the disadvantages for rejected applicants are ignored (Brodgen, 1949; Naylor & Shine, 1965). Disadvantages for rejected and wrongly assigned candidates have to be considered in the same way as advantages for the correctly classified subjects because the educational system has to provide all learners with the best support possible. With special reference to grading in schools, Klauer (1987) argues that, in the educational context, both types of errors have to be handled with equal weight. Otherwise, one of the errors is accepted more often than the other. This may, e.g., cause grading to follow a tendency of leniency which could change the overall function of grading. If Klauer's argument is extended to the education of the gifted, the intention never to exclude gifted students from programs especially designed for them would result in many unsuitable applicants being mistakenly accepted because the cut-off score for the decision would have to be set at a very low level. This problem will be discussed again later.

It is by all means possible to establish utility or loss functions in domains of life which cannot be

assessed in dollar units. One approach uses subjective estimates which can also be averaged over individual judges (Novick & Lindley, 1978; Vrijhof, Mellenbergh, & van den Brink, 1983). Using the method of pair comparison, loss functions on at least the ordinal level can be obtained. In principle, the ultimate goal is to establish a decision strategy which results in the least loss possible, rather than having to determine losses for every event. For this reason, it is sufficient to determine two values a and b so that the value k in the equation $k = a \times \alpha + b \times \beta$ is minimized by the choice of an appropriate cut-off x_c (Hambleton & Novick, 1973). α and β are the probabilities for the two kinds of wrong decisions and a and b are their weights. In the case of the education of the gifted, the β error, i.e., the erroneous rejection of a gifted student, may be taken as being more serious than the erroneous acceptance of an unsuitable student. In any case, all practical recommendations aim at taking as many students as possible into the identification procedure in order not to overlook any of the qualified persons. If the value of b in the equations shown above is chosen adequately high, the value of k can only be minimized if β is fixed at a very small number. However, the α error will inevitably grow as a consequence, that is, the incorrect acceptance of unsuitable applicants. Put simply, if the optimal decision strategy is to be computed statistically, one has only to fix the just barely acceptable relationship between α error and β error.

It has to be added that the weight of each error of decision can be fixed separately for different subpopulations. This results in correspondingly differentiated decision strategies (Gross & Su, 1975; Mellenbergh & van der Linden, 1981). Furthermore, it should be mentioned that decisions of a certain kind (e.g., the correct acceptance of suitable individuals) need not be weighted equally in all cases. The acceptance of a highly suitable candidate can be taken as more desirable than the acceptance of a candidate whose true score θ_i lies barely above the critical threshold score. In those cases, a linear or quadratic loss function is used instead of a so-called threshold loss function. In every case optimal decision strategies can be determined computationally (van der Linden & Mellenbergh, 1977).

CHOOSING A VARIABLE AS THE BASIS FOR THE DECISIONS

The selection of gifted students has to be based on one or more variables. These are measured with the aim of collecting information on an ability construct, on a level of knowledge related to a course of instruction, or on the success which can be expected in a program for the gifted. In this section, the selection of adequate variables is discussed.

(1) *Ability related variables.* If students are selected and nurtured by a program according to their abilities, it may be practical to use standardized ability tests which contain recent norm tables and which fulfil the usual requirements regarding reliability and validity.

In the simplest case, intellectual ability, this will be an intelligence test (Rost, 1991; Shore et al., 1991; Stanley, 1984; Terman, 1954). Structured ability tests, tests of creativity and instruments measuring special talents, e.g., in sports, in music or in the performing arts, can all be chosen so that they are in agreement with the underlying concept of giftedness (cf. Hany & Heller, 1991, and the chapters which follow). The theoretical assumptions on the concept of giftedness should be mirrored in the selection and application of the measurement instruments. This requirement is of highest priority if an acceptable array of instruments (Urban, 1990) is to be achieved.

Those instruments which were developed on psychometric principles allow, however, relatively few conclusions to be drawn regarding the development and the adequate nurturing of the ability measured (Borkowski, 1987; Howe, 1990). Many of the instruments currently in use were developed without explicit theories of cognitive-intellectual performance—or the theory has been forgotten by those concerned. Recent analyses of the cognitive basis of intelligent performance including problem solving, transfer of learning, and knowledge acquisition (Chi, Glaser, & Rees, 1982; Gray & Orasanu, 1987; Neber, 1992; Necka, 1991; Sternberg, 1977; Singley & Anderson, 1989) will stimulate the development of new instruments with higher validity for the processes of knowledge acquisition and knowledge application than traditional tests (Sternberg, 1991). The application of traditional ability tests can lead to systematic discrimination against certain subgroups of the population if the historical and cultural background of content and form of the test items is not carefully considered (Goldstein, Haldane, & Mitchell, 1990; Irvine & Berry, 1988).

For use in the education of the gifted, instruments should be developed which aim at uncovering the potential for development of the ability in question and which, at the same time, offer indications for its nurturing. A promising approach is given by the assessment of the learning potential as developed by Guthke (1974, 1982) and, recently, by Feuerstein (1979) in the Soviet tradition. These instruments (cf. the overviews given by Brown & French, 1979; Tyerman, 1986) try to measure not only the current status of a reasoning ability but also how far it can be changed by particular interventions. Although this approach has so far found its most fruitful applications in the diagnosis of learning disabilities, its application in the field of giftedness is certainly also possible (Guthke, 1992; Skuy et al., 1990). This development is supported by a tendency to use measurements of giftedness not only for identification purposes but also for the design of educational programs focusing on individual characteristics of the learner (e.g., Lupart, 1990). Expressed in the language of scientific diagnostics, this means that the modification strategy is favored against a selection strategy (Krapp, 1986).

It has to be conceded that the diagnostic foundations of the learning test concept have not yet been completely

clarified (Perleth & Sierwald, 1991). Attempts should be made to identify subjects of different learning ability, that is of different “zones of proximal development”, by means of a latent class analysis (cf. the overview given by Rindskopf, 1987). On this basis, the applicants for an educational program could be separated into two groups with different learning needs and learning aptitude. This methodological approach would probably provide the best method of testing the assumption which has often been expressed that gifted persons are qualitatively different from other persons regarding their reasoning processes (Davidson & Sternberg, 1984; Facaoaru & Bittner, 1987; Rogers, 1986).

(2) *Choosing predictors for an external criterion of success.* A slightly different approach is required if giftedness is defined on the basis of successfully completing a program for gifted learners. In this case, the selection procedure has to find predictors for later success and has to design a decision strategy on their basis. The problem of an adequate criterion for success has to be addressed once again. The question of which and how many criteria should be considered for evaluating the effects of an acceptance decision has been extensively discussed in training research (Klauer, 1992) and in personnel selection for work positions. Following Smith (1976), criteria for success in professional settings can be described on the basis of three dimensions.

- The time perspective (short-term measurements of behavior as against successes many years after completing the program or working in the field).
- The specificity desired (a global measure as against detailed information).
- The proximity to the employer's goals (pure descriptions of behavior as against estimates of the pay-off for the company).

Despite the variety of possible criteria, it seems to be practical to use a single global criterion for acceptance decisions (Roe & Greuter, 1991). This criterion can be a continuous variable (e.g., scores obtained in the final test of a course; evaluation of the originality of a project carried out by the participant; level of difficulty of the courses which were selected next by the individual) or a simple pass-fail criterion (as a measure for θ_0 and θ_1).

Although criteria for long-term success in life could in principle be taken into account here, it seems to be very difficult to find suitable predictors. Retrospective (Bloom, 1985; Wallace & Gruber, 1989; Yewchuk & Edmunds, 1992) and longitudinal observations (Freeman, 1991; Trost, 1992; Trost & Sieglén, 1992) of individuals of high intellectual productivity have aimed at isolating single variables which might serve as predictors of the long-term development of achievement. However, the results of those efforts were mostly unsatisfactory (Schneider, 1992). Nor do longitudinal or meta-analytical investigations of the long-term effects of special educational measures (e.g., pull-out programs: Vaughn, Feldhusen, & Asher, 1991; acceleration: Swiatek & Benbow, 1991; Van Tassel-Baska, 1992; Kerr, 1992; grouping: Feldhusen & Moon, 1992; Kulik

& Kulik, 1992; early admission to elementary school: Proctor, Black, & Feldhusen, 1986) seem to offer clear indications for exactly which variables should be considered when selecting candidates for giftedness programs.

There would therefore seem to be more justification in using criteria which indicate short-term success, that is, the successful mastering of the educational program. However, here too a decision has to be made on which criteria of success, that is, which learning goals should be preferred (Passow, 1992). After a criterion has been chosen, a predictor variable X has to be found which should be as valid as possible. This need not to be a single variable; it is often practical to combine several predictors. A composite score often shows a higher reliability than a single measurement. The prognostic validity, however, can be taken as the most important feature of the predictor. The higher the validity of the predictor, the less often wrong decisions are made. Figure 1 shows the relationship between α error and β error for measurement instruments with different validities (cf. Cronbach & Gleser, 1965).

If a continuous criterion variable has been chosen, a linear combination of several predictors can be formed by means of regression analysis. A combination results which shows a very close correlation to the criterion, i.e., it is highly valid (an example of an empirical study is given by Rust & Lose, 1980). If the criterion is dichotomous and discriminant analysis is used, several predictors can be computed for a discriminant function (e.g., Harty et al., 1983/84; Pyryt, 1986). The linear combination or the discriminant function then constitute the variable X which forms the basis of the decision function. In the case of a continuous criterion, two

domains of values θ , have to be determined which form the two groups of masters and non-masters or of successful and unsuccessful participants.

Regression analysis has often been recommended as a means for combining several predictors (Feldhusen, Asher, & Hoover, 1984). However, in special cases it can lead to problems. To begin with, it must be said that a number of predictors of low validity cannot replace one predictor of high validity. Figure 2 shows the results of a simulation on the basis of $n = 1001$ subjects. Several sets of predictors with a fixed correlation to a criterion were formed. Then, these predictors were taken step by step into a multiple regression. The course of the multiple correlations is demonstrated in Fig. 2. However, it can be clearly seen that adding more and more predictors of the same validity leads to successively lower relative gain. Furthermore, one can see that a single predictor with a correlation of $r = .80$ between predictor and criterion is of higher prognostic validity than the simultaneous consideration of seven predictors with a correlation of $r = .40$.

In addition, it should be acknowledged that multiple regression can represent only linear relationships between predictors and criterion and only those which are valid for the total sample. Different validities for different subsamples do not show up in the results of the overall analysis. Regression analyses separately performed for subsamples (e.g., for girls and boys, or for members of different ethnic groups) are recommended in order to determine the differential validity of predictors. Statistical procedures which can help to determine suitable moderator variables are available (e.g., Flaugher & Rock, 1969; Rock, Evans, & Klein, 1969). Interactions between predictors can be deter-

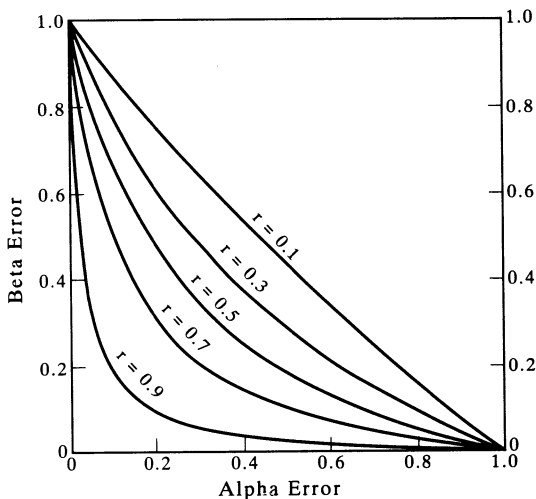


FIGURE 1. Minimal combinations of α and β errors shown for different levels of validity of the predictor. These minimal levels can only be reached by using optimal cut-off scores.

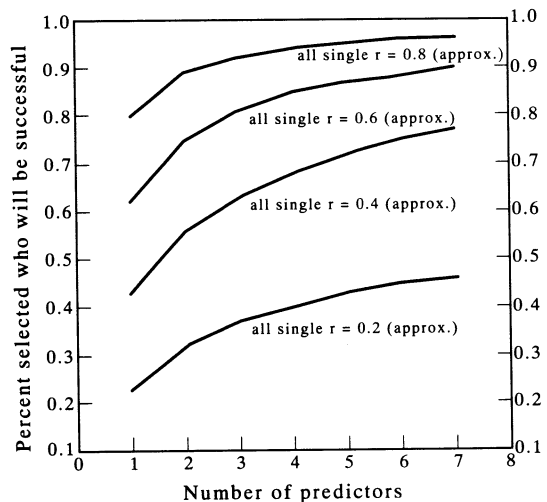


FIGURE 2. Changes in the multiple correlation coefficient R for sets of 1-7 predictors with fixed validities (results of simulations based on fictitious data).

mined well by multivariate techniques (Pyryt & Heck, 1991), whereas they remain undetected in regression analyses.

Another problem of regression analysis arises from the fact that the resulting linear combination allows for the compensation of low scores in some predictors by high scores in other predictors. If, for example, the results of a test of general intelligence, the grade average of the most relevant school subjects, and subjective statements on personal free-time activities in several science domains (measured by a biographical inventory) are all included in a regression analysis, a student can compensate low intelligence scores by merrily checking answers in the biographical inventory. This can result in the same final score as it is obtained by a highly intelligent student who answers the inventory in a highly self-critical way. Sometimes compensatory effects are desired. In cases where compensations would not make sense, a sequential decision procedure would be required which considers different aspects of giftedness in separate decision phases.

Rules for allowing or prohibiting compensation can frequently be found in the decision patterns applied by committees. If candidates are evaluated on the basis of numerous pieces of information by committees or commissioners, the resulting ranking of the candidates frequently cannot adequately be described by means of regression analysis. For this reason, a suggestion made by Moore and Betts (1987) is unlikely to meet with much success. They suggested that the evaluations of candidates made by different committee members should be compared on the basis of correlation tables and regression analyses. When judges make assumptions about causal or correlational relationships between the variables on the basis of their subjective theories, linear analyses cannot adequately represent the different weights ascribed by these judges to scores and to combinations of these scores. It is of course important to allow complex decision rules and to support complex decision behavior by displaying the available data clearly (Weber & Battaglia, 1985), but the quality of the resulting decision strategy still has to be evaluated. Configural judgment behavior can be most practically modeled by expert system technology (Hany, 1991b). The candidates' characteristics profiles are compared and are categorized together with the experts' judgments into typical patterns of evaluation by means of computer-supported analyses. In contrast to statistical optimization procedures, expert systems do not require representative samples. Missing case material is replaced by heuristic rules which allow for diagnostic reasoning even when information is missing.

The non-linear processing of information assumed to be undertaken by experts is however not always any more efficient than the linear combination of data. Dawes and Corrigan (1974) have demonstrated that the linear combination of data is not only frequently superior to complex forms of data processing but also especially resistant to changes in the weighting of

the variables. Furthermore, the linear combination of data seems to be particularly suitable for reflecting the structure of diagnostic decisions (Ramsey et al., 1986). A very readable overview of the relationship between statistics-based judgment and the expertise paradigm/expert systems is provided by D. A. Clark (1992).

Typological approaches to the combination of data can be regarded as an alternative to statistical procedures which combine data linearly. Candidates are grouped according to their categorial or ordinal scores obtained on predictor variables. Sometimes the criterion variable is included in the analysis. For instance, all applicants for an educational program could be asked to provide information on several dimensions. The scores on these dimensions are then preliminarily classified as "acceptable", "intermediate" and "not acceptable". These trichotomous variables are then subjected to a configural frequency analysis (Krauth, 1985; Lienert & Krauth, 1975). This procedure can lead to the identification of certain types of candidates with special profiles of characteristics (empirical examples are demonstrated by Perleth, Sierwald, & Heller, 1993, and by Steffens & Perleth, 1990). Continuous characteristics can be subjected to a cluster analysis. In contrast to configural frequency analysis, however, quite drastic decisions regarding distance measures and the agglomeration of clusters have to be made here. If it is possible to arrive at types of applicants empirically, these types can be compared on the basis of the external criterion of success. A decision can be made on which types should be accepted for the program in question and which should not. Empirical data can be used to judge the average disadvantage due to varying decision strategies which variously accept members of the separated types for inclusion in the program.

(3) *Setting standards on an internal criterion.* Earlier in this contribution it was argued that an individual need for special educational measures is present when a student has successfully passed a unit of instruction earlier than his or her classmates and when that student would not profit from further regular instruction. Criterion-referenced tests are used to measure whether or not a learner has mastered a unit of instruction. According to the postulate of content validity, these tests contain a representative selection of tasks which cover the knowledge domain. Decisions about which student has mastered that knowledge require the setting of a critical value θ_c which the student has to pass. The setting of the critical value cannot be made on the basis of the empirical distributions of values in the student sample. It must be made on the basis of the demands which the contents of the test items put on the students.

For this reason, Nedelsky (1954), Angoff (1971), and Ebel (1972) developed methods which require experts to judge each test item according to the probability that a student on the borderline between masters and non-masters would solve it correctly. Adding these estimated probabilities for all test items, a critical

score results that separates θ_0 from θ_1 . Additionally, the cut-off score x_c has to be set for the test scale (cf. next section). Angoff's method seems to be the most reliable of those mentioned here (Berk, 1976; Maurer et al., 1991).

Zieky and Livingston (1977; see also Livingston & Zieky, 1982) developed a procedure which is not based on fictive borderline students but uses real samples. Experts in a knowledge domain are told to identify subjects out of a sample (e.g., a given class of students) who border between non-masters and masters. These students work on the test. The median of the number of their correct solutions is set as the critical threshold score. An alternative procedure requires experts to identify masters and non-masters. Then the test is given to both groups. Based on the tests results of both groups, the critical score is set at a point that minimizes the number of wrong classifications. If a reference group is available for which an estimate of the distribution of masters and non-masters can be made, this knowledge can be immediately used to set the critical score. For example, if 20% of the sample are assumed to be masters, the threshold score of the empirical distribution of scores is fixed at a point which is only passed by 20% of the students. These procedures are discussed by Shepard (1980) and Klauer (1987). If one accepts that experts can determine who can be regarded as a master of a content domain or of a particular skill, one can develop a more positive attitude toward observations that "homemade" measurement instruments are often developed locally for identification purposes (e.g., Harty et al., 1983/84). From a criterion-referenced point of view, it is not necessary to use intelligence tests or other norm-referenced instruments for acceptance decisions. Tests which directly assess the knowledge which has been previously learned or which will be required later can be of higher diagnostic value (van der Linden, 1991).

The methods which have been presented up to now all require subject matter experts providing a subjective estimate in order to determine the threshold between masters and non-masters. However, other procedures have been developed which pay more attention to empirical data than to subjective judgment. Berk (1976) reviews many of these methods and in conclusion recommends the contrasting groups method for classroom use. This method consists of lessons which are given to one group but not to a second group. Afterwards, both groups work on a test which is valid for the teaching goals of that lesson. The results of both groups are compared; the test score which best separates the two groups is taken as the cut-off score. However, this procedure requires that most members of the instructed group master the content, that is, that they have learned what they have been taught.

Other methods (Block, 1972; Huynh & Perney, 1979) compare learning success in sequential units of instruction. The mastery of the following instruction unit (measured by a dichotomous variable) is used to deter-

mine the minimum competence which has to be demonstrated in the test which completes the previous unit of instruction. Only individuals who show this minimum competence are accepted for the later unit. It has been possible to realize this method in giftedness education in the following way: Before being admitted to an advanced course, e.g., in mathematics, the participants attempt a test on particular knowledge prerequisites. A certain proportion of the children then take part in the advanced course. Based on the results of the final test (or a judgment made by the teacher) at the end of the course, it is possible to determine who completed the course successfully and who did not. Then the score a person would have had to have achieved in the previous test in order to be successful in the advanced course is calculated. Though this procedure seems quite plausible, some problems are revealed when it is viewed from a perspective of educational psychology. Giftedness education is based on the principle that previous achievement should not be the sole precondition for being accepted for further special education. If nurturing of the gifted is only based on the "Matthew principle" of education (Walberg & Tsai, 1984), underachieving children and learning disabled gifted students are rejected from advanced educational programs (Butler-Por, 1987; Heller, 1987, 1989; Yewchuk, 1986; Zorman, 1991). To prevent this, the individual learning potential and the motivating effect of the nurturing program should be considered in addition to existing knowledge and skills when future learning progress is to be predicted.

SETTING CUT-OFF SCORES

When percentages, group sizes, or minimum requirements for criterion-referenced tests are obtained from expert judgments or empirical studies, the critical value θ_c which gives the threshold between mastery and non-mastery still cannot immediately be converted to a cut-off score x_c on the measurement scales used (Klauer, 1987). Measurement errors in the procedures and their perhaps unsatisfactory validity have to be taken into consideration when cut-off scores are determined. It is not defensible to simply use cut-off scores which have been computed on the basis of one student sample, as happened in many studies which tried to design a short form of the WISC-R which were intended to be as far as possible equivalent to the full form (e.g., Dirks et al., 1980; Elman, Blixt, & Sawicki, 1981; Fineman & Carran, 1986). The analysis of individual WISC profiles of gifted children shows that they vary enormously in some subtests (Hollinger & Kosek, 1986). The procedure detailed below seems to be more appropriate.

If the true score θ_i of an individual has to be determined on the basis of a single measurement x_i , a regression analytic measurement following Lord and Novick (1968) can be made which accounts for the reliability r_{xx} of the variable X :

$$\hat{\theta}_i = \bar{x} + r_{xx} \times (x_i - \bar{x})$$

This formula shows that the estimate of the true score $\hat{\theta}_i$ approaches the mean score \bar{x} of the measurement as the reliability r_{xx} decreases. If X and Θ are variables with standard normal distribution (mean: 0, standard deviation: 1), the formula reduces to

$$\hat{\theta}_i = r_{xx} \times x_i$$

Then, given a critical value θ_c , the cut-off score is determined as follows:

$$x_c = \theta_c / r_{xx}$$

According to van der Linden (1980), this formula is valid only when a normally distributed loss function is given which weights α error and β error equally. In the case of linear loss functions which allow for different weights for the two kinds of errors and which also account for the distance between θ_i and θ_c , the following formula is valid (van der Linden & Mellenbergh, 1977):

$$x_c = [\theta_c - (a_0 - a_1)(b_0 + b_1)] / r_{xx}$$

with $(b_0 + b_1) > 0$.

In this case, the loss function $l(\theta)$ for all rejections, i.e., when $x < x_c$, is determined as $b_0 \times (\theta_i - \theta_c) + a_0$, and for all acceptances, i.e., when $x > x_c$, as $b_1 \times (\theta_c - \theta_i) + a_1$. These formulae show that the cut-off score is set low if a_0 , the general loss caused by rejection, is weighted relatively highly. If the losses caused by a strong deviation of x_i from x_c are assumed to be very high, the difference of the levels of the two losses $a_0 - a_1$ have to be weighted conservatively because only then can the danger be avoided that extreme deviations $\theta_i - \theta_c$ coincide with wrong decisions.

The simplest case of a loss function is the threshold loss function. In this case, the loss $l(\alpha)$ caused by incorrect acceptance and the loss $l(\beta)$ caused by incorrect rejection are determined by constant values. These should be determined numerically in such a way that "gains" caused by correct decisions are set to zero. The cut-off score for the variable X is computed so that first of all the proportion of losses $\lambda = l(\alpha)/l(\beta)$ and $z(\lambda) = \Phi^{-1} \times [1/(1+\lambda)]$ are determined. Φ^{-1} is the inverse of the distribution function of the standard normal distribution z . The cut-off score x_c , given a variable X which has a standard normal distribution, and given Θ as the latent property, is determined as

$$x_c = \frac{\theta_c - z(\lambda) \times \sqrt{1 - r_{xx}}}{\sqrt{r_{xx}}}$$

(Vijn & Molenaar, 1981; see also Klauer, 1987). If both losses are weighted equally, $\lambda = 1$ and $z(\lambda) = 0$ result. The cut-off score is then determined as

$$x_c = \frac{\theta_c}{\sqrt{r_{xx}}}$$

All methods described here assume that first a critical value θ_c of the property Θ has to be set before the cut-off score x_c can be computed. Furthermore, content validity is assumed for the measuring instrument. If norm-referenced instruments are used, poor instrument validity can cause problems as is discussed in the next section. A special problem results if a continuous

property Θ is given and if the number of persons who have to be selected is fixed (fixed quota, e.g., if there is a maximum number of participants of an enrichment course). In this case, the simplest procedure is to build a rank order of applicants based on a linear combination of the predictors or on some other weighting of the data. Starting with the applicant who has received the highest rank, the best available applicants are accepted in a "top down" manner for as many as positions as are free. This procedure, which does not require a previously fixed cut-off score, looks very simple. However, this strategy has been accepted even by courts and professional associations (Casio, Alexander, & Barrett, 1988).

It should be noted that Richert (1991) takes a strong position against the use of cut-off scores. She argues that underachievers and other subgroups of children are too hastily rejected by the strict use of cut-offs on performance scales. In the present article however the position is taken that the use of inadequate indicators of giftedness and irrelevant measurement instruments is more likely to lead to unjustified rejections than the use of cut-off scores. The use of a cut-off score can be demonstrated empirically in every decision strategy which deserves the name and which is based on quantitative data even if the decision makers deny using a cut-off score.

REDUCTION OF DECISION ERRORS

The choice of a suitable cut-off score for the decision strategy helps to minimize the disadvantages which result from wrong decisions by reducing the frequency of wrong decisions. Other methods can serve the same purpose. Following Mills and Simon (1981), Klauer (1987) points to the following relationships:

- The more reliable a test is, the fewer misclassifications result.
- The more items a test has (or the more data items are available which together are used to compute the variable X), the fewer misclassifications result (Hambleton, Mills, & Simon, 1983).
- The more homogeneous the item difficulties and the higher the item-scale correlations are, the more efficient the test is.
- The greater the number of subjects who have to be classified, the more efficient is the reduction of decision errors.

The validity of the measurement instrument in relation to a given external criterion is of highest relevance for the quality of classification. The validity coefficient sets a lower bound to the extreme minimization of loss which can be achieved by setting a suitable cut-off. Figure 1 showed the correlation of α and β error as they appear in classification decisions when different validities for the relationship between predictor and criterion are given. Figure 3 shows the effects of different settings of λ given two different levels of validity ($r = .30$ and $r = .90$). For a fixed loss ratio, a straight line can be drawn in Fig. 3 (shown as dotted lines). If the line

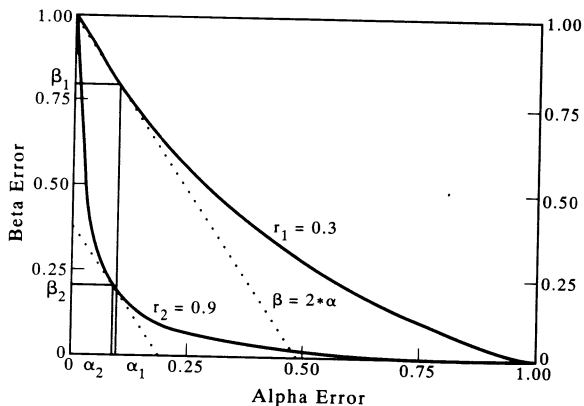


FIGURE 3. Relationships between the validity of the instrument and the frequency of unavoidable errors: The same ratio of accepted errors (the β error is ascribed only half of the loss value ascribed to α ; this ratio is shown by the slope of the dotted lines set at -2.0) results in different error frequencies (indicated by lines parallel to the axes) depending on the validity of the instrument (represented by the two curves).

touches one of the curves drawn for a given validity, the minimally possible classification errors can be read off (shown as lines parallel to the axes). Given a λ of 2.0, about 8% incorrect acceptances (α error) and about 20% incorrect rejections (β error) result from a validity coefficient (between predictor and criterion) of $r = .90$. If the validity coefficient is as low as $r = .30$, an α error of 10% and a β error of about 80% result. Figure 3 may also help to clarify why different weightings of the two kinds of errors results in substantial changes of the number of errors accepted only when a low validity of the predictor is given. To put it another way: only if the variable X is of low validity do different values ascribed to both kinds of errors lead to different frequencies of incorrect classifications.

Increasing the validity of a predictor for a criterion of success is therefore of special relevance. Computing a linear combination out of several predictors or combining information by configural integration as has been recommended in the previous text may increase validity. It may also help to separate subgroups of applicants and to use different sets of predictors or different weights of predictors for each group separately.

Another strategy for decreasing decision error is the reduction of the selection quota (Taylor & Russell, 1939). If only few applicants are to be selected from a large number, even an instrument having only medium validity can be very useful. As shown in Fig. 4 (from Taylor and Russell), an instrument with a validity of $r = .30$ may actually result in an efficiency of about 75%, given a 50% quota of acceptable applicants and a selection ratio of 5%. Therefore, recommendations made by many giftedness experts that a large talent pool should be created as the selection population seem to be acceptable at least from the perspective of

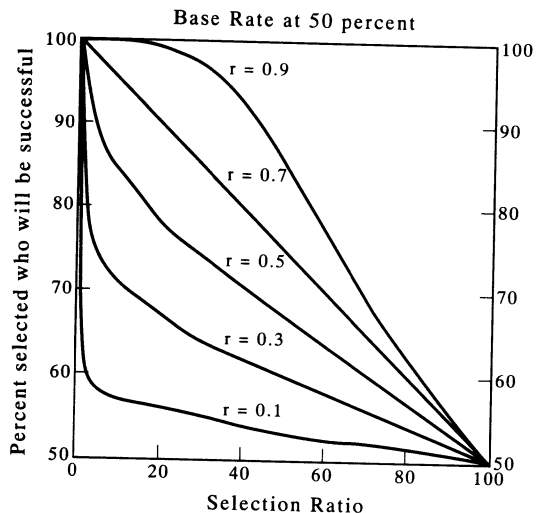


FIGURE 4. The relationship between the selection ratio and the percentage of selected persons who are suitable for the program for different predictor validities (theoretical data).

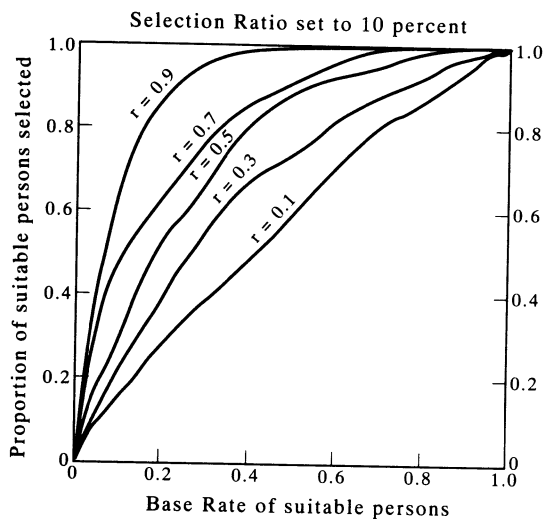


FIGURE 5. The relationship between the base rate of suitable persons and the percentage of selected suitable persons for different predictor validities (results of simulations based on fictitious data).

the selecting institution. However, the costs emerging from the recruiting of a large number of applicants have to be accounted for when the identification procedure is comprehensively evaluated (Martin & Raju, 1992).

It should also be recognized that fewer unsuitable candidates are accepted if the group of applicants mainly consists of suitable individuals. Figure 5 shows that a high ratio of suitable candidates (horizontal axis)

automatically results in a high percentage of suitable persons in the accepted group (vertical axis). However, if the ratio of suitable persons is low, only a highly valid instrument identifies many acceptable persons and reduces the β error. In practice, this means that only a large number of suitable candidates from which a small number of participants are to be selected for a program allows for an optimal selection of candidates and, thus, for a high level of learning in that program. The frustration arising from being rejected from the program can be reduced if several program courses are offered so that the candidates can apply for more than one course. In addition, a special course could be offered more than once so that all interested school students have several chances of applying for it. This not only enhances the individual chance of being accepted, but also allows the selection committee to collect information from the applicants several times and to aggregate them to an overall judgment of perhaps very high validity.

MAKING THE DECISION PROCEDURE APPLIED MORE TRANSPARENT

Every selection procedure used for giftedness education programs has to be in tune with the demands made by the program and the definition proposed by those responsible for it. In addition, calls are often heard that the procedure should be easy to use, that the statistical values should be easy to compute, and that it should be possible to explain and justify the overall method convincingly to lay-people (Berk, 1976). In pursuing this goal it may be helpful if the persons who apply the selection procedure are accountable for its consequences. This includes the calculation and discussion of acceptable levels of classification errors. Here are not only the α and β errors and the accepted loss function to be considered but also the base rates for suitable and unsuitable applicants. A committee, for example, may prefer to accept three unqualified candidates to the program rather than to incorrectly reject one in fact gifted child. However, if this ratio 3:1 is applied to every decision, that is, to every applicant, it could turn out that up to twelve unsuitable persons are accepted for every suitable person who is rejected. This may happen when the ratio of unsuitable to suitable persons in the applicant group takes a value of 4:1. To accept a high ratio of unsuitable candidates for a program for gifted children cannot be justified. The intended high level of learning cannot be reached in a course filled with too many average students. Such a program would frustrate the gifted students' expectations and would perhaps do more harm than if a few of them had not been accepted to the course. A strategy which radically minimizes or completely avoids β error (erroneously rejecting gifted persons) is undesirable because it would cause an irresponsibly high rise in α error. However, if a substantial β error is accepted, members of minorities are in particular danger of suffering first from decision errors. The strategy of accepting equal error frequencies separately in all relevant subgroups of the

population as was proposed by Richert (1991), is therefore to be welcomed from an educational point of view. From the perspective of educational productivity, however, this approach may be questioned and detailed justifications for its use may be required. It may be helpful to learn from a comparable discussion opened by research on personnel selection and economic growth (Schmidt, Ones, & Hunter, 1992).

The rejection of some gifted children for programs especially designed for them despite their being suitable cannot be avoided completely. These children may erroneously attribute their being rejected to their being of low ability. Therefore, the education of gifted children in special programs has to be supplemented with individual counseling in order to avoid such effects. In counseling settings, abilities and skills are measured independently of a given program or course of instruction (Heller, 1987; Wiczerkowski & Wagner, 1985). If a child has been rejected from a special program, individual counseling should assist in developing alternative educational pathways which may equally or better be suited to fostering personality development and realizing the individual's talents and interests. Mistaken decisions made by program committees may be compensated in these ways even if they cannot be reversed.

SUBJECTIVE CONCEPTIONS OF GIFTEDNESS AND SUBJECTIVE DECISION STRATEGIES

One additional aspect of selection procedures has to be clarified in advance before further recommendations for the identification of the gifted can be deduced from theoretical considerations. Since the pioneering work done by Meehl (1954) and Sawyer (1966), the demand has often been heard that diagnostic decisions should be made on a mathematical and statistical basis. However, the so-called "clinical judgment" prevails in practice and dominates decisions regarding the selection of gifted individuals. In many cases, teachers, program coordinators and other experts are in charge of making the decisions (Adderholdt-Elliott et al., 1991). Test scores and the results of statistical computations are often only used as the information basis for the subjective decisions. Calls are often heard for comprehensive individual case studies to be used as the basis for admission decisions (Renzulli & Smith, 1977; Weber & Battaglia, 1985; for school-career counseling in general: Heller, 1982).

The following questions have to be answered before this procedure can be evaluated:

- Do teachers and other persons who make admission decisions have acceptable ideas of the concept "giftedness" and "gifted student"?
- Can teachers and the other persons involved process complex information adequately?
- Do group decisions show features which make them superior to decisions made by individuals?

A short review of the literature regarding these questions follows.

(1) *How teachers understand the concept of "giftedness"*. The question of whether teachers can identify gifted students has always been controversial and causes conflicts even today (Rost, 1991 vs Hany & Heller, 1991). In fact, numerous studies have evaluated teacher judgments as being inadequate. If one compares those students who were identified by teachers as "gifted" with those who are judged by standardized tests to be highly intelligent, little agreement is found (Baldwin, 1962; Gear, 1976; Jacobs, 1971; Pagnato & Birch, 1959). Not very much attention has been paid to an early counterexample (Chambers, 1959). In the few last years, however, there has been much criticism of the fact that only simple nominations and scales were used for recording teacher judgment. In many of these studies, the kind of giftedness that teachers should focus on was not even defined. Hoge and Cudmore (1986) conclude that judgments made by teachers offer valuable information if it is placed on a methodological basis comparable to standardized intelligence tests. This assumption is empirically supported by results reported by Ashman and Vukelich (1983) who used detailed checklists for teachers and found positive correlations between the results of intelligence tests and evaluations made by teachers. In the same vein, Egan and Archer (1985) reported positive correlations between teacher judgment and subject-specific achievement tests. On the other hand, Sharpley and Edgar (1986) found only average correlations between subject-specific teacher judgments and the results of ability tests. These authors used, however, rather simple scales for recording teacher judgment. Hany (1991b), in contrast, found that teacher judgment separated two groups of students (of average and of high intelligence) better than statements gained from the students through questionnaires and even better than ability tests. In this study, the teachers were asked detailed questions and their answers were combined using complex decision rules.

So it seems that research to date on the quality of teacher judgment has been impaired by two phenomena which have been surprisingly rarely discussed: Firstly, simple judgment scales are used—often only nominations or single-item scales with five response levels for assessing an entire giftedness area. Such scales cannot be compared with intelligence tests test-theoretically. Secondly, in these studies it is assumed without further reflection that giftedness can be measured by means of a simple intelligence test. The insight that giftedness is more than intelligence has found its place in numerous theoretical models (e.g., Gardner, 1983; Renzulli, 1978; Sander, 1967) but not in studies evaluating the usefulness of teacher judgment. However, it is fair to assume that teachers make recourse to other, more complex, concepts than the abstract concept of intelligence when making a giftedness judgment. In any case, there is continual confirmation that teachers are capable of selecting suitable students for "giftedness courses" (Hany & Heller, 1990), and that they judge students quite consistently (Ashman & Vukelich, 1983). It can

be concluded from these observations that any disagreement between teacher judgment and intelligence test results is caused not by a lack of reliability but by poor construct validity.

The cognitive processes applied by teachers when they judge gifted students can be deduced from studies which focus on the subjective conceptions of giftedness held by teachers. Some of these studies investigate the quality of the prototype (or stereotype) of a gifted student represented in the teacher's long-term semantic memory. In two studies, one in Turkey and one in Germany (Hany, 1992a; Sahin & Düzen, 1992), teachers were presented with lists of characteristics. The teachers were asked to estimate how well these features characterize gifted students. It was found in both studies that teachers take logical thinking, quick understanding, and intellectual curiosity to be typical for gifted persons. The results of a German-American study (Busse et al., 1986a,b) can be interpreted in a similar way. In this study, the structure of the subjective concept of giftedness was also investigated. American and German teachers were asked to evaluate their gifted students on the basis of 84 given characteristics. A factor analysis of their evaluations showed that the teachers perceived their gifted students in a very detailed way. Five factors were extracted for the US teachers. Three of them were interpreted as being in accordance with the three-ring model proposed by Renzulli (1978). Seven factors were extracted for the German teachers, among them "logical problem solving", "verbal proficiency", "achievement orientation" and "artistic skills".

Similar results were obtained by Guskin, Peng, and their coworkers (e.g., Guskin, Peng, & Simon, 1992), who demonstrated in several studies that teachers do have a differentiated concept of giftedness. They identified five facets of the concept of giftedness: analytic or cognitive ability, social skills, creative arts, verbal ability, and motor skills. The authors were able to relate these factors to Gardner's (1983) model of multiple intelligences. Studies of this kind demonstrate that teachers are able to judge giftedness in a differentiated way if they are given a detailed instrument which allows for fine-grained judgment. However, more experienced teachers perceive gifted students differently than less experienced teachers do (Copenhaver & McIntyre, 1992; Schack & Starko, 1990). This fact calls for specific teacher training.

One study still in progress (Hany, 1992b) is based on research on concept acquisition which shows that the elements of a category are stored in memory either as single exemplars or in summarized form as prototype (Medin & Smith, 1984; Medin, Altom, & Murphy, 1984). This approach has since been transferred from general psychology to the psychology of social judgment (Smith & Zárate, 1992). It can be assumed that teachers who have only had contact with a few gifted students in their classes develop an exemplar-based concept of giftedness. These teachers judge a new student as gifted only when he or she closely resembles one

of the gifted students who were previously stored in memory as being gifted. Teachers who have had contact with a greater number of gifted students will tend to use a summarized representation, i.e., they hold a prototypical concept of gifted students and judge new students in a different way. If this assumption could be supported empirically, it would be possible to conclude that the decision behavior, particularly of those teachers who have had only little contact to gifted students, cannot be satisfactorily described by regression analytic or discriminant analytic models. Instead, configural decision rules must be assumed, based on the concrete contacts of the teachers to individual gifted students. If a group of teachers has to decide whether a student is gifted or not, very different opinions will emerge as a result of the different previous experience of the participant teachers. For this reason, Feldhusen, Asher, and Hoover (1984), Moore and Betts (1987), and many other authors recommend that the participants of a decision committee should come to an agreement about the concept of giftedness to be used. A written text would be very helpful there.

(2) *The subjective processing of complex information.* When confronted with difficult decisions, individuals tend to: (a) decide erroneously, (b) erroneously perceive their decision behavior, and (3) perceive decision problems inadequately. These facts were revealed by numerous investigations focusing on individual decision behavior (Einhorn & Hogarth, 1982; Pitz & Sachs, 1984; Rapoport & Wallsten, 1972; Slovic, Fischhoff, & Lichtenstein, 1977; Slovic & Lichtenstein, 1971). Human beings tend to be very economical with their information processing, particularly when faced with numerous and complex pieces of information. In this case, qualitative thinking replaces the quantitative combination of data, extreme information is weighted too heavily and hypotheses once set up are not likely to be revised. Particularly vivid key cases and recent memories govern decision behavior rather than an integrative summary of the mass of experience gathered by oneself and by others (Tversky & Kahneman, 1973). If decisions have to be made between numerous alternatives or when numerous aspects of information about the alternatives are available, individuals tend to use two strategies (Montgomery & Svenson, 1976). Either they concentrate on the most important information and neglect the rest (lexicographic decision rule) or they successively delete alternatives on the basis of limited information (aspect related deletion rule). For this second strategy, a cut-off score marking the minimum requirement is set on the most important characteristic. All alternatives which do not pass the cut-off score are immediately deleted from the list of acceptable alternatives (for more details, cf. Hany, 1991a).

In view of the weaknesses of individual decision behavior, the question should be raised of whether it is really appropriate to collect as much information as possible before a decision is to be made. Under special circumstances, this flood of information may

lead to more biased decisions than those made on the basis of limited data of high relevance. On the other hand, feeding the computer with all information and expecting an automatic decision may be an unwarranted alternative. It must be asked whether the measurement instruments available and the statistical procedures which are usually applied do justice to the complexity of student personalities. Perhaps it is merely an illusion to believe that quantified decision rules can be established for all individual cases. This objection seems to be justified by the very observation that in practice students turn up again and again who show very rare characteristics or combinations of characteristics which have not been seen by the judges before. Ready-made decision rules for these cases cannot be provided on an empirical-statistical basis; these decisions have to be deduced from meta-rules or from general heuristics for the practical decision process.

(3) *Group decisions.* It is often assumed that group decisions lead to better results than decisions made by individuals. It is claimed that the more persons involved in discussion, the more arguments are exchanged, the more carefully arguments are weighed up, and finally a solution to the problem at hand is accepted whose quality is higher than that obtained by individuals. Earlier empirical research on these questions was able to show that democratic rules are followed in many groups, thus favoring the opinion held by the majority of the group members (Davis, 1982). Further, it was confirmed that groups end up with better decisions than the average participant. However, as a rule group decisions do not reach the quality of decision which can be achieved by the best participant if he or she decides alone (Reagan-Cirincione & Rohrbaugh, 1992). The best qualified participants must, therefore, be allowed to exert major influence on the decision if the quality of group decisions is to be improved (Libby, Trotman, & Zimmer, 1987). Regrettably, unqualified group members can influence the solution process negatively (Davis, 1982).

Groups decisions are often more extreme than the average of the decisions taken by individual group members. Myers (1982) explained this "polarization effect" by the fact that more extreme opinions are disclosed and exchanged in homogeneous groups than in heterogeneous groups. If persons who share similar opinions meet in a group, they disclose their secret wishes and intentions. A one-sided picture of the opinions held by the group can emerge which leads to more extreme decisions. In heterogeneous groups, it is more difficult to exchange opinions, and decisions are made in a more conservative and cautious way (Watson & Kumar, 1992). When homogeneous groups are dominated by an additional pressure of conformity exerted by a strong group leader, typical decision errors result: Alternative solutions to a problem are not fully considered, not all relevant characteristics of the alternatives are discussed, the consequences of the decision are not investigated, and commitments made early in the discussion are not further revised (Janis,

1982). This phenomenon was labeled "groupthink" and was shown to govern some influential political decision groups (Janis & Mann, 1977).

Berk (1976) recommends that the participants of decision groups should make their decisions privately in order to avoid unfavorable mutual influences of the group members. He advises that group members should not be confronted with the opinions of their colleagues and that they should not be required to announce any change in their personal opinion. It follows from these recommendations that members of decision committees should discuss data and arguments but not individual decisions. These decisions are better collected in secret ballots. The final decision should then be based on the majority of the votes. Keren (1992) recommends that detailed information on the stages and consequences of the decision process should be given to the judges in order to improve individual decision behavior. He argues that providing judges with information that helps to cognitively structure the whole decision process is more effective than providing quantitative information (statistical data) or recommendations on how to proceed.

The question of whether teachers and school administrators are able to make adequate classification decisions on students can be answered with a cautious "Yes" against the background of the research considered. Individual judgment and group decision are prone to numerous errors, but the persons responsible can make rational decisions if they weight the available information carefully and if they compare their opinions with the opinions of the other members in a reserved way. Two recommendations arise out of a closer inspection of the current state of the research: Firstly, more studies on the form and quality of identification decisions should be made in the area of gifted education, and secondly, in-service training should be provided for teachers and school administrators in which they are advised to reflect on and evaluate their own decision strategies.

Identifying the Gifted: State of the Art in Theory and Practice

An overview of the publications on the identification of gifted youth reveals a growing sensibility toward the substantial connection between identification and nurturing. The decision as to who is to be counted as gifted depends on the predominant definition of giftedness and on the demands which are put on the participants of the planned educational program. Effective educational differentiation requires selection. This cannot be avoided or replaced by a principle of pouring out education to everybody on the watering-can principle. However, identification procedures are only acceptable if they do not trigger unjustified labeling and if the assignments of individuals to categories can be revised easily. Classifying students or learners must be regarded only as an aid for fitting instruction to children in an appropriate way. The

system of categories must correspond to the categories of instruction which are or will be realized and should not be more detailed. The selection of gifted students for special education must be part of a general philosophy of education which deals with the learning needs of all children.

Explicit and appropriate statements about how to design a comprehensive and defensible identification procedure can be found in most relevant textbooks on gifted education. Numerous measurement instruments are available which are well suited to gain a reliable informational basis for the decisions to be made. The recommendations on how to design the selection often take very different forms (e.g., talent search vs the *Revolving Door Model*) but the underlying opinions regarding the function and the value of identification itself seem to follow a common pattern of reasoning. Even from an international perspective, the identification of gifted students seems to be a matter of discussion only when there is conflict between different general conceptions of how to nurture giftedness. So it seems that many insights arising out of decision theory (introduced in the second part of this chapter) are at least implicitly followed in many recommendations for practical identification.

However, when programs are evaluated it is regularly discovered that many of the selection instruments used deviate substantially from scientifically justifiable procedure. The use of restricted definitions of giftedness, the application of deficient measurement instruments, the careless combination of information, and discrepancies between the definition of giftedness, the selection procedure and the educational program are deficits which have been observed many times (Richert, 1991). The three different models of how to select gifted students which were presented earlier in this paper are not clearly distinguished in the discussions. Considerations of how to establish cut-off scores seldom follow the recommendations made in statistical literature.

To turn now to research, evaluations of currently used selection procedures are necessary, clarifying their deficits and making open recommendations for improvement. Furthermore, there should be investigations on how robust selection procedures are introduced by local school authorities to individual variations. This is necessary because it may happen that in spite of the use of insufficient sources of information and the faulty combination of data acceptable selection decisions are made. It is particularly important to investigate the subjective information processing of those responsible for selecting the gifted. From studies of this kind, indications of how to design in-service training courses which contribute to better decision behavior may be derived. Research on the efficiency of content-valid measurement instruments for selecting gifted students for domain specific educational programs must also be developed. If more emphasis was given to those measurement instruments

which meet the demands of criterion-referenced testing, the problems of labeling which often accompany ability related testing could be avoided. Furthermore, problems regarding the prognostic relevance of indicators, resulting from the orientation toward the later success of the individuals selected, would also be eliminated. Content-valid instruments should be individually designed to fit the program and student population concerned. Therefore, the college education and in-service training of teachers of gifted students should, among other goals (cf. Chapter 35 of this handbook), focus on competence in developing such instruments.

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Identification of Gifted and Talented Youth for Educational Programs

JOHN F. FELDHUSEN AND FATHI A. JARWAN

Purdue University, West Lafayette, Indiana, U.S.A.

Introduction

Gifted and talented youth need differentiated educational services to sustain their academic, artistic, psychomotor, or social development. The curriculum must be modified and teaching methods adapted to the needs of these youth (Marjoram, 1990). However, educators are often unaware of these students' special abilities or in some cases are disbelieving or resistant to the diagnosis and the need for differentiated services (Garbers, 1987). Thus, special efforts are needed to identify gifted and talented youth, to diagnose their special talents and aptitudes, and to arrange optimal instruction for them.

For those educators who recognize gifts and talents in youth and the need for differentiated instruction there is a long standing tradition to regard the task initially as searching for "the gifted child" and as trying to avoid mistaken identification of students as gifted who are not "really or truly" gifted. The technical terminology is to avoid both false positives and false negatives. False positives are children identified as gifted who are not and false negatives are those who are mistakenly overlooked or rejected.

In early practice the term genius (Galton, 1869) was often used to denote people of very superior ability. Later usage, probably influenced by Terman and his genetic studies of genius, saw a gradual shift to the term "gifted". Terman began to use "gifted" in the alternative titles to the volumes reporting his longitudinal research, except for Volume 2 (Cox & Terman, 1926) which was titled "The Early Mental Traits of Three Hundred Geniuses".

Out of Terman's research and applications of his research from 1930 to 1970 and following a tradition of categorization and labeling in special education, the practice of identifying youth as "gifted" or "not gifted", based primarily on intellectual or academic abilities, became deeply entrenched in school practice. The practice persists to the present in spite of the frequent use of the terms "gifted" and "talented". In some cases "talented" or "academically talented" came to be used

as a lower level of giftedness, with the latter reserved for those of very special ability.

The publication of the Marland Report (1971) heralded a great surge of development of programs and services for gifted and talented youth in the United States. The report declared that:

Gifted and talented children are those identified by professionally qualified persons who by virtue of outstanding abilities are capable of high performance. These are children who require differentiated educational programs and services beyond those normally provided by the regular school program in order to realize their contribution to self and society (pp. I-3 to I-4).

The report further delineated six areas of giftedness:

- (1) General intellectual ability.
- (2) Specific academic aptitude.
- (3) Creative or productive thinking.
- (4) Leadership ability.
- (5) Visual and performing arts.
- (6) Psychomotor ability.

While the report had a great impact in the sense of stimulating development of programs for the gifted, identification practices moved in the direction of identifying all-purpose general giftedness, not specific talents or aptitudes. Equally pervasive in its influence on the field of gifted education was the "three-ring" model of giftedness promulgated by Renzulli in 1978 delineating (1) above average ability, (2) task commitment, and (3) creativity as basic components of the construct. The Renzulli model emphasized a search for "gifted behavior" as opposed to gifted status.

While these and other models (Sternberg & Davidson, 1986) continued to portray giftedness as a general condition or construct, other researchers had indeed been focusing their attention on special talents or aptitudes. DeHaan and Kough (1956) published the results of their work for the Quincy Illinois Youth Development Commission in which they had developed practices for identifying and nurturing talents and gifts in ten areas:

Intellectual ability; scientific ability; leadership ability; creative ability; artistic talent; writing talent; dramatic talent; musical talent; mechanical skills; physical skills.

From experiences in the Quincy Youth Development project DeHaan and Havighurst (1957) concluded that youth who are in the top 10% in a talent domain *may* be considered gifted and that talented youth may equal or exceed 20% of the school population.

Current practice in gifted education continues, however, to favor a general giftedness approach and the identification of all-purpose gifted youth, with far less attention to their special gifts and talents. In this paper we will review conceptions of giftedness in greater depth, discuss operational systems for identifying gifted and talented youth, examine concepts related to selection, and draw conclusions and guidelines for practitioners.

Conceptions of Giftedness and Talent

The history of the gifted education movement has witnessed extensive efforts in both theoretical and empirical areas to define the construct *giftedness*. Yet, there is little agreement among researchers and educators on a precise definition and measurement of giftedness (Horowitz & O'Brien, 1985; Janos & Robinson, 1985). The widespread disagreement is a result of varying and conflicting conceptions about the relationships among and definitions of giftedness, intelligence, and talent (Feldhusen & Hoover, 1986; Gagne, 1985). Hallahan and Kauffman (1982), however, argue that the reasons for disagreement are mainly due to differences of approaches regarding four issues: the range of skills and behaviors to which the term giftedness should be applied, the measurement of giftedness, the cutoff point above which a child is considered gifted, and the nature of the comparison group.

Identification of the gifted for academically oriented programs has become more complex and difficult as the focus of attention moves beyond traditional IQ definitions of giftedness to broader perspectives which view giftedness as a multifaceted process (Heller, 1991; Necka, 1991) including many talents and aptitudes as well as general ability (Feldhusen, 1986a, 1986b; Gardner, 1983; Getzels & Jackson, 1958; Guilford, 1967; Marland, 1971; Silverman, 1986; Treffinger & Renzulli, 1986; Tyerman, 1986; Wallace & Pierce, 1992).

Definitions of Giftedness

An explicit definition of giftedness is considered by many authors to be a keystone for the development of programs for the gifted. It is important because of the close link that must exist between the definition and the identification system (Feldhusen, Asher, &

Hoover, 1984; Hoge, 1988; Ward, 1983). It also is important because of its relationship with program goals and curriculum offerings (Feldhusen, 1982). Finally, the definition adopted or developed by a school will determine in general terms who will be selected and who will be excluded.

From a historical point of view, published definitions may be classified into six categories. They will be discussed next.

Psychometric Definitions

Psychometric definitions represent a quantitative approach in viewing giftedness in terms of cut off points on certain criteria such as IQ. This approach originated from the traditional psychometric research of Terman (1925) and Hollingworth (1929).

Terman and Hollingworth used intelligence as a basis for defining giftedness and operationally defined intellectual giftedness in terms of a line drawn at a score level on an intelligence scale (Terman & Oden, 1959; Hollingworth, 1929). In spite of using nine methods to collect data for the main experimental group of 643 subjects, an IQ of 140 on the complete Stanford-Binet scale was set by Terman as the provisional lower limit for inclusion in the case of children under 11 years. The ultimate goal, as indicated by Terman (1925), was to locate subjects in the top 1% of the school population.

Hollingworth (1929) also equated giftedness with high levels of intelligence as measured by standardized individual tests. She believed that "a mind must be judged by its product" and "the measurement of performance" is the "only approach to the measurement of mind" (p. 26). She defined intellectually gifted children as the most intelligent 1% of the population who are at or above 130 IQ.

Trait Definitions

Trait definitions are derived from psychological characteristics that are assumed to differentiate gifted children from others. At least one component of Renzulli's definition (1978), task commitment, is derived from this approach. Unusual curiosity, variety of interests, productive thinking, etc., are among the traits included in these definitions. Reynolds and Birch (1977) suggested that "The gifted student is likely to have: above average language development; persistence in attacking difficult mental tasks; the ability to generalize and see relationships; unusual curiosity; a wide variety of deep interests" (p. 216). Several of these characteristics may be viewed as traits.

Definitions Focused on Social Needs

This category refers to definitions that are based on social needs (Newland, 1976). In a comprehensive

historical review of public concern for the gifted during the period from 1950 to the present, Tannenbaum (1986) concluded that statistics of supply and demand in key professions, especially in science and technology, and racial balance were major factors in determining the direction and extent of concern about gifted education at all levels. The influence of politicians and economists in creating intense concern or lack of concern was always significant and consequently some researchers have concluded that “giftedness is societally defined” (Kirk & Gallagher, 1983; Sternberg & Davidson, 1985).

Educationally Oriented Definitions

Educational definitions focus on specific qualities of education or schooling that are important for the gifted. The federal definition (Marland 1971) represents this approach. Two conditions are essential: Demonstrated potential ability and a need for differentiated educational services. All definitions of giftedness that include a statement emphasizing the need for special provisions in the curriculum and/or instruction can be classified as educationally oriented definitions although some of them may be subsumed under two or more categories. Gallager’s definition (1975), for example, states that “These are children who require differentiated educational programs and services beyond those normally provided by the regular school program in order to realize their contribution to self and society” (p. 10).

Special Talent Definitions

The emphasis in the talent category is on particular aptitudes (von Ardenne, 1990; Balogh & Nagv, 1990; Howe & Sloboda, 1991). The term talented generally refers to students who are outstanding in a specific skill such as arts, music, mathematics, science, or any other esthetic or academic area (Davis & Rimm, 1985) that may or may not be matched by more general abilities (Kirk & Gallagher, 1983). Although it is common to use the words “gifted” and “talented” interchangeably, the relationship between the two concepts is somehow problematic.

Several theorists have attempted to clarify the concepts of gifts versus talents. Gagne (1985), for example, after reviewing related literature, presented a differentiated model in which he defined giftedness as above-average competence in one or more domains of human ability, and talent as above-average performance in one or more fields of human performance. Feldhusen (1992) proposed a new conception of the term talent as referring to superior aptitude or ability in any worthwhile line of human endeavor. He suggests that talent is a developmental phenomenon emerging out of general aptitudes and into specific career-oriented abilities.

Multidimensional Definitions

This category refers to recent definitions that integrate several factors and include more detail. Renzulli’s conceptual definition (1986) may be classified under the multidimensional, educational category:

Gifted behavior consists of behaviors that reflect an interaction among three basic clusters of human traits—these clusters being above average general and/or specific abilities, high levels of task commitment, and high levels of creativity (pp. 11–12).

Feldhusen and Hoover (1986) also presented a multidimensional conceptualization of giftedness as an interaction of superior general abilities (intelligence), focused talents, and a special conception of self. Motivation, according to their definition, is an outcome behavior resulting from self concept and self esteem which “impel an individual to work, to investigate, to learn, to solve problems, to strive, to achieve, to compete” (p. 141). Feldhusen (1986a) also stressed the role of a knowledge base, acquired through educational experiences, as another fundamental component of emerging giftedness.

DIFFERENCES AMONG THE DEFINITIONS

These definitions of giftedness differ in at least four fundamental ways:

(1) Degree of comprehensiveness or breadth: This dimension refers to the nature and number of variables included in the definition. At one extreme are definitions with a single variable and domain such as mathematical aptitude or creativity. At the other extreme are multivariate definitions that include a wide range of traits in addition to cognitive variables.

(2) Degree of superiority: This dimension ranges from conservative definitions such as Terman’s top one percent level in general ability as measured by the Stanford–Binet Intelligence Test to liberal definitions such as the multiple-talent viewpoint of Taylor, Allington, and Lloyd (1990) that considers almost every one to be gifted or talented in some way.

(3) Gifted versus potentially gifted focus: This dimension refers to an important aspect of the conceptualization of giftedness in terms of the extent to which definitions involve a static or dynamic view of components or characteristics of giftedness. According to Hoge (1989), the continuum ranges from definitions based on IQ tests to definitions that involve a set of potentialities that may or may not be developed.

(4) Terminology of giftedness: A variety of terms have been used in defining the giftedness construct. Some use the terms “giftedness” and “talent” synonymously, some distinguish between them, others associate them with the term “creativity”.

To sum up, there is much disagreement on the definition of giftedness. There is no one definition that will serve as the theoretical base for all programs and situations. Nevertheless, a definition is a central component of every organized program and should be conceptualized and stated with great care.

Developing Systems for Identification

For a sound identification system, there are a number of concerns to which personnel in charge of planning and developing identification systems must attend. These include (1) the rationale and goals, (2) defining the target population, (3) use of single or multiple criteria, (4) types of test instruments, (5) criteria for test selection, and (6) selection strategies.

Rationale and Goals of Program

The rationale and goals of a program for gifted and talented youth are of central importance in making informed decisions regarding the definition and identification of the target population (Borland, 1989). Advocates for gifted education combine individual and societal needs in their justification for programs (Tannenbaum, 1986; Ward, 1983). The assumption behind such a mixed rationale probably is that the *welfare of the individual* and the *welfare of the society* are congruent. In their discussion of the philosophy and objectives of special education for the gifted, Gowan and Demos (1964), for example, argued that the objectives should be determined by two factors, the needs of the individual and societal demands. Whether the concentration is on individual needs or on societal needs, there are important implications for the definition and identification of the gifted.

Nevertheless, it is widely accepted that the primary goal of programs for the gifted is to provide experiences that meet the needs of gifted learners which cannot be met in regular classrooms (Clark, 1992; Gold, 1980). A defensible goal for a special program should be to select and admit students who are most likely to benefit from the educational program and meet criteria of success as defined by program goals. This is no more than a frame of reference for the much more complicated task of working out specific, unambiguous objectives and activities. In addition to guiding all activities to be undertaken from the beginning, precisely stated objectives provide a solid foundation for any formal or informal attempt to monitor and evaluate (a) the degree to which objectives have been achieved, (b) the weaknesses and strengths of procedures and methods, and (c) the value of the objectives themselves. A key

question to be answered is: "With what objectives and under what conditions can the goals of the identification system and the program be achieved?" In the following sections some of the factors that can be brought to bear on this question are discussed.

Defining the Target Population

Defining the target population of students from which the selection is to be made is the first and perhaps the most important step in planning programs for the gifted (Borland, 1989). Almost all essential components of any well-structured program for the gifted are shaped by the definition of the target population. The Johns Hopkins accelerative model (Stanley, 1979), for instance, differs from the Triad model of Renzulli (1984) mainly because the target population for each model is defined and selected in a different way.

Sternberg and Davidson (1986) reviewed conceptions of *giftedness* and concluded that they have changed over the years from the psychometric conception that equated giftedness with high IQ (Terman, 1925) to a multidimensional conception (e.g., Marland, 1971; Renzulli, 1978; Tannenbaum, 1983) which includes intellectual and nonintellectual domains or factors and more domain-specific ones (Stanley, 1979). For practical purposes it is of great importance that the definition be reasonable to operationalize, that is, measurable. Otherwise, the theory-practice gap discussed by Yarborough and Johnson (1983) could not be closed. Defining the target population also requires accurate information about the student population in the grade level for which the program is intended. This is fundamental to informed planning for identification.

Special Populations

Identifying gifted students from special populations has posed a challenging problem for professionals and educators in the field of gifted education (Baum, 1986; Bragget, 1990; Feldhusen, Asher, & Hoover, 1984; Reid, 1989; Richert, 1985). Research in the past focused more on deficits rather than on strengths (Baldwin, 1985; Baum & Owen, 1988; Whitmore, 1981). However, gifts and talents among special populations exist in similar proportions as among the general population (Baldwin, 1985). Student civil rights to equal opportunity for special services means that an identification system should guarantee that no one who is qualified is overlooked.

The National Association for Gifted Children's Committee on Special Populations adopted a position statement relating to the definition and identification of special populations. The term is defined to include

“groups who differ from those who have been traditionally well represented in school programs for the gifted” and it “can be applied to children and young adults who are Black, Hispanic, Native American, Asian Pacific, rural, economically disadvantaged, handicapped, and female, as well as students whose gifts are in domains not traditionally recognized in school settings” (Jenkins-Friedman, Richert, & Feldhusen, 1991, pp. vi-vii). The statement also indicates that typical instruments and procedures used to identify gifted students for special programs may be inadequate and insensitive to the unique qualities and characteristics of special populations. Ignoring the needs and special problems associated with identifying gifted/talented students from special populations also leaves the field vulnerable to charges of elitism and racism (VanTassel-Baska, 1989).

Minority and Disadvantaged Gifted

The charge that minority groups are underrepresented in programs for the gifted and talented has been consistently supported by research findings (Skuy, Kaniel, & Tzurie, 1988). For example, representation of various ethnic groups in public schools compared to their representation in programs for the gifted is shown in the following table as presented by Zappia (1989):

TABLE 1

Ethnic group	Public school enrollment (1%)	Gifted programs enrollment (%)
Anglo-Americans	71.2	81.4
Blacks	16.2	8.4
Hispanics	9.1	4.7
Asians	2.5	5.0

The U.S. Office for Civil Rights (1987) also conducted a nationwide survey in the fall of 1986 to obtain data on the characteristics of students enrolled in public schools. According to the survey summary, 3% (372,421) of the total minority enrollment (12,199,456) were identified and served as gifted. The percent for whites was 5.35% (1,549,736) out of 29,956,580. The data indicated that minority students compose 29.6% of the total school enrollments but only 19.4% of the total population was identified and enrolled in special programs for the gifted.

In a national survey, including the fifty U.S. States, District of Columbia, and three territories, Patton, Prillaman, and VanTassel-Baska (1990) concluded that “Although states have been consistently positive in their philosophical orientation toward culturally diverse and low socioeconomic gifted students, they have lagged in incorporating these concerns for equality and pluralism into the definitional and funding structures of their gifted programs” (p. 94).

In another study, Colangelo and Kerr (1990) used data from the American College Test (ACT) Assessment Program’s Students Profile section to formulate and study profiles of the highest 5% and 1% of 729,606 high school juniors and seniors (334,126 male; 395,480 female) who took the American College Testing Assessment Program (English, Mathematics, Social Studies, or Natural Sciences) during the 1985/1986 academic year. A sample of perfect scorers (5,615) on at least one of the four sub-scales of ACT was selected. The results for perfect scorers by ethnicity indicated that all ethnic/minority groups of Blacks, Native American, Chicanos, and Hispanics were underrepresented. Whites were somewhat overrepresented and Asians were greatly overrepresented.

VanTassel-Baska and Willis (1987) conducted a three-year study to investigate the effects of low income on SAT scores among the academically able. The sample was composed of students who participated in the Midwest Talent Search Program in the years 1985, 1986, and 1987. Families of students with annual income of \$20,000 or below were considered “economically disadvantaged” based on U.S. Bureau of Labor statistics which indicated that the median family income in the United States in 1984 was \$28,623. Giftedness was defined as attaining a score of 95th percentile on an in-grade standardized achievement test in either math or verbal ability at the junior high level. Data analysis indicated that the participation rates of low income disadvantaged gifted students (in samples of 11,675, 14,486, and 16,425) were 13.2%, 13.8%, and 13.3% in 1985, 1986, and 1987, respectively.

Handicapped Gifted

The term “gifted handicapped” refers to children who have two sets of characteristics: giftedness and disability (Clark, 1992). They are impaired by one or more specific conditions that include: learning disabled, hearing impaired, visually impaired, neurologically impaired, emotionally disturbed, and motor impaired (Whitmore & Maker, 1985; Yewchuk, 1985). Obstacles to identifying disabled children as mentally gifted include: stereotypical expectations, developmental delays, incomplete information about the child, lack of challenge, and lack of appropriate tests or rating scales.

In the U.S. Human Civil Rights Office Survey of 1986, the total number reported for students having handicapping conditions other than mental retardation was 4,492,694. The estimated figure for gifted students among them ranges between 300,000 and 540,000 (Clark, 1992). The major problem in searching for gifts and talents among these handicapped students is that special teachers are more concerned about their handicaps than their abilities. For example, New York City schools provide full service for 60,000 handicapped students. According to Davis and Rimm (1985), a special program for the handicapped gifted was organized and

forms were sent to all schools serving those students asking for nominations to the program. The result of the survey indicated that none was nominated or referred to the special program from this large population.

Boodoo, Bradley, Frontera, Pitts, and Wright (1989) conducted a survey to investigate procedures used for identifying gifted learning disabled (GLD) children in all special education centers in Texas. The authors investigated whether any learning disabled children had been nominated, by whom, and what modifications were made in the criteria to allow such children into the gifted program. Responses from 180 special education centers and 143 gifted and talented programs were received. Analysis of the special education survey indicated that 91% of the districts (73% of which enroll less than 6,000 students) reported no GLD students, 6% had between 10 and 19, 1% had between 20 and 29, and one district had more than 50 GLD students. More than 90% of the districts did not respond to inquiries concerning aptitude, achievement, or behavioral characteristics of their GLD students.

Gifted Underachievers

"Gifted underachiever" is another category of special populations gifted. Whitmore (1980) defined "underachievement" as "performance judged either by grades or achievement test scores, or both, that is significantly below the student's measured or demonstrated potential for academic achievement" (p. 168). Although there are many different definitions (Seeley, 1989), the underlying concept is that there is a discrepancy between potential and actual performance (Mooij, 1992). The problem of gifted underachievers simply is that they often are not identified for any special services because they do not meet the criteria for selection which require high achievement or performance (Boyd, 1990). If the popular conception that many outstanding women and men were poor achievers or indifferent scholars as children is correct (Reynolds & Birch, 1977), and if the magnitude of the problem is huge as has been estimated (Whitmore, 1980), then identification of gifted underachievers should be one of the important concerns reflected in systems for identifying gifted students. Rimm (1986) has been a leader in efforts to identify and help gifted students who are underachieving in school. She offers a comprehensive set of guidelines for assessment of the underlying achievement problems and for corrective educational therapy.

Gifted Females

Gifted girls and women are listed as a "minority" group because of their underrepresentation in higher levels of schooling, professions, and achievement in mathematics and science (Gallagher, 1988). Sex differences on the Scholastic Aptitude Test, Mathematics, were found in

the first talent search of Johns Hopkins University (Stanley & Benbow, 1983). Fewer girls than boys scored at high levels of mathematical reasoning ability. At the high school level, the authors found sex differences favoring males in participation in mathematics courses, performance on the SAT-M, and taking of and performance on mathematics achievement and Advanced Placement Program Examinations. Also, in the Study of Mathematically Precocious Youth (SMPY), males performed better than females on achievement tests measuring knowledge and understanding of biology, chemistry, and physics.

Kerr and Colangelo (1988) in the same study discussed earlier also found increasing gender differences in American College Test (ACT) performance favoring boys. Girls who scored perfectly in English outnumbered boys at more than a 2:1 ratio. Boys scored perfectly in mathematics at more than a 3:1 ratio compared with girls. The authors concluded that at the highest extremes of academic ability, gender differences in performance are substantial.

Young (1988) presented "concerns and issues relating to the education of talented girls" from a New South Wales perspective. While the problems she delineated were derived from the Australian cultural context, the problems she discussed, underrepresentation of women in all professional fields, and the barriers confronting girls who aspire to higher level occupation—are relatively universal across world cultures. They represent major goals for leaders in gifted education in their efforts to bring about gender equality in programs for gifted and talented youth.

Alternative Identification Methods for Special Populations

Baska (1989) advocated using a quota system as one solution to ensure representation of all ethnic groups. Lowering the achievement criteria for admission of students from minority populations to increase their percentages in programs for the gifted is another solution (Maker, 1989). Frasier (1989) supports using "a culture-specific" assessment system that evaluates "the intelligence of each person in relation to others who come from similar socioeconomic backgrounds and who have had approximately the same opportunity to acquire the knowledge and skills needed to answer questions on an intelligence test designed for an Anglo-American society" (p. 219). She also recommends using standardized tests that allow for culturally different manifestations and interpretations of intellectual ability. While Frasier cited many references regarding the inappropriateness of traditional intelligence tests with Blacks, Kaufman and Harrison (1986) and Whitmore (1979) argued that intelligence tests are the only method appropriate for identifying gifted children who do not fit stereotypical patterns or who have undeveloped potentials or handicapping conditions. Whitmore argues

that the talents of underachievers and handicapped students are often not recognized before administering an intelligence test.

Maker (1989) synthesized different perspectives concerning identification of gifted children of cultural and ethnic minorities and made the following recommendations: use multiple assessment procedures, including objective data from a variety of sources; include culturally and linguistically appropriate instruments in the referral and testing processes; and use a case study approach, in which a variety of assessment data is interpreted in the context of a student's individual characteristics, and decisions are made by a team of qualified individuals (pp. 295-297).

From the review of literature on identification of gifted students from special populations we conclude that the problems associated with identifying and serving these gifted students are major concerns for both educators and policy makers. A defensible program for the gifted must deal with these problems proactively by using flexible, multiple criteria for identification. A variety of objective and subjective assessment data is better used and interpreted with reference to the diversity existing across and within populations and subpopulations of gifted children. In the nomination stage, the philosophy of "throwing a wide net" may be the best approach to discovering gifted students from special populations.

Developing Identification Systems

Multiple Criteria

In almost every program for the gifted there is a fixed number of openings and limited resources. The identification criteria are general conditions regarding eligibility for consideration or nomination. They function as a means of controlling the number of nominees or applications within a reasonable range.

A number of researchers and theorists have argued strongly and persuasively in support of multiple selection criteria (e.g., Howley, Howley, & Pendarvis, 1986; Richert, Alvino, & McDonnell, 1982; Witty, 1951). The use of multiple procedures for identification has been emphasized as a response to theories of human abilities which stress multiple factors (Gardner, 1983). It is important, however, to recognize that this approach does not necessarily guarantee making valid decisions. The quality and relevance of measures place limits on the reliability and validity of such decisions. The question to be raised, therefore, is not how many measures are used in the identification process, but rather what contribution each piece of information has to making valid decisions or to serving specific objectives. It is a waste of money, time, and effort to collect data that is not going to be used or that is not contributing to more valid and reliable decisions.

A variety of data sources are suggested in the literature for the identification of academically gifted and talented children for special services (Tuttle & Becker, 1983). The list includes standardized tests, school grades, rating scales, references, essay writing (Feldhusen & Baska, 1989), past accomplishments (Coleman, 1985), interviews, creativity tests (Torrance, 1984), and creativity inventories (Rimm, 1984). In a later section of this chapter we will present brief descriptions of instruments frequently used for identification, and criteria for test selection.

Phases of Identification

A sound identification system typically is carried out through a series of steps taken in the proper sequence and on time. The order and sequence of steps, clarity of objectives, purposefulness of each component, and the modifiability of the system are important foundations for a defensible identification system. The number of steps and the purpose of each step is dependent upon the nature of the program for the gifted. Is the program restricted to a school building? Is it a program serving a school district or a statewide population of students? Nevertheless, there are two common phases in most identification systems: screening and selection or placement.

Screening

Screening is probably the first major process in the identification system that requires translating theoretical foundations of the gifted program into real actions. It is the first level identification in Renzulli's (1984) revolving door identification model. Many activities are carried out during this process such as: Getting information from school records, collecting and categorizing information from nomination forms and referrals, testing, presenting and synthesizing information, and selecting candidates for further testing. The ultimate function of screening activities is to generate a pool of possible candidates for the next stage of identification. The following principles are suggested to guide planning to achieve this goal: (1) multiple criteria, (2) inservice training of staff on the identification procedures, and (3) using reliable and valid screening tests and rating scales.

Multiple criteria should be used to include as many promising candidates as possible. In addition to existing school records and group test scores, nominations from teachers, counselors, peers, parents, and the students themselves should be accepted. Setting cutoff points on some screening measures should not lead to ignoring strong evidence from other sources. The size and the quality of the target population from which the selection is to be done may be the most important guiding factor.

In school practice it is common to have 10–20% of the school population in the initial screening pool, especially if a broad definition of giftedness is used, including academic and artistic talent. Inclusion in the initial screening pool, not exclusion, is recommended by many researchers (e.g., Clark, 1992; Feldhusen, 1989). Borland (1989) suggested two practices to serve this purpose: (1) setting low cutoff points on screening measures, and (2) including every student who meets the cutoff score on any screening measure.

Effectiveness and subsequent efficiency of the screening process can be substantially improved by providing adequate training for all staff who participate in the screening process. An extensive review by Hoge and Cudmore (1986) of the literature on teacher accuracy in identifying gifted students concluded that the validity of teacher judgments or ratings can be improved through appropriate training. Such training should include clarification of the processes of screening and identification, communication of the overall goals of the program, and tryouts of all the forms and procedures.

Finally, the tests and rating scales should be of the highest quality obtainable. Evaluation information about tests is quite readily available in the *Mental Measurement Yearbooks*. Nomination forms and rating scales, however, are often locally produced with little or no attention to their validity or reliability. It is far preferable to use forms and scales that have been carefully developed and empirically tested in real practice.

Selection-Placement

In almost every program for the gifted there is a fixed number of openings and limited resources. Therefore, the ultimate goal of this phase is to select a limited number of students from the pool. Further testing may be required to make more valid decisions. Individual tests, group tests, essays, and interviews are possible sources of additional information that might be relevant to program services.

The task facing those who must make selection decisions is difficult and problematic. In order to assist the selection committee in its decision-making, several questions must be addressed. Some of these questions may be open-ended and have no absolute answers.

How should the data be synthesized?

How should the selection tests and criteria be weighted?

Where or at what level should the cutting lines for admission be drawn?

A plan for a comprehensive identification system should provide guidelines for those who must make decisions in both identification phases.

Selection Strategies

A special program for gifted or talented students should provide more advanced, rigorous curriculum experiences to satisfy intellectual needs which are not addressed in regular classes. Thus, selection strategies must be focused on finding those youth who need and can profit from the advanced learning experiences and excluding those who would not benefit from it or who would fail in the program. A straightforward objective strategy for selection thus is to rank order all qualified nominees based on a composite index (score), and to select from high to low until all openings are filled. Usually best available choices can be guaranteed using this strategy.

However, a problem may arise with this approach if the lowest scores selected are not qualified according to some minimal standards or abilities. Popham (1990) suggested that there are situations in education “where the decision revolves around not who is best or worse but rather who is qualified” (p. 35). Highly structured programs for the gifted can be included in those situations. An efficient identification system can play a role in providing the requirements for making selection decisions not only on the basis of “who is best” but also “who is qualified”. It is important for administrators of programs to be as clear as possible in adopting a selection strategy that assures that those who are selected meet minimum standards for success in the program. Decisions regarding minimum standards are influenced by the selection strategy and the orientation of the program. Empirical evidence and/or professional judgment can be used to make a sound decision.

There are two main approaches to making selection decisions: the statistical approach and the judgmental or clinical approach. The first approach requires the mechanical combination of different data sources using appropriate statistical methods, while the second approach depends on personal judgments. The statistical approach is generally superior to professional judgments in terms of predicting academic success (Sawyer, 1966). In addition, it is less costly since computer processing of the selection data can be used.

The final phase of the identification process is notification of students who are selected for the program that they have been selected and, if an application format was used, notifying those who were not selected and stating the reasons why they were not selected. For those who are not selected, an offer to reconsider the application is desirable. Generally, a review committee is formed to hear and reconsider those applicants who ask for a review.

The ultimate final stage of the identification process comes later when empirical tests of performance in the program are conducted to determine if those who are picked perform up to expectations and profit from program services. Procedures for such analyses will be presented later in this chapter.

Criteria for Test Selection

If a test is to be used for making selection decisions, it must demonstrate some standard technical properties. Following are major characteristics of tests that facilitate their use by professionals working with gifted students.

Relevance of Test

Identification techniques must be consistent with the stated goals of the educational program for the gifted. The initial step in selecting instruments for identification is to determine whether the purpose for which the instrument was designed matches the purpose for which the instruments are to be used. The test manual usually includes a description of the characteristics or behaviors measured. The best ways to judge the adequacy and appropriateness of the test's description of measured behavior for the intended purpose are to study the description in the test manual, examine the test itself, and read an evaluation of the test by a measurement expert as presented in the *Mental Measurement Yearbooks*.

Reliability

Reliability refers to the accuracy or precision of a test. It may be estimated in several ways: the degree of consistency among items (internal consistency), agreement between two alternative forms of the instrument (equivalency), or stability of results over time (test-retest). Internal consistency is assessed by finding the correlation of the test items with the total tests score. Equivalency and test-retest reliability are assessed by giving the test to a group and then repeating administration with an alternate form of the test or the same form some time later. In either event examinees' scores should be approximately the same from both testings. All of the forms of reliability should be examined in selecting an instrument for identification. Reliability estimates are reported in test manuals as correlation coefficients ranging from zero to one. The reliability coefficient is an index of the precision of the measurement. For example, a test reliability of 0.70 means that 70% of the difference between individuals taking the test will be explained by real differences, and 30% may be due to random or chance errors.

Another index related to reliability is needed to interpret individual scores; that is the standard error of measurement (S_e). The standard error of measurement is used to calculate confidence intervals around an individual's test score. The confidence interval states a range within which we are confident the true or correct score falls. The most common confidence estimates are 68%, 95%, and 99%. Suppose that we have two students with IQ scores of 115 and 120, and the standard

error of measurement of the test is 5. For the 68% confidence interval, the chances are 68 in 100 that if we retested these students, their true IQ scores would fall between 110–120 and 115–125 (plus and minus one S_e), respectively. For the 95% level, the ranges would be 105–125 and 110–130; for 90%, 100–130 and 105–135. The standard error and the confidence interval alert us, in the identification process, to the potential inaccuracies of the test scores.

Validity

Validity is the extent to which an instrument measures what it claims to measure. A test may have some validity for one purpose but be invalid for another. The questions to be asked about validity are these: What does the test measure? Is it measuring what we want to know? There are several common ways of estimating validity of a test: (1) prediction, (2) concurrent, (3) content, and (4) construct. For the purpose of identification or selection of gifted students the predictive validity of a test is usually the most important and most useful. Does the test select youth who will succeed in the program and go on to high level achievement? Concurrent validity refers simply to the correlation of a test with other established tests of the same characteristics. Content validity is used chiefly to judge the validity of achievement tests; does the test measure what we taught? Construct validity refers to theoretical efforts to understand psychologically what the test is measuring. Of these latter three types of validity, the third, content, may be of interest to coordinators of gifted programs when they use standardized achievement tests in selection or assessment of performance in the program. Again the question would be: Does the test measure student achievements that we regard as important indicators of learning?

Validity is a key evaluation concept in selecting and using tests in the identification process. It is imperative that the tests used in this awesome process of selecting youth for special educational opportunities measure abilities that are vital to success in the program. Students who lack the requisite abilities may suffer failure if the tests are invalid, and we do not want to miss students who should be in the program.

Normative Data

The quality and quantity of normative (comparative) data accompanying standardized tests is the key to interpreting test scores. Normative data (norms) allow the comparison and interpretation of an individual's score relative to groups of comparable students. If a student, for instance, has a percentile score of 80 on a test, this indicates that his/her score equaled or exceeded 80% of the examinees in the norm group. Information about the composition and selection procedures of norm groups is very important for meaningful interpretation of

scores. The norms of a test are based on performance of tested groups, and are reported in test manuals in many ways, such as standard scores, percentile ranks, stanines, or means. Therefore, the manual of a test should be studied carefully by gifted program coordinators to make sure that test scores are interpreted and used properly in the identification process.

Test Bias

A fifth criterion for evaluating a test for identification is the extent to which it is free from bias. Bias refers to aspects of a test that lead to lower test scores due to race, gender, social class, ethnic origin, religion, or age and that lead to inaccurate assessment of examinees. Bias is chiefly a problem of reliability of the assessment. Fairness, a closely related issue, is chiefly a validity issue. Is it culturally fair to use this particular test in the identification process if some examinees have never had an opportunity to develop this particular aptitude or ability?

Administrators and professionals involved in selecting instruments for identification of gifted students must be aware of problems of test bias and fairness with both scientific and ethical considerations in mind. Testing instruments should be reliable and valid for the youth being screened. Interpretation of test results should be based on accurate knowledge of the norm group's structure and the stated purposes of the test.

Ceiling Effect

Ceiling effect refers to the lack of an adequate range of difficulty of test items. A test with ceiling problems, when used for the identification of gifted students, will not reveal the full range of their abilities, especially the highly gifted. Real individual differences at the highest extreme cannot be assessed if the ceiling of the test is not high enough. Intelligence tests (Silverman, 1989) and grade-level standardized tests (Feldhusen & Baska, 1989) have serious ceiling limits. They are often not constructed and normed for use with gifted students. Ceiling effect is operating when the average score of a group is above 75% of the maximum score or when the distribution of scores is highly negatively skewed. The major approach to correction of ceiling effects is to use off-level testing (Feldhusen, 1991). This means that, if available, a higher and more difficult level of the test is used for a given age or grade level group. Thus, students in grades 4 and 5 are given the 7–8 grade form of the Stanford Achievement Test and similarly 7th and 8th graders are given the Scholastic Aptitude Test, ordinarily taken by graduating high school seniors. Interpretation of scores from off-level testing requires special attention, especially if percentile norms are used. The student's score from off-level testing may be lowered considerably but by attending to the norm

group the interpretation is that he/she has scored high, given the age and maturity of the new norm groups.

Test Instruments

A number of intelligence, aptitude, and achievement tests are commonly used in identifying gifted and talented youth. We will present brief descriptions of some of the most well known and widely used tests.

Intelligence Tests

Intelligence tests can be classified into four categories: individual, group, verbal, and nonverbal. An individual test is one that has been constructed so that only one person is tested at a time. A group test can be administered to a group of people at the same time. Individual tests allow examiners to observe behavior under standardized conditions and provide safeguards to maintain cooperation and motivation of the subject. Group tests are cost-efficient and typically more objective in scoring than individual tests. Verbal tests require reading or language skills while nonverbal tests do not require the use of language. Verbal intelligence tests predict academic success better than nonverbal tests (McLeod & Cropley, 1989). Nonverbal intelligence tests are more appropriate for individuals with limited verbal/language skill.

Despite criticisms about bias and limitations of intelligence tests (Snyderman & Rothman, 1988) they remain among the most useful (Borland, 1989), the strongest measures of intellectual ability (Gallagher, 1975; Snyderman & Rothman, 1988), and the most accurate method of identifying gifted children (Sattler, 1982). Individual intelligence tests are most useful for identifying gifted underachievers (Davis & Rimm, 1985; Whitmore, 1981), school-aged gifted youth (Robinson & Chamrad, 1986), gifted children with learning disabilities (Kaufman & Harrison, 1986), and for making decisions concerning early admission or grade advancement (Feldhusen & Baska, 1989).

The *Stanford–Binet Intelligence Scale* is a widely used individual intelligence test. It yields a single deviation IQ standard score that is comparable from one age level to another (i.e., has the same meaning or percentile standing). The fourth edition of this test (Thorndike, Hagen, & Sattler, 1986) includes 15 subtests and provides 20 scores measuring abilities in four broad areas: Verbal Reasoning (Vocabulary, Comprehension, Absurdities, Verbal Relations, Total), Abstract/Visual Reasoning (Pattern Analysis, Copying, Matrices, Paper Folding and Cutting, Total), Quantitative Reasoning (Quantitative, Number Series, Equation Building, Total), Short-Term Memory (Bead Memory, Memory for Sentences, Memory for Digits, Memory for Objects, Total).

Another widely used individual test of intelligence is the *Wechsler Intelligence Scale for Children (WISC-R)*. The WISC-R measures intelligence of children between the ages of 6 and 16 years and 11 months. Unlike the Stanford-Binet, the WISC-R provides three IQ scores: verbal IQ, performance IQ, and full-scale IQ. The WISC-R contains 12 subtests, two of which are supplementary. The verbal section includes information, comprehension, arithmetic, similarities, vocabulary, and digit span. The performance section includes picture completion, picture arrangement, block design, object assembly, coding, and mazes. A national survey of school psychologists in the United States indicated that the WISC-R is the overwhelming first choice as an assessment instrument in identifying gifted children, followed by the Stanford-Binet, with the Kaufman Assessment Battery for children as the third choice (Klausmeier, Mishra, & Maker, 1987). The *Wechsler Preschool and Primary Scale of Intelligence (WPPSI)* is a downward extension of the WISC-R for use with children from 4 to 6½ years old.

The *Kaufman Assessment Battery for Children (K-ABC)* is an individual ability test for children between 2½ and 12½ years of age. The K-ABC consists of 16 subtests grouped into five scales: sequential processing, simultaneous processing, mental processing composite (sequential and simultaneous combined), achievement, and nonverbal. Strengths of the K-ABC include its theoretical orientation, separated intelligence and achievement scores, the nonverbal score, limited oral instructions and limited verbal responding, colorful and interesting items, inclusion of sociocultural norms, and small racial differences (Kaplan & Saccuzzo, 1989).

The *Raven Progressive Matrices (RPM)* is a nonverbal group/individual intelligence test covering an age range from 5 to adult. The test is unlimited in time and requires minimal instructions. It consists of 60 matrices graded in difficulty. Each matrix contains a missing part, and the subject's task is to select from up to eight multiple-choice responses the appropriate design that completes the matrix pattern. It is especially valuable for evaluating minority and culturally different students who are limited in language skills.

Aptitude Tests

Aptitude tests are designed to measure specific abilities that develop over long periods of time or the potential for future achievement in specific areas or careers. Two aptitude batteries will be discussed, the *Differential Aptitude Tests (DAT)* and the *Scholastic Aptitude Test (SAT)*. The DAT is an aptitude battery that can be used with junior and senior high school students (Grades 7-12) and students in the upper elementary grades. The DAT measures verbal reasoning, numerical ability, abstract reasoning, perceptual speed and accuracy, mechanical reasoning, spelling, and language usage. The verbal reasoning and abstract reasoning may be used as

group intelligence tests. Stanley (1984) suggested using the battery as a screening method for intellectually talented students at the end of the seventh grade. Reliability and validity of the DAT are high and the test is viewed as an excellent measure of special abilities.

The *Scholastic Aptitude Test (SAT)* has been in use as a college entrance test since 1926. The Talent Search Programs in the United States (VanTassel-Baska, 1984) use the SAT as an off-level test for identifying precocious youth in mathematics and science at the 7th and 8th grade levels. It is also used as a criterion for admission in most state-supported residential schools of science and mathematics. The test is comprised of 85 verbal and 60 mathematical items. The SAT-V includes sentence completion, identification of opposites, use of analogies, and paragraph comprehension. The SAT-M includes items covering arithmetic, algebra, and geometry. The test is intended to measure reading comprehension, verbal reasoning and vocabulary, and quantitative reasoning. Separate verbal (SAT-V) and mathematical (SAT-M) scores are reported on a 200 to 800 scale. The SAT score is a transformed standard score with a mean of 500 and a standard deviation of 100. It is a highly reliable and valid test for the assessment of verbally and quantitatively precocious youth.

Achievement Tests

Standardized achievement tests are used to measure how much students have learned in a given subject matter content and especially to measure the high level achievement of gifted students. They can be group or individual tests. Group achievement tests are generally used as screening tools while individual tests are used for more precise assessment of a student's academic talent in a specific area. Standardized achievement tests usually provide national norms based on performance of a large sample. Because of the low ceiling of most grade-level achievement tests, we recommend using a higher level test for identification of gifted children. This can be done if the achievement test is in a multi-level form. Among the frequently used achievement tests in the United States are the *Metropolitan Achievement Test*, the *Sequential Tests of Educational Progress*, the *Screening Assessment for Gifted Elementary Students*, the *Wide Range Achievement Test*, and the *Peabody Individual Achievement Test*. They will be described next.

The *Metropolitan Achievement Test*, sixth edition, (MAT6) is a group multilevel battery measuring students' achievement in eight areas: vocabulary, reading, mathematics, spelling, language, science, social studies, and writing, K-12. The MAT6 is divided into a two-component system. The instructional (diagnostic) component has six levels, and is designed to provide specific information about students' performance in the curricular areas of language usage and mathematics at a given level. The survey tests component has eight levels,

and is designed to provide a global, overall assessment of student achievement (Rogers, 1989).

The *Sequential Tests of Educational Progress* (STEP III) are a multilevel test battery measuring achievement in the basic skills of reading, vocabulary, writing, and mathematics, and supplementary tests of science, social studies, study skills, and listening (Phillips, 1984). The tests include ten levels from pre-kindergarten through high school. The STEP III manual indicates that it can be used to diagnose students' competencies and as a selection device for special instructional programs. Separate locator tests are available to facilitate the use of a multilevel testing option in language and mathematics. The STEP III is a superior and well-designed achievement battery.

The *Screening Assessment for Gifted Elementary Students* (SAGES) was specifically designed to obtain information that is useful in identifying children for gifted programs that emphasize aptitude, achievement, and/or creativity (Johnsen & Corn, 1987). The three subtests of the SAGES, reasoning, school-acquired information, and divergent production, correspond to three areas of giftedness included in the federal definition, namely, general intellectual ability, specific academic achievement, and creative and productive thinking. Norms are available for average and gifted children. The reported research provides strong support for SAGES' reliability and validity.

The *Wide Range Achievement Test, Revised* (WRAT-R) is probably the most popular and widely used standardized individual achievement test. The WRAT-R measures the basic skills of reading, spelling, and arithmetic. It provides an estimate of grade level functioning in these areas. The test is not timed and easy to administer, with no certification requirements for administration. It has two levels, one for children from 5 to 12 and the other extends through adulthood. Estimates for internal consistency and test-retest reliability are adequate.

The *Peabody Individual Achievement Test* (PIAT) is an individually administered test designed by Dunn and Markwardt (1970) to measure scholastic achievement in five content areas: mathematics, reading recognition, reading comprehension, spelling, and general information. The PIAT is untimed and can be used with children from kindergarten through 12th grade as a wide-range screening measure (Williams & Vincent, 1985). The test is based on extensive reviews of the curriculum materials in the above five areas.

Rating Scales and Checklists

Rating scales are carefully developed instruments used in evaluating traits, attitudes, adjustment, abilities, personality or other characteristics of individuals. They are widely used to quantify observations, or to measure impressions in those instances where it is either unfeasible or illogical to attempt measurement in more

objective ways. Checklists are listings of behaviors, activities, or steps that have been noted by an observer. Items in a rating scale assess the degree or frequency with which a behavior occurs. Checklists assess behavior as observed or present.

Well-structured rating scales and checklists are useful instruments as part of a multi-identification system. They allow teachers, parents, peers, and other personnel to provide valuable information for use in the first stage of the identification process. Among the rating scales that have been developed through standardized methods are the Renzulli et al. (1976) Scales for Rating Behavioral Characteristics of Superior Students and the Purdue Academic Rating Scales (Feldhusen, Hoover, & Saylor, 1990). They will be described next.

The *Renzulli Scales for Rating the Behavioral Characteristics of Superior Students* (Renzulli et al., 1976) consist of ten rating scales that can be used by teachers in the identification of students with superior characteristics. The scales include learning, motivation, creativity, leadership, artistic, musical, dramatics, communication (precision), communication (expressiveness), and planning characteristics. Theoretical and empirical procedures were used to construct and develop these scales. Since no norms are available users are advised to develop norms locally.

The *Purdue Academic Rating Scales* (PARS) were designed and developed by Feldhusen et al. (1990) for teachers to assess students' observable behaviors associated with superior academic performance in English, mathematics, foreign language, science, and social studies at the secondary level. Each of the five instruments includes 15 items that are rated on a four-point scale (i.e., rarely, occasionally, frequently, always). A "Don't know" response option is also provided. Good reliability and validity of the scales has been reported by the developers. The Purdue Academic Rating Scales (PARS) provide a relevant and useful source of information for selecting students for advanced placement and honors classes and for other acceleration options.

While tests and rating scales might often have to be administered especially for identification purposes in a program for gifted and talented youth, students' cumulative school records may include recently administered test scores, grades in courses or subjects, teacher evaluations in narrative form, and teacher rating scale scores, all of which can also be valuable for use in the screening or the identification process.

Data Synthesis

An enormous number of research studies and writings have argued strongly and persuasively in support of using multiple selection criteria (Feldhusen, 1989; McLeod & Cropley, 1989; Monks, VanBoxtal, Roelofs, & Sanders, 1986; Richert, Alvino, & McDonnell, 1982; Sato, 1974).

But very few studies have discussed the emerging problems of (1) how to reduce and combine data in a defensible way that facilitates the final step of making selection decisions, and (2) what practical procedures need to be used in validating those decisions.

It is important to recognize that the use of multiple selection criteria does not necessarily guarantee making valid decisions. The quality of the identification measures and the manner in which the data are synthesized and interpreted is critical in making valid selection decisions. Therefore, the question to be raised is not how many measures are used in the identification system, but rather what contribution each measure makes to the validity and efficiency of the system. Five methods will be discussed:

- (1) matrix method
- (2) standard score method
- (3) multiple-cutoff method
- (4) holistic case study method
- (5) multiple regression method.

Matrix Method

Matrices have been widely used to gather and summarize data from the multiple sources used in the identification process. The Baldwin Identification Matrix is one example representing this method. According to Baldwin (1984), "it has been designed to include an array of assessment techniques which will help the planner get a complete profile of the child" (p. 7). The format of the matrix is organized to include six areas of giftedness: cognitive, psychosocial, psychomotor, creative products, motivation, and creative process. Each area has several components. The raw score for each component is transformed into a five-point scale. The points for each area are averaged and summed with other averages to give the total matrix score which cannot exceed 30 (5 points \times 6 areas). Feldhusen, Baska, and Womble, (1981) reviewed this matrix method and concluded that it is potentially inaccurate and combines data inappropriately. Initially reliable tests are reduced to less reliable scores in the matrix method of data synthesis.

Standard Score Method

The fundamental and appropriate metric of psychological measurement is the standard score system (Lauer & Asher, 1988). The use of the basic standard score scale (z-score) or any of its derivatives (e.g., T-scores) achieves comparability of means, dispersions, and the form of distribution (Guilford & Fruchter, 1973). Equality of units is an important characteristic of standard-score scales. A student's standing relative to his group on one test or more can be meaningfully expressed when raw scores, which have little meaning,

are converted into standard scores. The transformation of a raw score in a distribution to a z-score is done by subtracting the raw score from the mean of the distribution and dividing the result by its standard deviation. To avoid minus signs and decimals, the resultant z-score is often transformed to any of the common standard-score metrics by multiplying the z-score by a standard unit (e.g., 10 or 100) and then adding a constant (e.g., 50 or 500).

Feldhusen et al. (1981) suggested the use of standard T-scores to synthesize identification data. They demonstrated the advantages of using this method compared to the shortcomings of using the matrix method. The method requires converting raw scores to T-scores with a mean of 50 and standard deviation of 10. Then, T-scores can be added together to get a final selection index for each student. The group of applicants can be rank ordered and selection decisions can be made from high to low based on available spaces. Weighting of individual selection measures to increase their power or setting cutoff points is possible. Feldhusen et al. (1981) suggested that professional judgment might be used as a factor in determining selection in borderline cases.

This method has definite advantages over the previous methods, namely, (1) the use of a comparable common metric system, (2) allowing for compensation by using composite scores, (3) the simplicity of calculations, and (4) the flexibility of allowing for weighting variables and setting cutoff points.

The standard score metric can also be used to get a composite score for several identification measures within a theoretically circumscribed domain. For example, while it is indefensible to combine measures from mathematics, verbal ability, and artistic talent to select students for a program stressing science and technology, the standard score method can be used after selecting appropriate measures such as science achievement test scores, ratings by teachers of students' technological aptitude, and quantitative aptitude from a cognitive skills index. Here the measures may all have theoretical relevance to the program goals in science and technology.

Multiple-Cutoff Method

According to this method, a minimum score is set for each measure in the identification system. Students who have scores equal to or in excess of all the minimums are selected for the program. Any student who fails to meet the standard on any one measure is not selected. The rationale underlying this method is that high aptitude or ability in one area does not counterbalance low aptitude or ability in another area (Hills, 1971). The major problem with this method is that the cutoff points can be arbitrarily set without adequate evidence of the validity of the measures or without any reference to the criterion measure of success in the program. Also, as the measures become less reliable and highly correlated, the method becomes less and less defensible for selection

(Lord, 1962). In actual practice, the cutoff points are often established on the basis of external determinants, such as the number of applicants, the number to be selected, and the distribution of scores on one measure.

Rejection of an applicant who scores below the cutoff point on a single measure, as described by Guilford and Fruchter (1973), is "risky as compared with rejection on the basis of a composite score because of the fact that the reliability of a single test score is usually less than that of a composite" (p. 390). Also, the validity coefficient for a composite score derived from the combination of several related measures is likely to be higher than that of a single measure. Thus, the multiple-cutoff method does not maintain one of the significant advantages expected from using multiple selection measures, namely compensation.

Holistic Case Study Method

The main principle underlying this method is that an overall index of giftedness is better than the mechanical summation of individual scores on different identification measures. Obviously, the "holism" concept, originated from the Gestalt school of psychology, has a direct impact on this method. The concept simply means that the whole is different from the sum of its parts. Accordingly, by this method a holistic personal judgment or rating is made, not completely dictated by the data but rather guided by some broader framework for evaluation. In practice, this method may be implemented by a professional person or a selection committee. Candidates are rank ordered based on an overall score and selection is from the highest ranking applicants.

The problems with this method are two-fold. First, it is difficult to find scientific justification for the process of requantifying what is already presented in a standardized form such as IQ scores or SAT scores. A better alternative may be to restrict use of this method to evaluating the descriptive, qualitative portions of the criteria for identification (e.g., biographical data, recommendations). Second, this method does not consider the actual value or importance of each individual component in terms of its relationship with the criterion of success in the program.

Multiple Regression Method

The multiple regression method is based on the assumption that synthesis of the identification data should lead to a relatively accurate prediction of student success in the program. The assumption that an identification system is really selecting the right students with respect to the program goals cannot be taken for granted. The question of how effective and efficient the system is, needs to be carefully tested and validated against stated criteria of success in the program. The underlying

conception behind the use of measures in educational selection is that they have predictive validity (Cronbach, 1971; Feldhusen & Baska, 1989; Hoge, 1988), that is that they select students who will be able to meet the goals of the program and exclude students who would fail to achieve the goals. For such an assumption to stand, "data must be collected which indicate that the instruments used to identify students do indeed predict success in the gifted program" (Feldhusen, Asher, & Hoover, 1984, p. 151). This means that data are collected for predictor variables, tentative identification or selections are made, students enter the program and receive instruction, and at some end point they are tested for their achievements or learning. The scores from achievement tests then become the criterion measures for the regression analyses. Of course, other kinds of quantifiable outcomes or achievement measures reflecting program goals such as attitudes toward mathematics, metacognitive skills in solving mathematics problems, or mastery of basic mathematics operations might also be used as criterion measures.

Correlational and multiple regression analyses are appropriate means for dealing with the problems of synthesizing data and validating identification systems. Some of the advantages of this method are:

- (1) No other method has yielded more accurate predictions than the multiple regression method (Hills, 1971). Such predictions are not improved upon by using professional judgments as a method of combining data (Sawyers, 1966);

- (2) the use of multiple regression as a basis for synthesizing and validating the identification data implies a need for establishing solid relationships among the four major components of well-structured programs for the gifted and talented students: Program Objectives, Selection Measures (Predictors), Instruction, and Measures of Outcomes (Criteria).

- (3) The multiple regression method, according to Jensen (1980), also provides an unbiased selection strategy because instead of selecting on the basis of observed test scores, it selects on the basis of a predicted index that is a best-weighted linear combination of individual components with minimal error of prediction;

- (4) furthermore, the relative value of each measure or variable in the identification system can be determined by generating beta weights where all scores, ratings, and grades are converted into standard scores with means of zero and a standard deviation of one. Variables with low or zero weights can be dropped from the system, and the expense of the identification process can be reduced (Lauer & Asher, 1988).

- (5) The multiple regression method has an additional advantage over the multiple cutoff method, namely the compensation principle which allows a high score on one predictor measure to compensate for a low score on another.

- (6) The multiple correlation coefficient or the validity coefficient (R) is an accurate and clear indicator of the

degree of relationship between the composite predictor measures and the criterion measure.

(7) The flexibility in which the analysis is automatically done by computers is also one of the advantages of using correlational and multiple regression methods in combining and validating the identification data.

(8) In addition the major difficulty with multiple regression, namely finding reliable and valid measures of the criteria, can be a significant merit of the method in terms of forcing those making selections to think seriously and continuously about criterion measures as a critical component in a well-structured program.

(9) Multiple regression can handle both continuous and categorical variables. Some categorical variables such as sex or socioeconomic status may have to be considered in identification. In such cases, categorical variables are coded and analyzed along with continuous variables.

Conclusions and Recommendations

Finding gifted and talented youth who have potential for high level, creative achievement, performance, or productivity in adulthood is an inexact science. We know a great deal about finding bright students who are doing well in school but little about the additional factors that lead to superior achievement in the future. High intelligence and effective achievement oriented skills, however, are surely prerequisites for creative productivity in most fields of human endeavor. Thus, we can at least search for those youth who have high potential for creative productivity in the long run.

Evidence from recent research (Bloom, 1985; Feldhusen, 1992; Gagne, 1985) suggests that focusing on youth's special talents or aptitudes may be more productive than searching simply for generally gifted youth. Common practice in countries throughout the world is to search for the all purpose gifted child and then to provide general forms of educational enrichment. Our own research and analysis (Feldhusen, 1986a, 1986b; Feldhusen & Hoover, 1986) leads us to conclude that early in the assessment process diagnostic efforts should be used to identify the particular aptitudes, strengths or talents possessed by a child and that the results should be used to guide us in selecting appropriate educational services commensurate with the child's special abilities.

To a great extent, giftedness or superior talent reflect precocity in the development of special abilities. A child may be an early reader, show signs of musical talent at age four or five, exhibit greatly advanced skills in mathematics, reveal a vocabulary far larger than age peers, or reason with her/his parents at a nearly adult level of logical precision. All of these are precocious behaviors, signs that the child is out ahead of others and may remain so if educational or experiential services

continue to be available at appropriately advanced levels and pace.

There may be some value in communicating to a child and to his/her parents that the child is gifted but there are also liabilities in so doing. Labeling children "gifted" may generate undue or frustrating expectations from teachers, ridicule from peers, and puzzlement in parents. The term "gifted" also seems to carry high hereditary connotations. Robinson (1986) discussed the problems of labeling and urged that the negative effects be kept in mind by all who work with gifted children.

Over a period of years we have reviewed, analyzed, and critiqued identification processes in gifted education (Feldhusen, Baska, & Womble, 1981; Feldhusen, Asher, & Hoover, 1984; Feldhusen, 1991, 1992). Hoge (1988, 1989) has also carried out insightful critiques of practice and the literature on identification of the gifted. We agree with Hoge (1989) in concluding that there is a need to be explicit in defining the giftedness construct, the component traits and aptitudes, as a prelude to the use of the label. Further, definition should be derived from some theoretical formulation concerning human abilities in general and superior ability in particular. Then the specific identification or selection procedures should be derived directly from the definition and supporting theory. Finally, there should be substantial efforts to verify or validate the identification system empirically. In contrast to these suggestions, much of current practice in identification derives from practicality, judgment of questionable "experts", or tradition.

Our recommendations then are as follows:

(1) Identification processes in gifted education should be based on the best current conceptions and theories of human aptitude, talent, and abilities.

(2) Test instruments and rating scales with established reliability and validity should be selected for use in the identification process.

(3) Identification should be viewed as an ongoing process. One should not conclude that assessment at one point in time, even with multiple tests, finally and unequivocally identifies the gifted child. Giftedness is an emerging, developing set of abilities calling for repeated evaluation as the child matures.

(4) Labeling children as "gifted" should be avoided. It is preferable to regard the process as selecting children for programs or services.

(5) Identification should always be diagnostic in nature, identifying strengths, aptitudes, and talents as well as problems, weaknesses, and needs.

(6) Programs and services should be linked to the special talents, aptitudes, and abilities of gifted children as well as to their special problems and needs.

(7) Empirical validation should be used to verify that the identification-selection system is working as intended. Are the children selected doing well in the program? Are we missing children who should be in?

Are we selecting children who are achieving at high or superior levels in the long run?

(8) Efforts should be made to assure that all youth have equal opportunity to be identified for programs. Are we finding the gifted and talented among children of both genders, who are handicapped, among minority and culturally different children, and among those who may be underachieving and thus not revealing their gifts and talents? Instruments and procedures are now available to assure that all youth have equal opportunities to be identified and served in programs for gifted and talented youth.

The future of gifted education must be built upon the sound foundation of theory and research. Identification procedures lend themselves well to empirical validation and theory grows out of sound research. The two together can be used to identify and educate all youth who have special talents, aptitudes, or gifts.

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Giftedness in the Visual Arts and Music

ELLEN WINNER

Boston College and Harvard Project Zero, Chestnut Hill, Massachusetts, U.S.A.

GAIL MARTINO

Boston College, Chestnut Hill, Massachusetts, U.S.A.

Introduction

The study of giftedness has had a long and extensive history within the field of psychology. However, such study has focussed almost exclusively on giftedness in intelligence, as measured by the IQ test (Binet & Simon, 1916; Galton, 1883; Hollingsworth, 1942; Spearman, 1923; Sternberg, 1977; Terman, 1925). More recently, researchers have begun to investigate exceptional development in domains not measured by IQ tests, such as the arts (Bloom, 1985; Feldman with Goldsmith, 1986; Golomb, 1992; Pariser, 1991; Shuter-Dyson, 1986; Winner, 1982; Winner & Pariser, 1985). In this chapter, we consider what is known about exceptional development in two art forms: the visual arts, and music. As few large-scale psychometric studies of giftedness in the arts exist, our primary but not exclusive source of evidence will be case studies of individuals who have shown unusual giftedness in these domains.

A distinction is made here between ordinary giftedness and prodigiousness. Ordinary giftedness is a precocious ability in a particular domain: the gifted child advances more rapidly than his or her peers in a particular domain, and shows special aptitude in that domain. Prodigiousness is extreme precocity: the prodigy is a child who is able to perform at an adult level in a particular domain (Feldman with Goldsmith, 1986). Mozart is a prototypical example of a child prodigy. With one exception (the Chinese painting prodigy, Yani), our knowledge of prodigies in art and music is based on Western cases. In this chapter, we use the term "gifted" to refer inclusively both to the ordinary gifted child, and the child prodigy. However, wherever relevant, differences between these two kinds of children are pointed out.

We believe it makes no sense to talk about giftedness *per se*: one can only be gifted in a domain (although one can be gifted in more than one domain). By domain, we refer to a discipline or body of knowledge valued by a culture which is characterized

by a recognized set of steps that one must pass through to become proficient. Examples of domains valued today in many societies include chess, mathematics, music, and art, but not, for example, card games that rely on chance (as these would not satisfy the criterion of having steps towards expertise).

As Feldman with Goldsmith (1986) have pointed out, one only finds prodigies in domains which are both accessible and appealing to children. Hence, one finds prodigies in the visual arts and in music, but not, so far as we know, in law or finance. Feldman and Goldsmith also argued that prodigies are more likely to be found in domains whose knowledge base is highly organized formally. Perhaps for this reason, prodigies have been more readily found in the fields of music, chess, and mathematics than in literature and the visual arts.

We make two further distinctions in this chapter. First, we distinguish between individuals of normal or high intelligence who are gifted in a domain, and individuals who are gifted in one domain, but extremely retarded in all other areas. Such pathological individuals are typically referred to as *savants* (Miller, 1989; Treffert, 1988). We attempt to determine what distinguishes the gifted individual of normal or high intelligence from the gifted individual who is in all other respects low-functioning (either retarded or autistic).

Second, we distinguish between giftedness and *creativity*. By creativity, we refer to inventiveness within a domain. A creative individual revolutionizes a domain of knowledge. No child prodigies have ever, as children, effected a reorganization of a domain of knowledge; moreover, many who have effected such reorganizations were not themselves prodigies as children (Feldman with Goldsmith, 1986). Thus, there is no necessary link between giftedness and creativity. We focus here on childhood giftedness, and make no assumptions that early signs of giftedness are necessarily predictive of adult creativity.

Giftedness in the Visual Arts

There is an extensive body of research on the normal course of drawing development in the typical (usually Western) child (Arnheim, 1974; Cox, 1992; Eng, 1954; Freeman, 1980; Gardner, 1980; Golomb, 1992; Goodnow, 1977; Lowenfeld & Britain, 1970; Luquet, 1927; Winner, 1982). Children begin to scribble at about the age of 2; by the age of 3 or 4, they are making very simple but recognizable representations. Figures are formed by joining several geometric shapes. For instance, a person is drawn as a "tadpole:" a circle with lines extending from the circle for arms and legs. A cat is drawn as an oval (for the body), joined to a circle (for the head), with either lines or rectangles joined to the oval for the legs. These drawings are called schematic because they do not capture the contour of the object drawn, but rather represent the object through simplified, geometric shapes or schemes.

The normal course of drawing development has been described as U-shaped with respect to the development of esthetic properties (Gardner, 1980; Gardner & Winner, 1981; Winner, 1982). Prior to the age of about 7, children make drawings which have esthetic properties similar to those of adult artists' works. The strongest empirical evidence for this claim can be found in Davis (1991). Preschool drawings and paintings are striking, inventive, imaginative, expressive, and show little regard for the rules of realistic representation. Suns may be green, people may be the size of houses and may float all over the page, and hair may be purple. The child at this age is not striving for realism, but rather is playing with form and color. For this reason, this period is often considered the pre-conventional period.

Such flavorful, aesthetically appealing drawings give way in the middle childhood years to attempts to master the conventions of the drawing symbol system. During this conventional period, children become concerned with learning the rules of realistic representation: proportion, shading, perspective, etc. As a result, their drawings become wooden and labored. To put it succinctly, one might mistake the work of a 5-year-old for that of an adult abstract expressionist; one would never mistake the work of an ordinary 10-year-old for a master painter of any kind.

Most children never emerge from the literal stage. In late childhood and adolescence, children in our culture lose interest in drawing altogether, and the typical adult draws no differently from the typical adolescent.

Although considerably less is known about the development of exceptional talent in the visual arts, researchers have begun to study a range of gifted children over the past two decades. Our understanding of drawing development in gifted children comes from three quite different sources. (1) One source is children who have been identified as gifted in drawing by their parents and/or teachers (Cane, 1951; Gardner, 1980; Goldsmith, 1992; Goldsmith & Feldman, 1989; Golomb, 1992; Wilson & Wilson, 1976; Zhensun & Low, 1991). These

children may or may not go on to become artists: in many cases, the children have not yet grown up so it is too early to tell. What makes them a subject of study is that their drawings strike adults as in advance of those of their peers. (2) A second source is famous artists whose childhood drawings have been preserved (Gordon, 1987; Paine, 1987; Pariser, 1987, 1991; Richardson, 1991; Sloane & Sosniak, 1985; Vasari, 1979). We do not have an extensive body of juvenile artists, and most of the childhood works of artists that have been preserved were produced after the age of 9–10, leaving us with relatively little information on the very early drawings of artists. Nonetheless, such retrospective study provides perhaps the strongest evidence about the development of talent, since we know from the start that these children went on to become established artists. (3) A third source is a subset of autistic and/or retarded children whose drawings are nonetheless prodigious (Selfe, 1977, 1983; Morishima & Brown, 1977; Pariser, 1981; Park, 1978).

In what follows, the art work, personality characteristics, and environment of ordinary gifted and prodigiously gifted children is first described. Wherever possible, information on the childhood works of recognized artists is included in the discussion. The relation between artistic giftedness and other abilities is then considered, followed by a discussion of tests and other procedures used to identify artistically gifted children. Next, the phenomenon of exceptional artistic performance in nongifted children as a function of education is discussed by considering the striking results of Chinese art education. Finally, the phenomenon of artistic giftedness in nonpathological populations is compared to the puzzling phenomenon of savant artists. Here one finds the most extreme levels of giftedness in drawing operating independently of other forms of intelligence. Following our review of giftedness in the visual arts, we turn to a consideration of giftedness in music.

Early Signs of Artistic Giftedness

We do not know how common it is to find exceptional talent in the visual arts at a very young age (Golomb, 1992). Many art educators and researchers have become convinced that exceptional artistic talent at a very young age (e.g., 3 or 4) is rare, rarer than the frequency of such early talent in the domain of music (Feldman with Goldsmith, 1986; Goodenough, 1926; Hurwitz, 1983; Lark-Horowitz et al., 1973; Sloane & Sosniak, 1985). For example, Toulouse-Lautrec's drawings were simple, flat, and child-like until the age of 8 (Thomson, 1987). A survey of 18,000 drawings by children conducted by Lark-Horowitz et al. (1973) revealed no drawings produced by children under ten that showed exceptional talent. And Vasari (1979) describes Renaissance artists who were skilled draftsmen by 7 or 8, but not earlier.

As mentioned earlier, very young child prodigies may be less likely to show up in the visual arts than in music

because the domain of the visual arts is less formally organized than is the domain of music. Moreover, prodigies in music tend to be performers rather than composers. If we were to compare the incidence of prodigious ability in drawing and composition (both involve making rather than performing someone else's art), musical prodigies would be as rare as visual ones.

Realism

All researchers who have studied drawings by gifted children agree that these children pass through the same sequence of drawing stages as do normal children, but do so more rapidly (Gardner, 1980; Golomb, 1992; Lark Horowitz, Lewis, & Luca, 1973; Lowenfeld & Brittain, 1970). Children are singled out as gifted when they draw in advance of their peers on some dimension (usually realism), but these children do not skip any of the stages that their peers pass through. For example, as mentioned earlier, all children begin representational drawing by creating simple, schematic figures out of a few geometric shapes. Gifted children begin in this way as well, although they begin at a younger than average age and within a few months go on to draw in a more differentiated, realistic, non-schematic style.

The "core" indicator of giftedness in drawing is the ability to draw recognizable shapes at least one year in advance of the normal time of emergence of this skill. While typically children begin to draw recognizable

shapes representing objects in the world at around the age of 3 or 4 (Kellogg, 1969; Matthews, 1984), gifted children have been noted to begin to draw representationally at the age of 2. Figure 1 shows a striking contrast between the way in which a typical and an artistically gifted 2-year-old drew apples. The typical 2-year-old was asked to make an apple. He drew one slash. He was then asked to make another one. He obliged by making a second slash (Figure 1, TOP). This child made a slash for each apple because he had not yet acquired the understanding that lines on the page stand for the edges of objects. For him, a line simply stood for "thingness." The gifted 2-year-old drew one apple spontaneously, and added the second one effortlessly after his aunt asked him to draw another one (Figure 1, BOTTOM). This child had already grasped the concept of a line standing for an edge, and produced a fluid line describing the contour of each apple.

Soon after gifted children begin to draw recognizable forms, they also begin to draw in a realistic manner, capturing the precise shapes of objects, adding true-to-life details that typical children never would add (e.g., gas tanks on cars), and attempting to represent the illusion of volume and depth. In place of the simple, schematic, flat, charming, child-like forms typically found in child art, one finds remarkable adult-like, differentiated, complex images that suggest an effort to understand and master how objects are structured. Gifted children draw realistic images quickly and with ease. They do not labor and erase: their lines are sure and confident (Gordon, 1987; Paine, 1987; Pariser, 1987). The young Picasso, for example, could draw anything upon demand, and liked to start the figure from non-canonical places, for instance drawing a dog beginning with the ear (Richardson, 1991). A highly realistic pair of faces, copied by Millais at age 8 from an adult work is shown in Figure 2.

Numerous examples of children with precocious ability to draw realistically have been reported (Gardner, 1980; Golomb, 1992; Hurwitz, 1983; Kerschensteiner, 1905; Wilson & Wilson, 1976; Winner & Pariser, 1985). One of the most striking examples of early realism is found in the work of Eytan, an Israeli child described by Golomb (1992). Eytan's family did not remember whether he scribbled, but the family does have drawings that he produced at 2, an age when most children are just beginning to scribble. At 2, Eytan drew recognizable shapes: people, tractors, fish, cars, etc. Normal children make their first tadpole-like representation of a human at about age 3, and do not differentiate the head from the trunk until several years later. In contrast, Eytan began to draw humans with a differentiated head and trunk at 2½.

One way Eytan achieved realism was through the meticulous depiction of details, such as exhaust pipes on his vehicles. Another way that realism was achieved was through the depiction of volume and depth. Typically children in Western culture do not begin to try to depict the third dimension until the middle elementary school

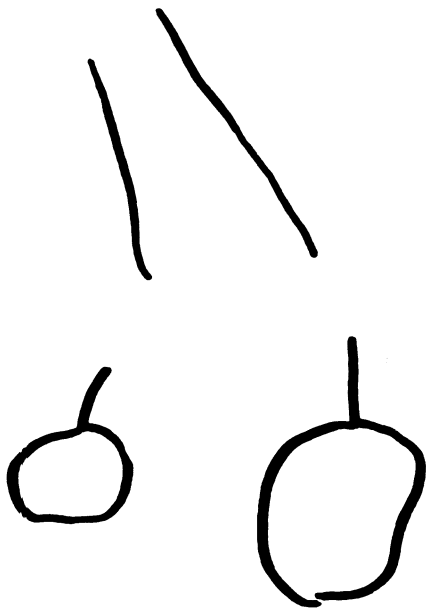


FIGURE 1. (TOP) Two apples drawn by 2-year-old on request. (BOTTOM) Two apples drawn by artistically advanced 2-year-old on request. Reprinted with permission of Ryan Sullivan.



FIGURE 2. Pencil copy of an adult work, drawn by John Everett Millais at age 8.

years. By the age of $2\frac{1}{2}$ Eytan was not content with drawing vehicles from their canonical side view, and invented ways to depict their volume, showing their sides receding into depth. He first used an orthographic projection system to show more than the front or side of a vehicle. By 3 he had abandoned this system and instead showed multiple sides of a vehicle by attaching the top and side faces to the front of a vehicle. After his third birthday, he used a mixture of three projection systems: horizontal and vertical oblique projection, isometric projection (in which the front view of a vehicle was its true rectangular shape, but the top and sides of his trucks were parallelograms); divergent perspective, in which lines diverge outwards to show the front, top, and both sides of a vehicle. By 4 he showed an understanding of the perspectival rule that objects receding in the distance are reduced in size, and he was beginning to experiment with foreshortening. Figure 3 shows an attempt at perspective by Eytan at age $3\frac{1}{2}$.

The ability to draw realistically at an earlier than average age also marks the childhoods of those who go on to become established artists. Gordon (1987) studied the childhood works of thirty-one Israeli artists and found that all stood out for their ability to draw realistically. The desire and ability to draw realistically at an early age also characterized the childhoods of those who go on to become sculptors: Sloane and Sosniak (1985) interviewed twenty sculptors about their childhoods, most of whom recalled drawing realistically at an early age. Numerous other well known artists' early drawings have been singled out for their advanced realism: e.g., Millais (Paine, 1987), Landseer (Goldsmith

& Feldman, 1989), Seargent (Cox, 1992), and Klee, Picasso, and Lautrec (Pariser, 1987, 1991).

Picasso provides a clear example of the ability to draw highly realistically at an early age. He claimed, perhaps apocryphally, that he bypassed the typical stage of early drawings in which children draw in a fanciful, playful, nonrealistic manner. "I have never done children's drawings. Never" (Richardson, 1991, p. 29). However, since we have no records of his works before the age of 9, it is not clear whether this is true. What is clear is that Picasso wanted to see himself as a prodigy. When he went to see a show of child art, he noted, "As a child, I would never have been able to participate in a show of this kind: at age 12 I drew like Raphael" (Richardson, 1991, p. 29). And he recalled specific examples of this adult-like style: "Even when I was very small, I remember one of my first drawings. I was perhaps six. . . . In my father's house there was a statue of Hercules with his club in the corridor, and I drew Hercules. But it wasn't a child's drawing. It was a real drawing, representing Hercules with his club" (Richardson, 1991, p. 29). At 11, Picasso enrolled in his father's academic drawing class, in which students had to make detailed renderings of plaster casts. While most students considered this drudgery, Picasso loved it, and produced technically skilled and precise drawings.

In their childhoods, artists not only draw realistically from life, but are also skilled at imitating the styles of other artists. Both Picasso and Lautrec were noted for their early ability to copy. Picasso could paint in the style of El Greco, Velasquez, and Goya at a young age; Lautrec was such a good imitator that

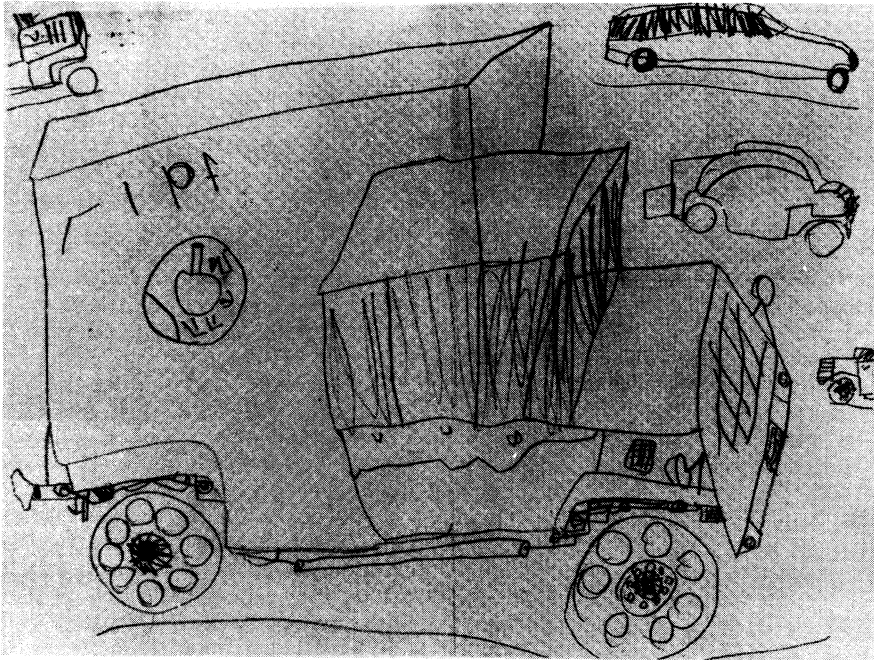


FIGURE 3. Drawing of a truck by Eytan at age 3½. From Claire Golomb, *The child's creation of a pictorial world*. Reprinted with permission of The Regents of the University of California, Copyright & Copy; 1992.

his teacher called him “a regular little ape” (Pariser, 1991).

Realism as an early indicator of giftedness in drawing may be culturally determined. In the West, at least from the Renaissance until the twentieth-century, artists have striven to capture the illusion of space, volume, and depth (Gombrich, 1960). While gifted children probably begin to draw realistically long before they have had much if any exposure to examples of Western fine art, they have certainly been exposed to realistic images on billboards, magazines, and picture books. The most well-known non-Western artistic prodigy is Yani, a Chinese child who painted in the Chinese brush and ink style at an adult-like level in the preschool years. Although like Western gifted children Yani's paintings do not look child-like, they cannot be described as naturalistic. They are painted in the allusionistic style of traditional Chinese painting, in which the goal is to capture the spirit of objects rather than their exact likeness. Thus, as Goldsmith and Feldman (1989) point out, the technical sophistication of her work reveals itself along dimensions different from those of Western gifted children.

It is interesting that the near adult-like level of skill displayed in Yani's paintings contrasts sharply with her child-like calligraphy (Goldsmith & Feldman, 1989). In an early study of the correlates of artistic aptitude, Manuel (1919) also found no relation between skill in drawing and handwriting. The technical graphic skill involved in drawing appears not to generalize to the domain of handwriting.

ESTHETIC PROPERTIES

Although almost all Western gifted children who have been identified in the literature stand out first and foremost for their ability to draw realistically, Golomb (1992) described two counter-examples. Varda and Amnon, two Israeli kibbutz children, were identified as gifted by age 5, and they both went on to pursue art training as adults. The works of these two children diverged from those of average children not by their verisimilitude, but by their sense of composition, form, and color. Lark Horowitz et al. (1973) also noted this alternative path of giftedness, in which children draw schematic, child-like drawings which are imbued with an order, clarity, and richness that renders them reminiscent of primitive art.

Similar cases have been described (Clark & Winner, cited in Winner & Pariser, 1985; Kerschensteiner, 1905). Hurwitz (1983) also has noted that artistically gifted children like to doodle, play with line and with negative space, and improvise. Thus, although an early ability to draw realistically may be the most typical and striking characteristic of gifted children, non-representational signs of giftedness such as skill in design, form, color, and composition should not be overlooked.

EXPLORATION OF A SINGLE THEME

Picasso viewed paintings as a logical sequence of explorations. “Paintings,” he said, “are but research and

experiment. I never do a painting as a work of art. All of them are researches. I search constantly and there is a logical sequence in all this research" (Lieberman, 1960, p. 33). Many gifted children seem to exemplify this approach. In their drawings, they explore a single theme, over and over again. For Eytan, for instance, the theme was vehicles, and these were drawn far in advance of his human figures. Yani painted only monkeys until the age of 7 (Goldsmith & Feldman, 1989). Kerschensteiner (1905) described G. J., who drew only horses. Gardner (1980) described Gabriel who focussed on portraits, and Stuart who focussed on comic book style figures.

Thus, the drawings of gifted children sometimes seem programmatic, each a further exploration of the same theme. Perhaps because of the continual practice with a particular subject matter, these children show far greater skill when drawing their favored themes than when drawing other subjects. It should be noted, however, that the drawings of ordinary children have also sometimes been described as having a thematic focus (Eng, 1954; Fein, 1984; Gardner, 1980). Thus, this characteristic may not be as clearly indicative of giftedness as is early realism.

THE INFLUENCE OF CARTOON IMAGES

Cartoon-style images exert a powerful influence on the drawings of those Western children who have access to such images. This influence appears to make itself felt in late childhood. Gifted drawers are often able to make comic strip images at an adult, professional level (Gardner, 1980). Cartoons are often produced in astonishing abundance: Anthony, a child studied by Wilson and Wilson (1976), drew about 10,000 comic strip figures in his school years. Gardner (1980), however, describes a gifted child who used cartooning as an escape route from a perceived inability to draw realistically: even the most illusionistic cartoon figures are more formulaic, and hence easier to draw, than are life studies.

THE INVENTION OF IMAGINARY WORLDS AND THE CONSTRUCTION OF NARRATIVES

Particularly in middle childhood and adolescence, artistically gifted children create imaginary settings and fantasy characters in their drawings, and their drawings depict episodes in the lives of these invented characters. This is the age when gifted children begin to create superheroes and science fiction characters modeled after the images they see in comic books. The Wilsons note that visual narrative need not be in the form of a series of frames, as in a comic strip. Each drawing functions as a shorthand for a complex plot. One episode may begin in one sketch book and then continue on disconnected pages. These fantasy worlds allow children an escape into a private world. One child studied by the Wilsons said, "Most people . . . just look at them and say "that's a pretty picture" without understanding what

the people are really like and the story behind them" (Wilson & Wilson, 1976, p. 46). The Wilsons note that gifted children are often much more interested in inventing imaginary worlds in their drawings than in experimenting with form and design. In the process, they produce countless drawings, and thus gain fluency and technical skill.

CAPACITY FOR SUSTAINED CONCENTRATION, AND INTRINSIC MOTIVATION TO DRAW

Artistically gifted children draw daily, for long periods of time at a stretch, often preferring the activity of drawing to play or TV. At the age of 2, Eytan was reported to spend 15–20 minutes at a time drawing (Golomb, 1992). The 2-year-old who drew the apples in Figure 1b often preferred to draw than to come to lunch (Sullivan, personal communication). Gardner (1980) describes a household in which Shula, an artistically gifted child, drew regularly for hours at a time.

The intensity with which these children draw results in a prolific body of work. Yani, for example, made 4000 paintings in the span of three years. Picasso recalled that he drew all the time as a child: while others played, he drew figures in the dirt. He not only drew constantly as a child, but also made skillful paper cut-outs of animals, flowers, and people (Richardson, 1991).

Artistically gifted children not only engage in continual drawing, but are also sometimes compulsive collectors of objects (Gardner, 1980). Artistically gifted children thus satisfy a hunger for visual stimulation by surrounding themselves with their own created images, and with objects whose shapes and colors they find appealing.

Such an intense need to draw suggests that for these children drawing is intrinsically rather than extrinsically motivating. These children are self-directed and self-disciplined (Hurwitz, 1983; Rosenblatt & Winner, 1988a). Often drawing serves as an escape into fantasy, or an escape from boredom, especially the boredom of school (Wilson & Wilson, 1976).

The Role of Family and Teachers

Artistically gifted children almost always seem to have parents or close relatives who are artists, or who are in fields related to the arts such as crafts or design (Feldman with Goldsmith, 1986; Goldsmith & Feldman, 1989; Gordon, 1987). The families of artistically gifted children tend to be very supportive and encouraging of their children's artistic inclinations. They make art materials available, and save and carefully date their children's drawings (Freeman, 1974; Gardner, 1980; Gordon, 1987). In some of these families, the craft of making art seems to be passed on much as in a guild.

Although only one of the parents of famous sculptors studied by Sloane and Sosniak (1985) was an artist, all were highly supportive of their children's artistic interests. One quarter of the sample revealed that their

families were not knowledgeable about the arts. One sculptor wrote, "[My mother] doesn't really understand art. She took us to museums. She did all the right things . . . She always supported culture in general terms. In the way a nineteenth-century woman would support culture, as one of the finer things in life" (p.95). However, most the families of famous sculptors were "artistically enthusiastic." Over half of the families visited museums and some parents participated in adult art classes. Other sculptors mentioned that a supportive parent or relative served as a role model for them.

Although most of the children who have been identified as artistically gifted have parents who are in the arts, or who value the arts, we do not know how many artistically gifted children go unrecognized because they lack such parents. If their parents do not notice, value, and encourage their ability, these children may simply lose interest unless they are discovered by someone outside the family. Kerschensteiner (1905) describes a child whose talent was discovered fortuitously by two artists who happened to see him copying an advertisement. He later went on to study art. Had he not been discovered, he probably never would have gone on to study art.

Gifted children typically are self-taught in early childhood. They guide their own graphic development, teaching themselves skills through constant practice. Although their parents are usually artists themselves, the parents at least claim to be supporters and encouragers rather than teachers. Thus, gifted children often have, in a parent, the kind of teacher that Bloom (1985) has argued is most important in the early years of a gifted child: someone who is warm, empathetic, and encouraging, rather than someone who gives lessons in skill development. (Yani, however, may be an exception. It seems likely that she received painting lessons from her ambitious father, although he denies teaching her.)

Artist parents may attempt to actively instruct their gifted children when they reach adolescence. However budding adolescent artists may actively reject offered instruction from their artist parents. One adolescent studied by Gardner (1980) insisted that he would rather solve visual problems on his own than be shown by his father how to solve them.

At least in the West, gifted children are often suspicious of formal art education, believing such tutelage to be unnecessary and potentially destructive of their talent (Gardner, 1980). The typical art class in elementary and high school does not serve to stimulate these children's art. It is a sad commentary on the way that art is typically taught in school that none of the sculptors studied by Sloane and Sosniak had anything good to say about their elementary or high school art classes. Winner and Pariser (1985) also noted this: the artists they interviewed reported that what crystallized their identity as young artists was some professional artist who noted their ability. Contemporary Chinese artists show the same negative attitude towards their elementary school arts instructors (Winner, 1989). Thus, family and community appear to be more important than schools in

the development of artistic ability. Not surprisingly, then, gifted children often make their best, most inventive work out of school (Hurwitz, 1983; Wilson & Wilson, 1976).

Correlations Between Artistic Giftedness and Other Abilities and Disabilities

Giftedness in the visual arts appears to be independent of intelligence as measured by the IQ test, but correlated with high imagery skills. In addition, there is some evidence that giftedness in the visual arts is correlated both with nonright-handedness (an index of anomalous brain dominance), and with verbal deficits.

RELATION BETWEEN ARTISTIC GIFTEDNESS AND INTELLIGENCE

Because of the temptation to assume that any kind of giftedness is a function of general intelligence, numerous attempts have been made to find a relationship between artistic talent and intelligence (e.g., Goodenough, 1926; Harris, 1963; Hollingsworth, 1942; Manuel, 1919; Terman, 1925; Thorndike, 1913). For example, Harris (1963) reviewed studies of drawings by retarded children and concluded that these drawings were behind those of normal children, leading to the conclusion that drawing development correlates with mental age. The assumption that drawing development is a function of general intelligence underlies the use of the Goodenough-Harris Draw-a-Person test as an IQ test. In this test, the number of details included in a drawing of a person is used as a measure of IQ.

However, the Draw-a-Person test correlates only modestly with standard IQ tests. And there is no evidence that children of high IQ draw particularly well (e.g., Hollingsworth, 1942; Terman, 1925). Moreover, there is no theoretical reason to expect such a relationship, as the skills deployed in drawing are visual and spatial skills, rather than the verbal, logical, and mathematical skills conventionally measured by IQ tests (Gardner, 1983). In short, there is no convincing test evidence that drawing ability and IQ are related.

The most striking evidence for the radical independence of intelligence and artistic giftedness comes from the drawings produced by autistic and retarded individuals with extremely low IQs, discussed later on in this chapter. There is also experimental evidence reviewed below demonstrating that children gifted in the visual arts have higher than average visual-spatial skills (they excel in recognition of hidden shapes and incomplete figures, and in visual memory), and that these skills operate independently of IQ.

RELATION BETWEEN ARTISTIC GIFTEDNESS AND VISUAL IMAGERY SKILLS

Artistically gifted children excel in their ability to recognize hidden geometric shapes in complex designs, and this ability is independent of IQ (O'Connor & Hermelin, 1983). Similarly, these children excel in visual imagination,

as measured by the ability to recognize incomplete figures in drawings. Artistically gifted children may excel on such a task because they can readily store and access an internal visual lexicon of images. Again, this ability is independent of IQ (Hermelin & O'Connor, 1986; O'Connor & Hermelin, 1983).

Artistically gifted children also excel in their visual memory. Vasari (1979) noted that Michaelangelo had such a good visual memory that he could remember every detail of a painting even if he had only seen it once (cited in Hermelin & O'Connor, 1986). And in his biography of Picasso, Richardson (1991) notes that Picasso prided himself on his ability to concentrate and remember visual details as a child. There is experimental evidence as well to demonstrate that artistically gifted children excel in both long- and short-term visual memory, and that this ability is not correlated with IQ.

An early study investigating visual memory in artistically talented children was conducted by Lark-Horowitz (1941, cited in Lark-Horowitz et al., 1973). Lark-Horowitz compared artistically gifted and average children's ability to draw a polar bear model immediately after viewing it, and once a year for three years after the model had initially been seen. The gifted children's drawings were far more accurate and detailed than those of the average children, and their drawings changed little over the course of the three years. However, because children in the average group may have recalled as much but have been unable to draw what they recalled, little can be concluded from this about visual memory. Later studies, however, have used measures independent of drawing to assess visual memory, and these studies have consistently shown that artistically gifted children excel in visual memory, and that this skill is not a function of intelligence.

For example, in a study by Hermelin and O'Connor (1986), children were asked to recall Persian letters. Artistically gifted children performed better than their IQ-matched controls, and better than a sample of mathematically gifted children with higher IQs. These results demonstrate the lack of relationship between IQ and the ability to store and/or access nonverbalizable shapes.

Children identified as gifted in drawing also have superior memory for properties of pictures. Rosenblatt and Winner (1988b) asked children identified as gifted in art by their teachers, and a control group of average drawers, to look at a series of pairs of pictures. Later, they were shown the same picture pairs again, but this time one of the pairs had been altered in color, form, composition, line quality, or content.

The gifted children outperformed the control group in identifying which picture had been altered, and in pointing out how each picture had been altered.

RELATION BETWEEN ARTISTIC GIFTEDNESS AND ANOMALOUS BRAIN DOMINANCE AS INDEXED THROUGH HANDEDNESS

It is well known that a disproportionate number of nonright-handers (both ambidextrous and left-handed)

turn up in spatial fields. This finding has been noted among mathematicians (Annett & Kilshaw, 1982; Benbow, 1988), architects (Peterson & Lansky, 1974, 1977), and athletes (McLean & Ciurczak, 1982). As are individuals in other spatial fields, visual artists (both adult artists, and artistically gifted children) are more likely to be left-handed than are individuals without a visual-spatial proclivity. Among adult art students one finds a higher proportion of left-handers than in the population at large (Mebert & Michel, 1980; Peterson, 1979); adults who rate themselves as having artistic talent are more likely to be left-handed than those who rate themselves as having verbal talent (Smith, Meyers, & Kline, 1989); and elementary school children identified by their teachers as gifted in art are more likely to be left-handed than children identified as simply average in art (Rosenblatt & Winner, 1988b).

The relation between artistic ability and handedness suggests that individuals with artistic gifts may have anomalous patterns of brain dominance (Geschwind, 1984; Geschwind & Galaburda, 1987). Geschwind (1984) has suggested that nonright-handedness may be an index of superior right-hemisphere brain development. Hence, one would expect to see a relationship between nonright-handedness and visual-spatial skills (since these are typically mediated by the right-hemisphere). This is precisely what one finds among artistically gifted individuals. As shown above, such individuals excel in a variety of visual-spatial skills besides drawing, and as shown here, they also have a higher than average tendency to be nonright-handed.

RELATION TO VERBAL DEFICITS

Geschwind (1984) went on to suggest that superiorities in the visual-spatial domain are often linked to pathologies in the verbal domains. For example, superior visual-spatial abilities have been found to be associated with autism (autistic children do not develop normal language) and dyslexia (Geschwind, 1984; Geschwind & Galaburda, 1987). Geschwind (1984) referred to the association between left-hemisphere disabilities and right-hemisphere talents as a "pathology of superiority."

If Geschwind's hypothesis is correct, one should find that artistically gifted individuals have a higher than average incidence of language problems. This hypothesis was supported by two studies. Adult art students report having more reading problems than did other college students (Winner, Casey, Da Silva, & Hayes, 1991). And they make more spelling errors than do other college students (Winner & Casey, in press). In addition, art students tend to make the kind of spelling errors associated with poor reading skills—nonphonetically based errors that do not preserve letter-sound relationships (Frith, 1980; Phillips, 1987). Nonphonetically based errors are ones in which wrong letters are included, correct ones are omitted, or letters are reversed (e.g., "physicain" for physician); in contrast, phonetically based errors are ones which, when

sounded out, sound correct (e.g., “phisician”). The tendency to make nonphonetically based errors obtained even when SAT performance was partialled out. It appears that artistically gifted individuals have problems specific to reading and spelling that are independent of the kinds of abilities assessed by the SAT.

These findings may shed some light on why artistically gifted children do or do not go on to become artists. Individuals may pursue art not only because of specific visual-spatial strengths, but also by default, because of verbal deficits. These verbal deficits may lead visually talented children to avoid fields which require extensive reading. By default, then, they may drift into the arts. Given that our culture places a higher value on linguistic than artistic skills, it would not be surprising to find individuals with both kinds of talents drawn to verbal fields.

Procedures for Identifying Artistically Gifted Children

School programs for the gifted and talented have for the most part focussed on academic giftedness, and have neglected giftedness in other domains such as the arts. It was not until 1972, for instance, that in the United States artistically talented children were identified as a subgroup of “gifted and talented” students. In 1978, the Gifted and Talented Children’s Education Act in the United States identified visual and performing arts as one of five areas of giftedness which should receive special services (Clark & Zimmerman, 1983). As a result, many public school programs for artistically gifted children were initiated in the United States.

Three kinds of procedures, varying in level of formality, have been used to identify artistically gifted children for special art programs (Clark & Zimmerman, 1987). The most formal assessment measure is the normed, standardized test, designed to be used uniformly in a wide range of classes. More informal tests or checklists have also been developed and used by particular programs for artistically gifted children. Finally, some programs have not relied on any tests, but rather on a combination of methods including nomination (by teacher, peers, or even the students themselves), portfolio review, interest inventories, and academic performance.

STANDARDIZED TESTS

A variety of tests were developed in the United States in the 1930s to identify artistically gifted children, but none of these tests are available today. These include the Meier-Seashore Art Judgment Test, the Graves Design Judgment Test, the Goodenough Drawing Scale, the Horn Art Aptitude Inventory, the McCarty Drawing Scale, the Kline-Carey Drawing Scale, the Lewerenz Test of Fundamental Abilities in the Visual Arts, the McAdory Art Test, and Munro’s Seven Drawing Test (Buros, 1972; Clark & Zimmerman, 1984).

Creativity tests such as the Torrance Test have also been used. Standardized tests to identify artistic talent have, however, been severely criticized (Clark & Zimmerman, 1992; Hamblen, 1988; Hausman, 1988; Munro, Lark-Horowitz, & Barnhardt, 1942), as there is no conclusive definition of talent in the visual arts. Moreover, students have gifts in different areas within the visual arts, and one test cannot detect ability in all possible specializations. Finally, there is no evidence that results on standardized art or general creativity tests predict success in art programs (Clark & Zimmerman, 1983, 1992). Thus, most researchers today argue against reliance on one purportedly all-purpose test of talent; instead they advocate the use of multiple criteria for identifying artistically talented students (Clark & Zimmerman, 1992).

INFORMAL INSTRUMENTS

Most programs today in the United States use a combination of at least two informal (i.e., non-standardized) methods for selecting students into special art programs (Clark & Zimmerman, 1992).

Nominations (by classroom or art teacher, self, peers, or parents) are the most widely used means of identification, and account for over half of the procedures used.

Non-standardized drawing tests are often developed for use by particular art programs. For example, the DeCordova Museum in Lincoln, Massachusetts used two tests designed by David Baker. In the Visual Narrative test, students are asked to tell a story by drawing a series of pictures; in the Memory Assessment, students see a painting by Van Gogh and then reproduce the painting from memory (Lazarus, 1982). Another example of a locally used assessment instrument is the Clark-Gareri Drawing Instrument used to identify students for the Iowa University Summer Arts Institute (Clark & Zimmerman, 1987). Students are asked to make three drawings in half an hour (a house seen from across the street, a person running fast, and a group of children playing). These locally-designed tests are scored on a variety of dimensions (e.g., composition, expression, technique), and the dimensions used, as well as the scoring guidelines, differ somewhat from test to test.

Portfolio reviews are used increasingly, because this method allows judges to review a wide range of work by each potential student. There is a current movement towards the inclusion in portfolios of drafts of work in progress and of student journal entries about the work (Wolf, 1989). In Australia, for instance, students must keep visual arts “process diaries” (New South Wales Department of School Education, 1988). The inclusion of drafts and written reflections makes it possible to assess students’ aptitude on a variety of dimensions, rather than on a single, global one. For an example of a detailed scoring system designed to assess students across the full range of ability, see Winner and Simmons (1992).

Behavioral and biographical checklists have been advocated as a means of identifying students whose art

work does not reflect their underlying potential (Clark & Zimmerman, 1987; Ellison, Abe, Fox, Coray, & Taylor, 1976; Khatena, 1982; Lazarus, 1982; Wilson & Wilson, 1992). Checklists allow children with potential in art to be identified because they spend their free time drawing, or because they take particular pleasure and pride in their drawings.

Academic performance as measured by grades or IQ scores are also sometimes used in conjunction with some of the above measures, because of the widespread belief that artistically talented children are also academically talented or have high intelligence (Clark & Zimmerman, 1992). However, as discussed earlier in this chapter, there is strong evidence that artistic talent is independent of IQ scores and hence of academic performance. Thus, the use of such measures is suspect.

There is no "tried and true" means of successfully identifying those students who will flourish in an art program, and Clark and Zimmerman point to the need for further research on appropriate identification tools.

High Drawing Ability in Ordinary Children as a Function of Instruction: The Case of China

If one spends time in China observing kindergarten and elementary school children drawing and painting, giftedness in the visual arts appears to be a cultural rather than an individual phenomenon. Chinese children do not make child-like drawings, but rather make drawings that seem to challenge theories of the developmental course of drawing skill. Instead of the charmingly simple, invented schemata produced by Western

children, one sees Chinese children producing highly differentiated, remarkably adult-like drawings and paintings (Gardner, 1989; Winner, 1989). Figure 4 shows a "Western-style" painting by a 6-year-old Chinese child; Figure 5 shows a "Chinese-style" painting by a 6-year-old Chinese child. These are the two styles in which Chinese children learn to paint. The Western style consists of cartoon-like figures in a multitude of positions; the Chinese style consists of watered-down versions of schemata developed over the centuries by Chinese masters.

Such adult-like paintings can be seen in endless supply in any good urban school in China. It is not just the gifted children who draw in this way. To be sure, the average Chinese child does not paint as well as Yani. However, while the artistically talented children excel, and while it is the talented children's pictures that are selected for international exhibitions, the paintings of the ordinary children are also strikingly higher in skill than those of Western children.

If one looks closely, the mystery of such mass talent can be resolved. From the age of 3, as soon as they enter kindergarten, Chinese children are *taught* to draw. In contrast, Western children are simply given art materials and allowed to explore. This difference in approach to early childhood education reflects very different views of childhood and learning: while in the West, progressive education is grounded in the belief that children learn best by doing, exploring, and discovering on their own (Dewey, 1934; Piaget & Inhelder, 1969), Chinese education is grounded in the belief that children learn best by imitating. Moreover, if adults know the solution to something, there is no point in letting children try to discover the solution on

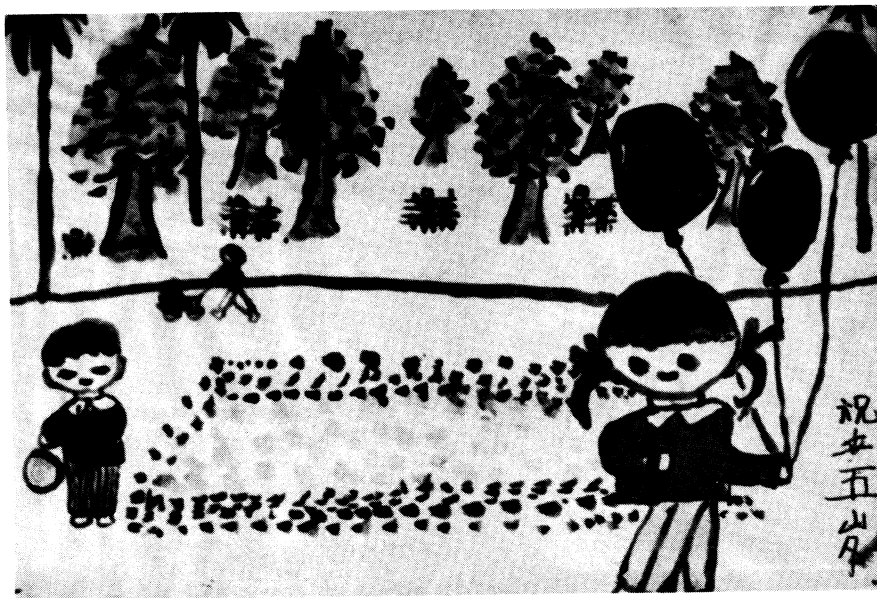


FIGURE 4. Western-style painting by a 6-year-old Chinese child.

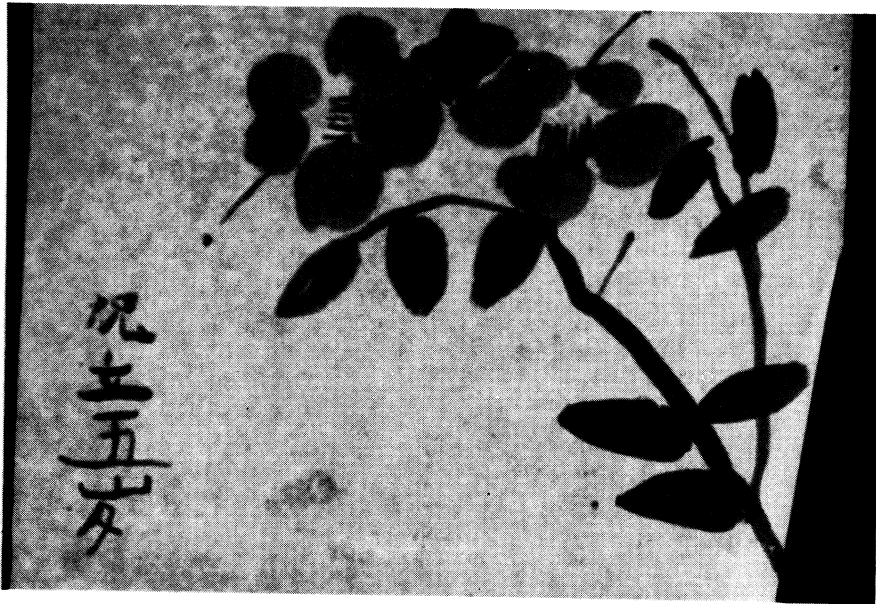


FIGURE 5. Traditional Chinese-style painting by a 6-year-old Chinese child.

their own. Such practice is simply a way of reinventing the wheel, for which no benefit is seen (Gardner, 1989; Winner, 1989).

The Chinese art teaching method consists of presenting the child with a set of very simple schematic formulae which are then gradually and additively made more complicated. The teacher and the textbook supply the models for these schemata, and the child copies the models in a step-by-step, stroke-by-stroke fashion, much as in the well-known drawing books by Ed Emberly (1972) and Mona Brookes (1986). This method is also used to teach calligraphy in China, and resembles the way penmanship was taught in the U.S. and elsewhere until recently. Thus, while to the naive eye Chinese children's drawings look non-schematic in their complexity, they are in fact based on schemata that the child has mastered bit by bit. This method of teaching is made possible in part because the domain of Chinese painting is itself quite formulaic: there are rules for how to paint birds, flowers, shrimp, goldfish, etc. The cartoon-like Western style that Chinese children learn is also equally formulaic.

The Chinese example demonstrates that it is possible to find near adult-level performance in drawing among average, non-gifted children, but only when the domain itself is highly formulaic, and when the method of teaching consists of copying adult models in an additive manner.

“Savant” Artists

A small proportion of children and adults with autism and/or retardation are able to produce drawings that are

unusually realistic. Such individuals, often referred to as “savants” (Miller, 1989; Treffert, 1989), are found in a variety of domains (e.g., mathematics, lightning calculation, calendar calculation, chess, mechanical ability, mnemonism, unusual sensory discrimination, music, and art) (see Feldman and Morelock, this volume). While the skills exhibited by savants depend on the domain in which their skill is found, all savants possess a phenomenal ability to recall things in vivid detail, and often possess eidetic imagery. The extreme level of skill displayed by these individuals, in the face of severe lack of skill in almost all other areas, is striking and not fully understood. The existence of such individuals in the domain of the visual arts (and music, as discussed later) provides incontrovertible evidence that drawing ability (and musical ability) can exist and operate at a very high level without the benefit of other, more “general” intellectual abilities.

Selfe (1983) reports in detail on a group of autistic children who show such anomalous drawing skill. These children all had prototypical autistic symptoms: delayed language, impaired social relationships, ritualistic behaviors, and severe learning difficulties (they were in the lowest 2% of the IQ range). All had poor gross motor coordination, as shown, for example, by late walking and difficulty in tying shoes and catching balls (cf. also Morgan, 1987). Along with their exceptional drawing ability, these children had good fine motor coordination (which helped them to wield a pencil with skill), and showed skills in perceptual matching, spatial imagery, and visual memory. In short, their drawing ability, visual-spatial skills and fine motor coordination were way in advance of all other abilities.

These children all showed an anomalous pattern of drawing development. While normally children begin to draw between the ages of 1½ and 3½ years, all six of Selfe's subjects began drawing somewhat later—between the ages of 2½ and 4. Normal children's first drawings are scribbles. Representational drawings (of recognizable objects) do not typically emerge until the age of 3 or 4. In contrast, these autistic children never scribbled. Their very first drawings were recognizable objects. Thus, these children appeared to bypass the scribbling stage (cf. also Morgan, 1987, for a similar claim).

While early representational drawings by normal children tend to depict a restricted range of rather predictable subjects (typically generic people and generic houses) (Lark Horowitz et al., 1973), these autistic children depicted a wide range of unusual subjects in their earliest drawings e.g., yachts, windows, cars, churches, hospitals and flowers. They repeatedly drew the same subjects with obsessional interests, and displayed their highest level of skill when drawing their favorite subjects. For example, Selfe's most famous and widely written-about subject, Nadia, drew horses constantly (see Figure 6); her few human figures were (with possibly one exception) drawn with a lower level of skill. A Japanese autistic child studied by Morishima and Brown (1977) drew insects with striking realism, but disliked and was quite poor at drawing humans (cf. also McGregor, 1990).

At the same age at which the young Toulouse-Lautrec or the young Picasso were making relatively child-like drawings, these autistic children are able to draw with adult-level realism. Typically these children show little interest in color or decoration. Their only interest appears to be naturalistic rendering. Their drawings show an extremely high ability to capture proportion, contour, occlusion, and depth through perspective and foreshortening.

The process of drawing appears to be more important to these children than the final product. While normal children typically talk about their drawings to others, and show them to their parents with pride, autistic children do not talk about or show their drawings, and

appear unaffected by praise of their work (Park, 1978; Selfe, 1983). They seem to draw for themselves only, and display no interest in others' reactions to what they produce. Moreover, while normal children distort the outline of an object to fit onto the paper (thus sacrificing realism to showing the complete object), autistic children with drawing talent frequently draw figures right off the page, truncating rather than squishing them, and sometimes make one drawing on top of another (Selfe, 1977).

These autistic children appear to possess excellent visual memories. They rarely copy directly, but instead draw from memory. While normal children complete a drawing object by object showing no sense of advance planning, these autistic children often draw details in various sections on the page and later connect these details with perfectly fitting larger lines, thus revealing that they are holding the finished product in mind as they draw (Selfe, 1983).

Autistic children with high drawing ability draw almost every day, producing many more drawings than do average children, and are often wedded to a particular drawing implement. Nadia, for example, drew with extremely high skill when using a fine ball point pen, but her drawing disintegrated when she was forced to use a thick crayon. David Downes, a child studied by Morgan (1987) also preferred implements that made a fine line, and rejected the use of wide brushes.

Drawings by the small subset of autistic children with drawing talent are not only unlike those of average children and of non-pathological talented children. They are also wholly unlike drawings by other atypical populations, such as children who are psychotic, deaf, or retarded. Psychotic children's drawings are bizarre and not highly realistic; drawings by deaf children are similar to those by normal children but somewhat behind developmentally (Winner, 1982) and drawings by non-autistic retarded children follow a normal, but delayed developmental sequence (Lark-Horowitz et al., 1973).

The drawings by Nadia and other autistic children with precocious drawing talent demonstrate an anomalous pattern of development. These children do not



FIGURE 6. Drawing of horses by Nadia before the age of 4.

pass through a regular series of stages, beginning with scribbling, and continuing on with schematic, simplified forms. Instead, these children begin to draw in a naturalistic style from the start. How can such extreme talent in the face of extreme retardation be explained?

One possible explanation rests on the fact that these children are linguistically impaired and thus socially isolated. Perhaps they turn to drawing as their only form of communication. However, children who are socially isolated because of retardation or psychosis do not draw like autistic children. Moreover, since these children do not talk about or show their drawings, and seem uninterested in the finished products, they do not appear to be using drawings as means of communication.

It might also be suggested that these children's skill results from the possession of eidetic imagery. However, if the possession of a completely accurate image is sufficient to capture that image realistically on paper, then all children should be able to draw realistically when looking at a model. Moreover, normal children with eidetic imagery do not show exceptional drawing skill (Haber & Haber, 1964).

In our view, the most satisfactory explanation is that the anomalous drawing ability of autistic children is directly tied to their inability to generalize, abstract, and classify (Arnheim, 1980; Pariser, 1979; Selfe, 1977). For example, Nadia was unable to match two pictures of the same object unless both were in the same orientation; and she could not match pictures of different types of chairs. The lack of ability to generalize and classify may be related to the ability to draw in a naturalistic fashion.

Normal children show their conceptual understanding of an object in their drawings, and their simple schemata are evidence of generalization and abstraction (Arnheim, 1974). The use of a circle for a head, for instance, is an abstraction: a circle is somewhat like all heads and overlooks the individual variations in head shape.

In contrast, the realistic drawings produced by autistic prodigies are not generalizations but are snapshot-like depictions of individual objects from particular vantage points, e.g., not a generic house, but a specific church seen from a particular angle. Thus, the high realism of autistic drawings may be a result of these children's inability to form visual concepts. These children may have no choice but to render every detail of a figure; they may be unable to grasp the general form of objects.

Selfe (1983) describes these children as using a visual-spatial modality without interference from language, "untrammelled by conceptual analysis and reorganization" (p. 202). Their conceptual deficiency leaves them free to record objects with a naked eye, without the interference of the schemata imposed by knowledge and understanding. Evidence that knowledge interferes with realistic rendering comes from studies showing that children draw more realistically when copying nonrepresentational designs than when drawing recognizable objects (Phillips, Hobbs, & Pratt, 1978),

and that people can copy pictures more faithfully when the models are unrecognizable because they are positioned upside down (Edwards, 1979).

Savants in the visual arts (as well as in music and other domains) may be an extreme example of what Geschwind and Galaburda (1987) refer to as the "pathology of superiority." Geschwind and Galaburda articulate a theory that can account for the frequent finding of superior right-hemisphere talents (visual-spatial skills, musical skills) with learning disorders (dyslexia, autism), an association that takes its most extreme form in savants. According to the theory, in savants there is a disruption of typical left-hemisphere brain functions resulting from prenatal influences, which leads to compensatory migration of neurons to the right, and to dominance of certain right-hemisphere functions. Left-hemisphere prenatal injury is more likely than right-sided injury because the left hemisphere develops more slowly than the right, and hence is more vulnerable. One influence on the prenatal brain is circulating testosterone, which can slow cortical growth in the left hemisphere (the more vulnerable hemisphere). Such slowing leads to compensatory neuronal migration to the right hemisphere.

This account is consistent with the fact that savants are disproportionately male (testosterone is a male hormone which is produced in greater quantities by the male fetus than the female fetus), and that the skills of the savant are right-hemisphere skills (spatial skills such as drawing, chess, mathematics, and music). This account is consistent with some evidence from CT scans of left-hemisphere damage in savants (Treffert, 1989). Geschwind and Galaburda's (1987) account is also consistent with the finding that a disproportionate number of savants were born prematurely (Treffert, 1989). There is massive brain cell death in humans just before birth, but when left-sided insult occurs in premature infants, before such massive cell death, there is still a large reservoir of right-brain neurons available to accommodate a neuronal shift to the right. This, Treffert argues, could well lead to the savant syndrome. Of course, though, premature birth could be only one of the associated factors, neither necessary nor sufficient: many savants were not premature, and most premature infants do not become savants.

Autistic drawing prodigies stand apart from nonpathological children with and without drawing talent. Nonautistic children who may go on to become artists do not typically display their precocity at as young an age as autistic children. While autistic prodigies share with the young Picassos and Lautrecs a strong inborn talent, their conceptual impairment allows them to do immediately what it takes most "normal" artists years to learn how to do—draw realistically, with minimal imposition of formulaic schemata (Gombrich, 1960). Drawings by autistic prodigies are thus a symptom of their autism. However, drawing talent is not a necessary symptom of autism, since prodigious drawing skill characterizes only a small subset of autistic children. Why some autistic

children possess this extreme talent while most do not is not known.

The Relation Between Artistic Giftedness and Creative Adult Artistry

The drawings of gifted children, like those of ordinary children, pass from a pre-conventional to a conventional stage, in which their drawings lose some of their early freedom and inventiveness. This has been noted by Clark and Winner (cited in Winner & Pariser, 1985), who found that two children they studied produced their most free and inventive work before the age of 7. In their high school years, their work became more constrained, and one of the children temporarily lost interest in art during adolescence.

An examination of the childhood and adolescent drawings of established artists shows that they too pass through a constrained, conventional stage at adolescence. In fact, they seem to pass through such a stage with a vengeance, insisting on drawing only in the most academic, realistic, dull style (Gardner, 1980). Picasso, Klee, and Lautrec all drew and painted realistically at adolescence, despite the fact that by this age they had had plenty of opportunity to view Impressionist and Post-Impressionist images. Pariser (1987) claims that these three artists all showed a “slump” in late childhood. He conjectures that this time “[reflects] the effects of a period of consolidation when old skills are changed to accommodate new demands” (p. 22). Klee’s early fluid, expressive, whimsical images gave way to banal and labored images in adolescence as he began to copy images from calendars and comic strips (Pariser, 1987). The 10-year-old Klee showed a “painful concern for accuracy and no trace of effort to be inventive or expressive,” notes Werkmeister (cited in Pariser, 1987, p. 10). But he did not lose his ability to draw playfully, as can be seen in free and humorous drawings done in the margins of his school notebooks (Pariser, 1987). Lautrec’s drawings lost their sense of movement in late childhood, and became more like drawings by ordinary children of the same age (Pariser, 1987). Picasso’s work between the ages of 10 and 14 has been characterized as “dull” (O’Brian, 1976; Pariser, 1987). Two of the Israeli artists studied by Gordon (1987) showed a similar decline, passing from assured, flowing lines to more tentative, faltering lines as they struggled to master the conventions or realism.

At adolescence, when ordinary children lose all interest in drawing, the individual who may become an artist emerges from this period of decline and begins to draw again with flow and self assurance (Gordon, 1987). Once they have mastered the conventions of the graphic symbol system, those gifted adolescents who continue to produce art go on to a post-conventional phase in which rules are willingly violated and realism is abandoned for other styles. It is at adolescence that future artists begin to find their own voice (Gardner, 1980).

It is noteworthy that children who go on to become artists pass through the same two-phase sequence as do normal children (pre-conventional and conventional) before going on to a third phase not attained by ordinary children (the post-conventional phase). Gifted children may well need an early pre-conventional period of freedom and exploration. They also need a period in which they conquer the rules of graphic symbolization valued in their culture—in the West, this means mastering realistic, illusionistic rendering. Gifted children arrive at this second stage earlier than do typical children, and they go much deeper into rule mastery, drawing much more illusionistically than does the average literal stage child. During this period, the gifted child’s drawings lose some of the whimsical charm of ones produced in the preschool years, just as those of the average child do. Since all artists seem to have passed through this literal stage, it is likely that this stage is a necessary prerequisite for later ability to violate conventions.

This broad three-phase sequence has been described by Alfred North Whitehead (1929) as characterizing expertise in all domains. First there is the period of romance, in which the child has the freedom to explore the domain. Following this is a period of precision, in which children learn the grammar of the domain, and gain technical mastery. Finally comes the period of generalization, in which the individual returns to the early romanticism with the added advantage of technical mastery. In his study of over two hundred talented individuals, Bloom (1985) found that these three stages characterized development in all of the domains he studied (including the sciences, the arts, and sports).

Not all artistically gifted children go on to become artists. Indeed, probably most do not. Why should this be so? One possible reason is that the arts are not highly and widely valued in our society. Thus, there are often pressures on artistically gifted adolescents to give up the arts in favor of more “useful,” conventional, or lucrative work (Getzels & Csikszentmihalyi, 1976).

Other historical and cultural factors may also play a role. There is a disjunction between the core ability of the artistically gifted or prodigious child, and the kinds of art that are valued by our culture today. The core talent of children who are gifted in the visual arts is the ability to capture the contours of objects faithfully, so that the resultant drawings look realistic rather than schematic. This ability is a visual-spatial and motor precocity: such children can guide a pencil so that the lines on the paper mirror the outlines of the object they are representing. Children with this ability produce drawings that are astonishing in their realism. This core ability is possessed by ordinary gifted children, by children who draw at a prodigious level, and by savant artists.

However, highly realistic drawings are very different from the kinds of art works produced by contemporary adult artists in our culture. What is valued in the West today is innovation and expressiveness, rather than faithful realism. As Richardson (1991) noted in his biography

of Picasso, no great painter has ever produced a work of "any serious interest" before adolescence. Presumably, this is because the technical accomplishments of the child drawing prodigy are a far cry from the expressive, innovative paintings we prize as significant adult works of art. Thus, one should not assume that there is any direct route from early signs of visual giftedness to adult creativity in the visual arts.

The case of China serves to underscore the historical and cultural determinants of who becomes an adult artist. In China, where traditional brush painting is still valued, gifted children's works (such as those of Yanli) do closely resemble the kinds of adult works that are prized by the culture today. Thus, there may be a more direct route from childhood prodigiousness to adult artistry in China today than in contemporary Western culture. And, as discussed below, in the domain of music, where early giftedness typically reveals itself in performance rather than composition, gifted children's performances also closely resemble the kinds of adult performances prized by the culture. Nonetheless, there is no direct route in music from childhood prodigiousness to adult artistry.

Giftedness in Music

Music has universal appeal, and all children show sensitivity to music. However, the differences among individuals in musical ability are extremely wide. Gesell and Ilg (1946) remarked that the area in which individual differences are most marked is the domain of music, noting that a child under 2 may sing songs with great accuracy while some adults (the present first author included) never attain this ability.

As is the case with the visual arts, a considerable amount is known about the normal course of musical development (Bamberger, 1991; Shuter-Dyson & Gabriel, 1981; Sloboda, 1985), and much less about the emergence and development of exceptional musical ability. As with the visual arts, our knowledge of childhood musical giftedness comes from three sources. (1) Children who have been identified as gifted or actually prodigious in music by their parents and/or teachers have been studied (Walters, Krechevsky, & Gardner, 1985; Feldman and Goldsmith, 1986). The most detailed study of the development of a musical child prodigy is the study of Erwin Nyiregyhazi (E. N.) carried out by Revesz (1925) when E. N. was between 7 and 12 years of age. (2) Biographical information about the emergence of talent in famous performers and composers exists, though on a somewhat anecdotal and disconnected basis (Scott & Moffett, 1977; Schonberg, 1970). (3) Finally, children who are classified as musical savants, who show extremely high levels of musical ability in the face of retardation and/or autism, have been studied (Miller, 1979). From these three groups of subjects, a consistent picture of early musical giftedness emerges. However, all studies of musically gifted children have

been of Western children, and all children studied have been gifted in Western classical music. We know little about the emergence of musical giftedness in cultures with non-Western music; and we know little about children who show musical giftedness with non-classical forms of music.

Early Signs of Musical Giftedness

The core ability of the visually gifted child was described above as a visual-spatial motor precocity which allows the child to capture the contour of three-dimensional objects on a two-dimensional surface. The core ability of the musically gifted child is a sensitivity to the structure of music: tonality, key, harmony, and rhythm. This sensitivity allows the child to remember music, and to play it back with ease, either in song or on an instrument. This sensitivity to structure also allows the gifted child to transpose a theme to a new key, to improvise on a given theme, and to invent melodies.

Signs of ordinary musical ability emerge very early in all children, usually during the preschool years. Musical giftedness also reveals itself very early. In fact, giftedness in music may appear earlier than giftedness in any other domain of skill (Stanley & Benbow, 1986).

Many well-known performers and composers have demonstrated musical giftedness as young as 1 or 2, and almost always before 6 (Scott & Moffett, 1977; Shuter-Dyson, 1986; Shuter-Dyson & Gabriel, 1981). For example, in a survey of forty-seven musicians, Scheinfeld (1956, cited in Shuter-Dyson & Gabriel) found that their ability had been detected on average at 4 1/2. Drake (1957, cited in Shuter-Dyson & Gabriel) found that 70% of the great violinists in Leahy's *Famous violinists* were prodigies as young children. Mozart composed a concerto for the harpsichord at 4 (Waterhouse, 1988). Mendelssohn was even more of a child prodigy than Mozart; and the violinist Yehudi Menuhin performed with symphony orchestras at the age of 7.

The strikingly early age at which giftedness often manifests itself in music may be because music is a domain that is both appealing and accessible. However, an early emergence of talent is not a necessary indicator of musical giftedness. Sloboda (1985) found that concert pianists are not necessarily recognized as musically gifted in early childhood.

INTEREST IN MUSICAL SOUNDS

Perhaps the earliest clue that a child is gifted in music is a strong interest and delight in musical sounds (Radford, 1990; Scott & Moffett, 1977; Sosniak, 1985). Stravinsky's first memories were of song (Gardner, in press, a). And Mozart's ear was so delicate that loud sounds made him physically ill (Schonberg, 1970). However, Sloboda (1985) points out that heightened attention to sounds *per se* is not in itself evidence of

musical sensitivity: a response to a sound may simply be due to the infant's natural heightened attentiveness to novelty.

Musical children respond more strongly to music than do average children, showing an intense interest in auditory information (Miller, 1989). Such children often have a strong sense of goodness of tone and timbre: e.g., both Rubinstein and Menuhin broke toy violins because the tone of these toys was so poor (Radford, 1990).

MUSICAL MEMORY

One of the earliest signs of musical giftedness is the ability to sing back heard songs with accuracy. This ability is made possible by exceptional musical memory, a skill that has been said to be the ability most central to musical talent (Judd, 1988).

While children typically begin to sing and talk at about the same age of 18 months (Sloboda, 1985), musically gifted children may begin to sing at a younger age, and often before they can speak (Shuter-Dyson, 1982). E. N., the 7-year-old Hungarian musical prodigy whom Revesz (1925) studied, did not speak until the age of 3, but before the age of 1 he began to try to sing back songs that he heard. Revesz reports that Handel also sang before he could speak.

In the normal course of development, children do not try to imitate heard songs until about 2–2½. Children are able to sing portions of these songs with accuracy at around 3, and can sing whole songs by about 4. However, intervals in these songs are only approximate, and children are not yet able to maintain the same tonality through a single song. It is not until about 5 that children can reproduce with accuracy the familiar tunes of their culture (Gardner, Davidson, & McKernon, 1981; Sloboda, 1985). Musically gifted children present a striking contrast: these children sing with great accuracy, demonstrating the ability to match pitches with precision by their second year (Revesz, 1925).

Musically gifted children can imitate a song after only one exposure, and familiar themes from TV are rapidly and effortlessly learned (Miller, 1989). Mozart began to pick out tunes on the piano at 3 (Schonberg, 1970). Pepito Areola, a child studied by Richet (1900), could play twenty pieces from memory by the age of 3½. At 3, the pianist Arthur Rubinstein listened to his older sister playing the piano and surprised his family by faultlessly playing the pieces she had been practicing (Winn, 1979). At the beginning of his fourth year, E. N. could reproduce with accuracy on the piano any tune that he overheard (Revesz, 1925); by 7 he could play complex Beethoven sonatas from memory. Mozart, at 14, was able to write down Alleferi's *Miserere*, a complex piece of music with nine parts, after listening to it only a few times (Henson, 1977).

A series of memory tests administered by Revesz showed the 7-year-old E. N. had a short-term musical memory almost equal to that of an adult musician tested. That is, E. N. performed as well as the musician when asked to listen to pieces of music, commit them to

memory, and play them back. Moreover, E. N. revealed a long-term memory which was far superior to that of the adult musician: both were asked to reproduce music heard 24 hours earlier, but only E. N. succeeded, and he did so effortlessly and flawlessly.

E. N.'s memory gave evidence of a tacit understanding of musical structure: he was better able to recall familiar structure, harmony, and rhythm than random harmonies, and had better recall for the music in the diatonic scale than for dissonant music built on the twelve tone chromatic scale. Thus, his memory was structure-preserving: it was somewhat dependent on familiar structure, and was thus not eidetic, mindless, or literal. Superior recall for familiar form indicates some at least unconscious representation of familiar form.

Bamberger (1986) notes that the extraordinary ability of musically gifted children to play back what they hear is nonreflective and tacit. Such children often say that they cannot imitate a piece if they think about it.

PERFECT PITCH

While one might predict that musically gifted children would show perfect pitch—the ability to name notes heard, and the ability to sing notes named—this is not the case. Some prodigies have shown perfect pitch. E. N., for example, at the age of 3 could instantly locate on the piano notes that were sung to him. He also had other, related acoustic skills: he could recognize intervals and the notes in a chord and analyze chords. In fact, his capacity for resolving multiple chords has hardly ever been equaled (Revesz, 1925). Mozart also had perfect pitch: he could tell when violins were a quarter out of tune by the age of 4 (Schonberg, 1970).

However, interviews with teachers of musically gifted children reveals that perfect pitch is not consistently associated with musical giftedness (Walters et al., 1985). Sergent and Roche (1973) argue that perfect pitch is a function of training. They surveyed one-thousand musicians, and found that the possession of perfect pitch was related to the age at which musical instruction was initiated. Of those who had begun instruction before age 4, 95% had perfect pitch; of those who had begun instruction at age 12, only 55% had perfect pitch. However, this evidence does not prove that perfect pitch is a function of training: perhaps children who begin instruction at a very early age are simply more gifted than those who begin later, and also tend to possess perfect pitch.

SIGHT-READING

As with the skill of perfect pitch, the ability to sight-read is also not consistently associated with giftedness in music (Walters et al., 1985). This is an ability possessed by some but not all musical prodigies. Mozart was one prodigy who did possess this skill. At the age of 8 he immediately could play a piece he had never seen before

(Scott & Moffett, 1977). E. N. also possessed this ability at the age of 7.

SKILL IN PERFORMING ON AN INSTRUMENT

While in contemporary Western culture artistically gifted children do not typically take art lessons, most musically gifted children begin formal instructions on an instrument in the early elementary school years. Musically gifted children thus get instruction from a young age, and weekly instruction is augmented by daily practice. Teachers report that they can easily tell whether they have a gifted student: gifted students play easily, learn rapidly, make quick self-corrections of their errors, and perform with confidence (Walters et al., 1985).

While musical instruction is necessary for the flowering of musical talent, training at any age will not do. The training of a future musician must be initiated at a very young age. Most great performers began taking lessons in their early years. "A string player," the violinist Alexander Schneider stated, "should begin at 5-years-old. Later is too late" (Winn, 1979, p. 40). However, there are some counter examples to this rule. Apparently the family of Leonard Bernstein did not acquire a piano until Bernstein was 10. And Shuter-Dyson & Gabriel (1981) note several other examples of famous musicians who did not take up an instrument until adolescence.

MUSICAL GENERATIVITY: ABILITY TO TRANSPOSE, IMPROVISE, AND COMPOSE

There is a clear distinction between the act of performing existing music, and the creation of new music. A further distinction exists between composing new music and two more constrained forms of creation: transposing a given piece to a new key, and improvising from a given musical theme. The transposer takes a given piece and shifts it to a new key. The improviser takes a given musical theme and improvises from this theme, without changing the essential style and structure of the already existing piece.

All children begin to produce their own, spontaneous songs at around 18 months. During this time, they are experimenting with intervals. Their spontaneous songs grow in length and internal organization between 2 and 3. However, by 5, spontaneous singing declines in frequency, as the child becomes concerned with making mistakes, and shows an interest in imitating heard songs with accuracy (Sloboda, 1985). Thus, the ordinary child, at least in Western culture, stops generating music by the end of the preschool years. This decline in playful experimentation with song has its parallel in the decline of flavorful, pre-conventional drawings of the preschooler, and the concern for literalness in drawing discussed earlier in this chapter.

Once again, musically gifted children tell a different story. Most musically gifted children learn to play an

instrument, and soon after they begin to play an instrument, they show "musical generativity." This generativity first takes the form of the ability to transpose tunes to new keys, and to improvise on themes. E. N. could transpose pieces to new keys at 7. By 10 he could accurately transpose complex pieces at first sight into any key without difficulty.

E. N. could improvise at the beginning of his fourth year, and until 7 he improvised more than he composed. He was able to improvise on his own themes as well as on those of others. When he had just turned 6, for example, he was given a pastoral theme and asked to improvise a funeral march on it, which he did with great skill. He was then asked to improvise a children's song on the same theme, which he again effortlessly carried out. These improvisations showed remarkable spontaneity and musical imagination.

A musician studied by Walters et al. (1985) reported being "one of those kids who would play the piano, play it wrong and keep playing it wrong, fooling around with the themes. At a young age, I would pick things off the radio by ear, and then change them and rearrange them." Similarly, Pepito Aereola could, given a few bars, continue a melody in the same style (Richet, 1900). And Mozart improvised at 4 (Scott & Moffett, 1977; Schonberg, 1970).

The ability to compose music in early childhood is much rarer than the ability to interpret music (by singing or playing an instrument in an advanced manner). Musically gifted children typically first reveal their talent by early, accurate singing, and early ability on an instrument, and only later on do a minority of these begin to compose. Revesz (1925) argued that a gift for composition is rarely seen before late childhood. J. S. Bach, Handel, Beethoven, Mendelssohn and Brahms are examples of great musicians reported by Revesz who were performing virtuosi in early childhood, but who did not begin to compose until at least early adolescence, if not early adulthood. E. N. is one of the rare cases of children who began to compose music at an early age, composing melodies with accompaniments at 3½. Haydn, Mozart, Chopin, Mahler, Meyerbeer, Saint-Saens, and Strauss also produced their first compositions before the age of 10 (Revesz, 1925; Radford, 1990). Mozart started composing at 4, and by the age of 8 he had already written six sonatas for piano and violin, and three symphonies for small orchestra. However, the biographies of great composers show that the ability to compose at an early age is much rarer than the ability to interpret (i.e., perform) music at an early age.

A comparison with the domain of the visual arts is instructive here. As was pointed out earlier in this chapter, the incidence of very young child prodigies in the visual arts is lower than the incidence in music. However, what is usually meant by this is that prodigies in the visual arts are rarer than prodigies in music *performance*. Drawing is more analogous to composition of music than to performance. If we compare the frequency of prodigious composers to the frequency of prodigious

drawers, we may find that musical prodigies are just as rare as are visual arts prodigies.

CAPACITY FOR MULTIPLE REPRESENTATION OF MUSICAL RELATIONS

Musically gifted children have an unusual capacity for representing musical relations in multiple ways (Bamberger, 1986). These children move freely among four ways of attending to a piece of music, shifting their focus of attention among the instrument and the actions performed on it, the score, the sound, and the music's structure.

When one focuses on the instrument, the music is represented as a felt path, a sequence of actions performed on one's instrument. For instance, one might think of a pitch on a violin as the third finger on the E string. The musical score is a very different kind of representation, and students must connect the kinesthetic representation to the notational one. The imagined sound towards which the performer is striving is yet another representation. When thinking of the music in terms of sound, one listens to one's own playing to keep it in tune, or one matches one's sound to remembered models of others playing. And finally, there is the level of musical structure, in which one attends to the organization of a piece, and the relations among its parts.

From studying conversations between music teachers and their musically gifted students, Bamberger (1986) noted that the teachers shift continually among comments which highlight music as a felt path, as a set of notations, as sound, and as structure. The children shift their attention readily with the teacher. Bamberger argues that such easy shifts from one mode of representation to another is a significant aspect of musical giftedness.

An experimental task administered by Bamberger (1986) to gifted children revealed this ability to entertain multiple representations of music. Four groups of individuals were given a set of Montessori bells, all of which looked alike, but each of which had a different pitch when struck with a mallet. The four groups were: gifted children, musically untrained children, musically untrained adults, and musically trained adults. Thus, musically gifted children could be compared to nongifted children, and to nongifted adults with and without training. Subjects were given all of the pitches of the C major scale plus three matched pairs: two Cs, two Gs, and two Es. The bells were laid out in arbitrary order.

Children were asked to do three tasks: (1) construct "Twinkle Twinkle Little Star;" (2) notate the song in any way they wanted; and (3) arrange the bells so that a notation different from theirs would make the same tune. The tasks were designed to tease apart multiple representations of music. For instance, the construction task was meant to disturb the familiar structure of the instrument field, because the bells were arbitrarily

arranged. Thus, the felt path of pitch relations (low to high) was violated.

Some pitches in "Twinkle" are identical but have a different function. For instance, when performed in the key of C, the note G occurs on "twinkle" and again on "star", but the second time it occurs at the end of a phrase and thus has a different structural function from the first G. Some people hear these Gs as the same, some hear them as different. If one responds to the context, the two notes sound different; but if one can focus on the single dimension of pitch, the two notes sound the same.

The gifted children shifted strategy during the construction task, and with each shift, they attended to different dimensions, as detailed below. In contrast, the nongifted subjects maintained a single, consistent strategy during the entire task, including the trained adults who were students at a prestigious American university and had had at least five years of music instruction.

The children and adults with no musical training always added new bells to the bell path in their order of occurrence in the tune, never moving backwards to hit the same note a second time. The result was a row of bells, one for each pitch. Thus, they needed to use two different bells for the two Gs. Each was heard as a different event. These nongifted and nontrained subjects were using what Bamberger (1986) calls a "figural" strategy, because they were focusing on the shape, or figure of the tune, and hearing individual notes within the context of the shape of the tune. Doing so leads to the two Gs being heard as different events because of their different functions within the tune.

The nongifted but trained adults used a "formal" strategy. They built a C major scale out of the bells, and played the tune on the scale, moving back and forth as needed. Unlike the untrained individuals, these people focused on the tune as it relates to the formal structure of the C major scale.

The gifted children switched strategies as they went about the task. At first, they looked like the untrained subjects. They began with a figural strategy by searching for each pitch, lining them up from left to right. But when they got to "star," they switched to a formal strategy: they moved backwards to hit the G already used for "twinkle." Thus, they recognized the two Gs as the same. The first part of the piece (Twinkle twinkle little star) was thus played on bells lined up as C-G-A. But they then faced a dilemma when they got to the F for the first note of "How I wonder what you are." If they followed their initial figural strategy of lining up bells in order of occurrence, they would have to put G to the right of A. But this move would not represent the downward pitch from G to F; and such a move would not yield a purely figural strategy since it would require skipping from G over the A to F. If on the other hand they followed their new formal strategy, the F would have to go to the left of the previous G since it is lower. But the C bell was already to the left of G, because of

the initial figural strategy of placing the bells in order of occurrence.

The gifted children felt this conflict between figural and formal strategies, and made different choices at this point. For instance, one child responded to the fact that F is lower than G. Thus, he moved left. But the bells were not ordered from low to high, so he realized that he had to search for the F bell. He then recognized that the F had a double meaning: it was next in the tune, but also lower than G and higher than C. So, he pushed the C to the left, and inserted F between C and G. The added notes beginning with "star" were placed in order of occurrence (backward) but also classified according to a low-high series (D E F). Thus, for the gifted children, multiple dimensions came into conflict. During the construction task, all of the gifted children made multiple representations of the tune as they constructed it.

When asked to notate the song so someone else could play it, none of the gifted children used standard notation, although they all knew such notation well. Instead, they invented their own way of notating the task. When asked to make sense of another form of notation different from what they had constructed, no one in the nongifted group, whether trained or not, could make sense of notations other than their own. It was as if the internal representation and the notation were locked into one another. In contrast, all but one of the gifted children could easily grasp the alternative notation and were able to rearrange their bells so that the new notation would play the same tune. For instance, those who had used numbers as names for positions were able to make sense of notations in which numbers referred to order of occurrence in the tune.

Thus, musically gifted children have multiple internal representations for the same piece of music. They can move freely from one kind to another, and can easily see one as the other. In contrast, nongifted individuals, irrespective of age and musical training, use a single strategy, and focus consistently on a limited set of musical dimensions.

CAPACITY FOR SUSTAINED CONCENTRATION: SELF-DISCIPLINE AND COMPLIANCE

Discipline from an adult mentor is not all that is necessary for the maturation of early talent. A certain personality structure may also be important (Winn, 1979). Children who are rebellious and independent often react negatively to pressure and refuse to practice. Without regular practice, one does not go on to become a great performer, or indeed, composer. Thus, a certain degree of compliance as a child may be one of the ingredients necessary for musical talent to come to fruition.

Self-discipline and drive are also critical. Musical prodigies are often as hard on themselves as are their parents and teachers. There are anecdotal reports of such children refusing to go to sleep until they have

mastered the passage they have set for themselves that day (Marshall, 1981). Like prodigies in all domains, musical prodigies have an exceptional ability to concentrate in their field of endeavor, and to persist and work hard (Feldman with Goldsmith, 1986). These children usually have an extraordinary amount of energy: one mother of a prodigy recalled that as a baby, her child never needed a nap (Marshall, 1981). Mendelssohn is reported to have thrived on a strict schedule set by his parents which began at 5 a.m., when he and his sister began their studies of music, history, Greek, Latin, science, literature, and drawing (Schonberg, 1970).

Thus, extensive work in childhood seems to one of the necessary ingredients to becoming a great adult musician. Louise Behrend, a music teacher, suggested that this might be why so many great musicians have been Asian or have emerged from the early twentieth-century Jewish population of Odessa, in Russia. Both of these cultural groups are extremely disciplined (Winn, 1979). It is likely that there are children with exceptional giftedness who never develop their talent because they lack this personality factor (whether inborn or a product of culture) of persistence and drive.

THE MUSICAL PRODIGY'S "MIDLIFE CRISIS"

The conflicts induced by Bamberger's (1988) laboratory tasks, described above, are in some ways analogous to the disequilibrium that occurs spontaneously during the adolescence of musical prodigies. At adolescence, musicians become increasingly reflective about their music. One result is that once seamlessly connected dimensions become separated, and effortless performance seems to fall apart. One of Bamberger's (1988) subjects, a 16-year-old performer, said, "It's easy to feel like your playing has gotten worse because now we're listening and hearing so much more" (p. 410).

Bamberger (1982) refers to this crisis as a "midlife" crisis which results, for many prodigies, in the giving up of music. These adolescents go through a period when their musical abilities as performers break down. They report that in childhood they were able to make music spontaneously, but that they have now become self-conscious and have lost the ability to play with the ease of their childhood. Adolescent prodigies' need to reflect about their previously spontaneous music making results in chaos.

The adolescent midlife crisis for the performer is a period of cognitive reorganization. Adolescents cannot return to the nonreflective, spontaneous intuitions of childhood, and must invent new ways of understanding the music they are performing. It is at this point that some prodigies stop making music altogether. These individuals carry with them a strong feeling of having failed, no matter how much success they achieve in other fields in their lifetime (Bamberger, 1982).

The Role of Family and Teachers

While musical giftedness typically displays itself very early, this gift does not mature without strong discipline and formal training. Almost all music prodigies come from musical families (Judd, 1988; Radford, 1990; Scott & Moffett, 1977).

Scheinfeld (1956) found that 75% of fathers, and 50% of the mothers of a group of musicians he studied had some musical talent. A musical environment in the home may be particularly crucial for the development of musical talent. Freeman (1979) presented evidence that the home was more important than the school for musically gifted children: without a supportive home environment, such children often give up a musical instrument.

Music prodigies who continue to perform and compose as adults are nurtured and even pushed by their parents and teachers. The gift is never fully developed when first observed, and must be nourished through daily training. Those who continue with music as adults all report having had at least one parent or teacher who cared deeply about their talent, and who worked with them daily, sitting with them as they practiced and establishing a structure of discipline. Thus, parents play a much more active, interventionist role in the nurturance of musical compared to artistic talent.

The musician studied by Sosniak (1985), for example, had a mother who worked with him twice a day for 15 minutes. Practice was a daily event, rarely forced, but simply expected. The violinist Isaac Stern remarked, "There *has* to be someone pushing, a parent or a teacher. Every one of the kids I've guided has someone like that in their lives, pushing them, sometimes gently, sometimes horribly, sometimes, unfortunately, to the point of driving the child away from music. It's the quality of parental pushing that helps determine the eventual outcome of the prodigy" (Winn, 1979, p. 40).

Correlations Between Musical Ability and Other Abilities

RELATION BETWEEN MUSICAL GIFTEDNESS AND INTELLIGENCE

As with artistic giftedness, musical giftedness appears to have no necessary link to intelligence. Attempts to correlate musical aptitude with measures of general intelligence have yielded positive but low correlations. It appears that once an IQ of about 90 is attained, intelligence is not predictive of musical ability (Shuter-Dyson, 1982).

To be sure, there are many reports of musical individuals possessing a high IQ. E. N. was intellectually advanced for his age. Most of the prodigies studied by Feldman with Goldsmith (1986) showed above average musical skill. And students at the Yehudi Menuhin school of music were shown to have IQs averaging 130, a level well above the average of 100 for the population at large. However, the student at this school with the

lowest IQ, who was quite deficient in both reading and mathematics, was given an award for musicianship (Shuter-Dyson, 1986). Moreover, as in the case of the visual arts, the existence of musical savants with pathologically low IQs demonstrates that high musical aptitude can flourish in the context of a very low IQ.

RELATION BETWEEN MUSICAL GIFTEDNESS AND VISUAL PERCEPTUAL SKILLS

As discussed earlier, artistic giftedness seems to be accompanied by superior visual imagery abilities. These abilities allow skilled manipulation of visual information, whether or not that information is related to the domain of the visual arts. Parallel research on musically gifted children has not been carried out. Thus, for example, it is not known whether such children have superior memory for nonmusical auditory information, suggesting an enhanced general auditory processing skill, rather than one limited to music. However, the fact that superior auditory discrimination skills as measured by the Seashore music tests are not necessarily predictive of musical giftedness (Sloboda, 1985, discussed below) suggests that the auditory processing skills of the musically gifted child may be confined to the domain of music.

Some research has examined the relation of musical ability and visual-spatial perceptual skills. Both adults and children with musical talent have been shown to have enhanced visual-spatial abilities, as measured by such tasks as finding hidden patterns, or combining apparently disconnected visual stimuli into a single image (Barrett & Barker, 1973; Karma, 1979; Hassler, 1990; Hassler, Birbaumer, & Feil, 1985, 1987). These findings suggest that musical and spatial abilities are both made possible by an enhanced right hemisphere. Hassler (1990) also makes the interesting observation that these findings are consistent with a hypothesis put forth by Waterhouse (1988) that special abilities of all kinds involve prodigious ability to store, generate, and manipulate precise visual and auditory images, and to generate and recognize patterns in these images. Waterhouse (1988) notes that musicians, painters and writers have been reported (anecdotally) to possess prodigious memory for both visual and auditory patterns. The extent to which musical and artistic giftedness is supported by an ability to operate on *both* auditory and visual imagery is a fascinating question which calls out for further experimental research.

RELATION BETWEEN MUSICAL GIFTEDNESS AND ANOMALOUS BRAIN DOMINANCE AS INDEXED THROUGH HANDEDNESS

In most people, tonality and pitch are processed in the right hemisphere, although the left hemisphere may be dominant for the processing of rhythm (Gardner, Winner, & Rehak, 1991). Thus, if left-handedness is an index (however crude) of superior right-hemisphere development (Geschwind & Galaburda, 1987), one

might expect a disproportionate number of left-handers among musicians. Such a finding would mirror the findings on handedness and artistic giftedness discussed above.

The picture is complicated in the case of music by evidence that the left hemisphere plays a larger role in musical processing in the case of musically gifted and/or trained individuals (Bever & Chiarello, 1974; Mazziota, Phelps, & Halgran, 1983; Shanon, 1980). However, the evidence is conflicting: Gordon (1970, 1980) found a stronger right-hemisphere advantage for musicians than for non-musicians. Moreover, it is not clear whether the stronger role of the left hemisphere that has been reported is a function of giftedness (and hence is present at birth), or is a function of training, or both. If, as is likely, the left hemisphere takes over as a function of training (as students become more analytic about music), then one might still expect a higher incidence of left-handers among musicians.

Unlike artistic giftedness, musical giftedness does not appear to be correlated with anomalous dominance as indexed through handedness. Oldfield (1971) found that the incidence of mixed- and left-handedness was no higher in musicians than in the population at large. This finding was replicated by Byrne (1974) for left-handedness, but not for mixed-handedness: among a group of instrumentalists, there was a disproportionate number of mixed-handers. However, Byrne (1974) found no difference in musical ability as a function of handedness.

Given that musical performance requires rapid movement and skilled coordination of both hands, it is possible that musicians develop their left hands through constant practice, leading to the finding of a high number of mixed-handers among instrumentalists. Such learning would be consistent with the fact that musicians do not seem to have a tendency to be left-handed, and would suggest no difference in cerebral organization in musicians and non-musicians.

However, there is some intriguing evidence that musicians do indeed have anomalous dominance in the form of more symmetric brains, as predicted by Geschwind and Galaburda (1987). Hassler (1990) found greater right hemisphere involvement in processing of linguistic material in male musicians than in male nonmusicians. Just the opposite result was reported for female musicians, however. Clearly, more research on the relation between musical giftedness, sex, and cerebral organization is needed.

Procedures for Identifying Musically Gifted Children

As in the case of the visual arts, numerous standardized tests of musical aptitude have been developed. These have been used to identify musically gifted children for special programs in music, and for research purposes, to try to identify the components of musical aptitude. These tests are described in detail by Shuter-Dyson and Gabriel (1981).

All of the tests require children to listen and to respond to music, but not to perform music. Each test is made up of subtests which assess particular components of musical ability. The tests differ primarily in terms of which subtests are used, and the age group for which it is appropriate. The two most frequently used tests are the Seashore Measures of Musical Talents (Seashore, 1938; Seashore, Lewis, & Saetvit, 1960) and the Wing Standardized Tests of Musical Intelligence (Wing, 1962). A full discussion of these tests can be found in Sloboda (1985). These tests are designed for children no younger than 8.

In any of the music aptitude tests, subjects typically hear a pair of sounds (e.g., two notes, two chords, two simple melodies), and the task is to indicate whether the two are the same or different, whether one is higher or lower, louder or softer, better or worse, etc. Sloboda (1985) reports that the most common subtest in all the music assessment measures requires subjects to listen to two melodies which differ by one note. The task is to determine whether the two melodies are the same or different, and, if different, to indicate where the different note is.

Tests reflect particular conceptions of musical ability. For instance, the Seashore tests contains a subtest of pitch discrimination and of loudness discrimination which may require finer discriminations than even professional musicians can make. The inclusion of such measures reflected Seashore's (1938) view that such sensory skills were central to musical ability. However, this view has been often challenged, and one might argue that musical expertise has more to do with grasping structure than with making extremely fine discriminations (Sloboda, 1985). For this reason, the Wing test has been argued to be more valid than the Seashore test (Shuter-Dyson & Gabriel, 1981; Sloboda, 1985).

Tests of musical ability, like tests of artistic ability, have never been as widely used as have academic and intelligence tests, probably because there has simply been less teacher demand for such tests. Sloboda (1985) points out that for this reason, there has been much less research into the development of these tests. Hence test results should be used with caution. Moreover, these standardized tests should not be used alone. Indeed, they were designed only as supplements to other records of achievement. When used in this way, these tests can be of some use in detecting musical giftedness at least in the school years, and in selecting students for special music programs. However, as in the case of the visual arts, many teachers admit that the tests are rarely necessary: one can detect a musically gifted child immediately, simply by observing the kinds of signs of musical giftedness detailed earlier in this chapter. For older children, the most commonly used means of identification is not the standardized aptitude test, but the extended audition (a kind of achievement test), combined with an interview (Shuter-Dyson, 1985).

High Musical Ability in Average Children as a Function of Instruction: The Example of Suzuki

The view that only the talented few can benefit from extensive training to become great as adults has been challenged by the Japanese violinist Shinichi Suzuki (1969). Through a carefully designed method, Suzuki has taught thousands of ordinary Japanese children to play the violin in a manner comparable to that of child prodigies. Suzuki's pupils begin their training as early as the age of 2. The first stage of training involves the mothers more than the children. All mothers are given violin lessons, and they practice the violin daily in the presence of the children. The violin is treated as a special object that the children are not yet ready to use or even to touch. As a result, the children naturally begin to yearn to play the violin themselves.

Once it is clear that the children are motivated to begin to play, they are given a small violin and are allowed to begin lessons. Suzuki-trained children are not exposed initially to musical notation, but are taught to play entirely by ear. Constantly exposed to violin music (they carry tape cassettes in their knapsacks), these children learn to play back what they hear on the violin, learning by exposure and imitation, and this only after they have been seduced into wanting to learn.

The results of this training are as astonishing as are the results of the typical Chinese drawing regimen described earlier in this chapter. Suzuki-trained children play complex pieces with exceptional skill at very young ages. Suzuki thus demonstrated that by rigorous training beginning at an early age, average children can perform skillfully in music. But just as most Chinese children trained to draw well do not go on to become artists, so also most Suzuki-trained children do not go on to become musicians. This need not be seen as a failing of the Suzuki method, however. Suzuki feels that the goal of his method is character building through steady work, rather than the creation of future musicians.

"Savant" Musicians

The "savant syndrome," is just as striking in the domain of music as in the visual arts, and provides the strongest evidence for the independence of musical ability from other cognitive and even perceptual skills (Charness, Clifton, & MacDonald, 1988; Hermelin, O'Connor, & Lee, 1987; Lafontaine, 1968; Miller, 1989; Sloboda, Hermelin, & O'Connor, 1985; Treffert, 1989).

Treffert (1989) and Miller (1989) argue that musical savants may be even more common than previously supposed. As is the case with prodigies, the domain in which savants have most frequently been noted is music (Rimland & Hill, 1984). Musical savants are typically retarded and blind, and less typically autistic. Like savants in the visual arts and in all other domains, they also are disproportionately male. However, as Miller (1989) points out, we know nothing about the role of

culture in musical savantism. For example, we do not know whether musical savants emerge in cultures with non-Western scale structures, and if so, whether their pattern of abilities resemble those in Western savants. Thus, the following discussion makes reference only to savants in the Western musical culture.

As with drawing prodigies and savants, musical prodigies and savants resemble each other in their pattern of skills. Like music prodigies, musical savants display signs in early childhood of musical giftedness. In fact, there are no known cases of musical savants whose talent has emerged after early childhood (Miller, 1989). The early signs of talent displayed by savants are identical to the signs shown by musical prodigies. Parents of autistic musical savants have noted that at the age of 1 or 2 their children could sing in perfect pitch and rhythm, and could sing many long and complex songs. These children show an intense interest in and emotional reaction to music at an early age. One child sat rapt, at the age of 3, through a 3 hour opera on TV, yet was unable to sit through one program of Sesame Street, showing extraordinary attentional abilities limited to the domain of music (Rimland, 1978). Another child was unresponsive to his environment but was drawn to music and, like Mozart, was easily disturbed by loud noises (Miller, 1989). These children have been reported to play many songs on the piano in any key by 3, and to pick out melodies on the piano from sonatas they had heard by the age of 4 (Rimland, 1978).

Like musical prodigies, musical savants all possess a phenomenal memory, able to play back faithfully anything they hear. Like artistic savants, musical savants produce works that are highly faithful to the physical stimulus (Rimland & Fein, 1988). The artist savant makes drawings that capture all of the details of the object represented; the music savant reproduces music from memory without missing a note.

Blind Tom, a famous example of a retarded musical savant, possessed a repertoire in memory of over 3000 pieces (Miller, 1989). Also, like musical prodigies (at least E. N.), savants have a memory that is not literal, but is sensitive to the structure of music (Miller, 1989). N. P., a 23-year-old autistic musical savant, was studied by Sloboda et al. (1985) and compared to E. N. and to a professional musician who had not been a prodigy. Like E. N., N. P. recalled familiar, diatonic music better than atonal music, and outperformed the professional musician in recall. However, when the piece was atonal, the professional musician showed better recall than the savant, presumably because he was more familiar with the structure of atonal music. This study provides evidence that the savant's memory for music is not mindless and eidetic: if it were, the savant should have shown superiority of recall regardless of the structure of the music. Musical savants appear to have the same kind of structure-preserving, structure-understanding memory for music as did E. N.

Musical savants more closely resemble their non-pathological counterparts than do savants in other

domains. For example, Miller (1989) contrasts musical savants, who have intact musical skill, to savants in calendar calculation and hyperlexia. Such savants have splinter rather than intact skills: calendar calculators cannot calculate outside of the calendar, and hyperlexics can decode print but cannot extract meaning from large units of texts. It is for this reason that one would not ever consider a calendar calculator to be a mathematician, nor a hyperlexic to be a superior reader (Miller, 1989). And savants in the visual arts are also quite different from their nonpathological counterparts in their lack of interest in the finished product. There are no obvious gaps in what musical savants can do with music. Hence, Miller argues that their music making is essentially indistinguishable from that of prodigies, especially from those with absolute pitch.

However, researchers including Miller (1989) have also pointed out ways in which musical savants differ from prodigies. First of all, unlike musical prodigies, most savants do not come from musical environments (Miller, 1989), suggesting little or no role for an environment which supports and nurtures musical talent.

Second, unlike musical prodigies, all musical savants have displayed their talent through the piano (Miller, 1989). Perhaps this is because the piano is in fact easier to play than wind or string instruments. The piano keyboard maps sound to keys digitally in one to one correspondence, so that one need not learn the subtleties of bowing and fingering required by string and wind instruments.

Third, unlike prodigies, savants all appear to possess perfect pitch (Treffert, 1989). Perhaps perfect pitch is what allows the savant, who lacks other conceptual skills, to grasp musical structure.

Fourth, the creativity of savants is more often limited to transposition and improvisation than to composition (Treffert, 1989), although some instances of genuine musical generativity have been reported by Hermelin et al. (1986). These researchers compared five savants to six children who were proficient on the piano, testing them for musical inventiveness (e.g., composing a new song, creating an accompaniment). On all tests, the savants were superior to the comparison groups. Thus, musical savants are not just extraordinary performers and imitators: they can also generate music, even if they have no "meta-cognitive" awareness of how they compose (Treffert, 1989). Hermelin et al. (1987) argue that, like savant artists who can access a representational store of images, savant musicians can access a representational system of musical rules and structures which enables them to invent music conforming to familiar structures. However, Hermelin et al. (1987) also admit that the musical savant's creativity is more limited than is that of the musical prodigy. Whether this is because creativity is constrained by IQ, or because savants do not experience the world in the same way as "normal" individuals and thus do not experience the full range and subtlety of human emotions, is not known. Certainly it is true that there are no world-class performers or composers who

are savants, suggesting that genuine creative artistry depends on more than an isolated island of skill, no matter how spectacular the skill within that island.

Fifth, it has been argued that savants play in a rigid manner devoid of expression and subtlety (Judd, 1988; Treffert, 1989). Such a position would be consistent with the early view that savants are incapable of abstraction, and are pathologically concrete (Scheerer, Rothman, & Goldstein, 1945). Their music has been called colorless, stereotyped, and mechanical. However, Miller (1989) strongly rejects the claim that savant musical performance is rote and without interpretation or comprehension. Instead, he argues that savants have much in common with normal musicians: they have strong emotional reactions to the music they play, they take delight in playing, and they have clear preferences for certain types of music over others. Finally, savants also differ from prodigies in that they do not reflect about their music (although Miller (1989) cautions that this could be due to limited language skills). Nonetheless, savant music has a nonreflective character to it, as shown in the speed of their responses to experimental tasks (Miller, 1989).

As in the case of savants in the visual arts, the existence of musical savants can be accounted for by Geschwind and Galaburda's (1987) theory of the pathology of superiority. As discussed earlier, research on normal subjects has shown that music is processed in the right hemisphere in musically naive individuals but that musically trained people, who use analytic strategies, may also use their left hemisphere for music (Bever & Chiarello, 1974; Mazziotta et al., 1983). Treffert argues that musical savants are probably using a nonanalytic, and hence right-hemisphere strategy when they play music. They typically play by ear, and are nonreflective about their music.

The fact that so many musical savants are blind is intriguing. One suggestion put forth by Treffert (1989) is that blindness may leave neurons to be recruited for other talents (much as deafness frees cells for visual purposes) (Neville, 1991). Such a suggestion would be entirely compatible with the pathology of superiority explanation. However, although the association of blindness, retardation, and savantism is too regular not to be causally connected, we do not yet know what the underlying cause is.

Children trained to draw in China, and Suzuki-trained violinists, can be seen as the mirror image of artistic and musical savants. On the surface, all three groups of children demonstrate exceptionally high ability. But for the Chinese-trained child artists and the Suzuki-trained child violinists, the ability displayed is simply the result of rigorous and early training which emerges despite lack of exceptional inborn talent. For the savants, the ability displayed is the result of exceptional inborn talent which emerges *despite* lack of training. In neither the "average-highly-trained" group, nor the savant group, do we find a population of future geniuses who will transform their respective fields. These are not the

children who become Picassos and Mozarts. Perhaps the genius of an adult Picasso or Mozart is the result of a blend of the inborn giftedness of the savant *without* the savant's pathology, along with the rigorous training of the Chinese drawers and Suzuki violinists.

Relation Between Early Musical Giftedness and Adult Musicianship

Great music is of course not only formally complex but also emotionally expressive. In this way, music and the visual arts stand apart from the two other domains in which one finds child prodigies: mathematics and chess. Because the domain of music is so complex and formally structured, the danger for child prodigies in music is that they may acquire skill without emotional depth. Emotional depth can only come with experience, and thus cannot be found in even the most prodigious child genius. The violin teacher, Dorothy Delay, demythologized the child prodigy by insisting: "Children are *never that good*. No matter what you say, a child can never play the way a 45-year-old musician can" (Winn, 1979, p. 41). Nonetheless, Revesz (1925) insisted that E. N. was not just a technical virtuoso as a child, but also played with expression and interpretation, and was able to criticize others' performances in terms of the performer's interpretation of the music played. Radford (1990, p. 102) notes the performance of Corey Cerovsek who at 14 was described by his conductor, Rudolf Barshai in these words: "His imagination is like an adult's. His style is that of an experienced artist." But, as Radford (1990) points out, it is deemed unusual for a prodigy to show such depth of feeling and understanding of the music he/she performs.

Children who go on to become adult musicians typically begin to connect to music in an emotional way during late childhood. If this does not happen, the child may stop playing. Isaac Stern explained, "The child must become possessed by music . . . It can happen at any time between the ages of 10 or so and 14. Suddenly the child begins to sense something happening and he really begins to work . . . At this point the prodigy begins to flower. It happened to me when I was 11." And the violinist Nathan Milstein stated, "I didn't like to play the violin when I was a child. I didn't love music. Few children do. But suddenly I changed because I started to love what I play, not just the playing" (Winn, 1979, pp. 40-41).

This deep emotional involvement in music seems to emerge around adolescence. At this age, musical prodigies go through a period of transition, a shift from precocity to more mature artistry. Here, according to Menuhin, is where many flounder, unable to make the bridge between sheer mechanical skill and personal, expressive style (Winn, 1979). It is at this age that Bamberger (1982) notes that a "midlife" crisis occurs (as discussed above), as adolescent prodigies begin to ask themselves why they are so involved in music,

whether they are simply fulfilling their parents' dreams, or whether this is what they themselves want to do.

This same adolescent transition from precocity to mature artistry was also discussed above in relation to the visual arts, when children begin to find their own personal voice (Gardner, 1980; Gordon, 1987). It is not until adolescence that children are able to express deep emotions in their art or music.

Conclusions

Children who are gifted in art or music do not necessarily become adult artists, musicians, or composers. In fact, most probably do not. When discussing artistically gifted children, the art historian Hartlaub commented that the promise of these "over-potential years of childhood is almost never fulfilled in adulthood" (Lark Horowitz et al., 1973, p. 190). As Bamberger (1982) points out, prodigies experience a "midlife" crisis at adolescence, at which point many give up working in their domain of gift altogether.

Even among those who weather this crisis and do not drop out, most do not become known as creative geniuses. This is not surprising, as there is no direct route from precocity to inventiveness. But of course a few prodigies do go on to change their respective domains. These are the ones who earn the epithet "creative" or even "creative genius." These are the individuals who, at adolescence or early adulthood, take a new stance. They begin to take risks; they challenge the establishment (Gardner, 1993).

In a study of seven creative geniuses, Gardner (1993) suggests that a certain degree of tension, or "asynchrony" is required for a prodigy to grow into an adult artist or musician/composer who would be classified as creative, or even as a genius. Gardner (in press) argues that creative geniuses differ from prodigies in how well the individual synchronizes with his or her domain as it currently operates within the society. The prodigy typically exhibits talents that fit well with a domain that is recognized by the society as important, and the skills of the prodigy are thus instantly recognized. In contrast, the creative genius often initially exhibits talents that do not fully fit within the domain in which the individual works, and which do not fit with the established tastes of the field (e.g., critics, gallery owners, conductors).

Of course, some individuals, such as Mozart, are initially child prodigies and later go on to become adults who transform their fields. As a prodigy, Mozart pleased the establishment. But it is only because of his later behavior, when he began to write music that was considered shocking, and which broke with established convention, that we now consider him to be a creative genius. The creative artist/musician takes risks, and breaks with conventions. The gifted child, or the child prodigy, does not. As Hurwitz (1983) points

out, gifted children have invested a great deal of energy in mastering a set of skills, and are often unwilling, or even unable, to experiment in the way that one must do in order to be creative.

Gardner's (1993) notion of "fruitful asynchrony" is compatible with Getzels and Csikszentmihalyi's (1976) notion of problem finding. In a study of art students, Getzels and Csikszentmihalyi (1976) found that the art students who went on to become recognized as creative artists did not differ from their art student peers in technical skill. Where they stood out was in their tendency and ability to find challenging problems. This problem finding mentality is reminiscent of Picasso, who delighted in posing difficulties for himself which he could then go on to solve (Richardson, 1991). Even as a child, he fought against what came naturally, insisting on setting up difficult drawing challenges for himself such as beginning a drawing from an odd starting point, or drawing a profile facing right when the opposite orientation is more natural for a right-hander (Richardson, 1991).

Sheer hard work also plays a role in determining whether a prodigy becomes a creative adult artist or musician or composer. The personality characteristics associated with success in any field may be drive, tenacity, and the willingness to overcome obstacles (Gardner, 1980, 1993). "I believe in nothing but work," said Picasso, who had tremendous energy and drive (Richardson, 1991, p.48).

Finally, historical and socio-cultural factors determine who becomes classified as an adult creator or genius. No individual or artistic work is inherently creative or not. Instead, creativity is an emergent property formed by an interaction among the individual's gift, the state of the domain at the time when the individual begins to exhibit talent, and the tastes and judgments of the field (e.g., critics, curators, publishers) (Csikszentmihalyi, 1988; Gardner, 1993 in press; Gardner & Wolf, 1988). There is a fair amount of serendipity involved in determining whether giftedness grows into creative genius. One needs, quite simply, to be born at the right time, at a time when the field is ready to recognize one's talents.

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Indicators of High Ability in Young Children

CHRISTOPH PERLETH

University of Munich, Germany

GERHARD LEHWALD

Institute for the Study of Human Environment, Leipzig, Germany

COLLEEN S. BROWDER

Center for Special Education, Munich-Unterschleißheim, Germany

Introduction

Approaches to Identifying Early Indicators of High Ability

One of the first complex studies designed to determine indicators of intellectual giftedness was carried out by Terman (1925) and his colleagues. The longitudinal investigation beginning in 1920 included 1528 school children having an IQ of 135 or above. Although one may criticize the Terman study for its lack of a control group, the selection procedure, and other reasons (e.g., Rost, 1993), the researchers did determine—retrospectively—several differences between their more gifted and less gifted children. The more gifted children were able to walk about one month earlier and their language development began about 3.5 months earlier than the less gifted children. In addition, approximately 50% of the children studied could read before entering school. Parental interviews suggested that these children could be characterized by rapid comprehension, insatiable curiosity, familiarity with things, excellent memories, large vocabularies, and an unusual interest in numerical relationships (Terman & Oden, 1947).

Following in the footsteps of Terman, giftedness researchers attempted to identify indicators which predict excellent performance in school or even in later life. In considering the promise of development, researchers have primarily worked on the following areas: sleep, habituation, memory, concentration or attention, information processing, and accelerated development in individual areas, etc. Most of the research was done in a retrospective way, i.e., questionnaires with possible indicators were given to the parents of gifted children and youth asking about interesting aspects of the (early) development. On the basis of these,

behavioral checklists (e.g., Renzulli & Hartman, 1971) were then constructed for early identification of gifted or promising children. This retrospective approach seems very problematic to us. A second unsatisfactory aspect is that the samples were frequently recruited in counseling centers.

When faced with the problem of identifying and fostering infant or early development of high ability today, it is apparent that the traditional approach of identification has become increasingly questionable. Tannenbaum (1992), for example, compared different studies of child prodigies. He demonstrated that the hope placed in such children by researchers, teachers, and/or parents was frequently misplaced. Feldman (1986) reported that six infant prodigies he had selected for their talents in chess, music, mathematics, painting, and omnibus abilities disappointed his expectations as early as school age. Only one of the six prodigies developed in a more or less continuous way. There is little evidence that an early unfolding of intellectual potential will lead to extreme giftedness in one or more areas as adults. In truth, the little research available on infant prodigies raises more questions than it answers.

As far as possible, this contribution will emphasize a developmental or prospective perspective. It will not take a retrospective approach about the developmental relevancy of cognitive abilities and personality traits of infant prodigies. Crook and Eliot (1980) showed that predictions of this sort are often faulty. A more fruitful approach is to prospectively examine indicators which can be used to predict the developmental course of gifted individuals. As Nancy Robinson (Chapter 27 in this volume) so aptly points out, however, the emphasis in literature on early development has been on central trends or on children with developmental problems. Therefore we have to include cross-sectional studies, too.

We will attempt to provide a concrete practical orientation in this chapter, focusing on indicators of high ability. We will begin with definitions of high ability as a theoretical framework for the chapter. Following the description of three approaches to defining high ability, we will focus on selected sets of indicators which are frequently cited in the literature: general psychometric measures, more or less stable components of the cognitive apparatus, including motivational characteristics, and also early expertise in selected fields of achievement. Following a discussion of psychometric instruments used with young gifted children, the following components of high ability will be reviewed: attention and habituation, memory capacity and durability, memory efficiency, sleep, knowledge base and strategies, strategy use, metacognition and executive control, causal attribution, and curiosity and interests. Later, indicators to do with specific areas of achievement such as language, numerical/mathematical expertise, or (precocious) reading and writing will be summarized. Finally, socialization variables influencing development of high ability will be discussed, primarily the question how certain social conditions, especially caretaker-child interactions can effect a child, fostering exceptional learning and cognitive abilities. Finally, the practical applications of the findings, as well as ages and domains where they are appropriate will be discussed. Related problems in the interaction of promise of development and its fulfillment will also be addressed.

The careful reader may notice that the majority of the research cited in this chapter stems from English-speaking countries or at least from research published in English. Obviously it is difficult to review books and journals from countries where you do not understand the language. But another reason for this is the lack of empirical research or at least the lack of data-based publications on early indicators of giftedness in wide parts of the world. The Soviet researcher Leites (1990), for example, does not refer to empirical research. The Munich-Moscow Study of Giftedness, conducted in 1990-1993, is the first empirical giftedness study in Russia which covers different areas of giftedness and achievement (Averina, Scheblanova, & Perleth, 1991). The German authors Stapf and Stapf (1988) or Urban (1992) do not provide the reader with evidence from empirical data (empirical data for German gifted children are available from the Munich Longitudinal Study of Giftedness conducted by Heller and associates, the Marburg Study of Giftedness conducted by Rost and coworkers, or Trost's study; none of these studies, however, cover the preschool age; see Heller, 1991b; Perleth & Heller, 1993; Rost, 1993; Trost, Chapter 17 in this volume). A Chinese group from the Institute of Psychology of the Academia Sinica conducted studies in gifted children including preschoolers. However, a Chinese publication from this group (Zha, 1990) does not include statistical results on the quality of early indicators of giftedness apart from the finding that the

gifted children outperform average ones in cognitive variables.

Early Identification and Early Nurturance of Highly Able Children

When considering early identification of children with intellectual gifts and talents, one question should always be asked: Is it necessary to identify such children before school age, or as some research (e.g. habituation and sleep studies) indicates as early as infancy? Here we are faced with a general problem of diagnosis. We must consider our objectives when determining and defining indicators of high ability. Obviously, during the preschool years, the primary goal should be the guarantee of optimal child development. Decisions about the nurturance of giftedness should be based on adequate diagnostic information about the status and prediction of personality development. Otherwise, talent development in a broader sense is unfeasible. Early developmental predictions are indispensable for educators dealing with preschool children as well as aiding the child psychologist. Some researchers (e.g., Clarke, 1984) assert that predictions about development made prior to the age of 4 are too unreliable and should not be made. However, the predictive potential also depends upon the level at which the ability was assessed (cf. Casey & Quisenberry, 1982; Sattler, 1988). In prospective longitudinal studies (Crook & Eliot, 1980), children rated as mentally retarded frequently showed spontaneous remissions or positive developmental trends. On the other hand, there is also evidence for unvarying problematic developmental courses (Weinert, 1984), supporting the position that reliable indicators are hard to find at an early age. In contrast, predictions of higher intellectual functioning of groups of children are more reliable and stable (Humphreys & Davey, 1988) although this finding is somehow trivial from the statistical point of view.

Clearly, however, the identification of high ability should be linked to specific suggestions for creating optimal learning conditions. By steadily enriching knowledge, nurturing strategies, and motivation in social interactions, we can hope to aid in making "temporary" developmental advantages permanent.

Models of High Ability

In this chapter, our understanding of high ability or giftedness are those capacities and competencies found in the infant and child which are relevant for academic learning processes. We, therefore, do not subsume constructs such as musical or psychomotor giftedness under the term high ability, but view this, as Campione, Brown, and Ferrara (1982) expressed, as: "the ability to perform well in schoollike and testlike situations"

(p. 392). In the following, we will therefore only deal with a segment of that which makes up modern conceptions of giftedness (e.g., Tannenbaum, 1983; Gardner, 1983; Perleth, Sierwald, & Heller, 1993).

Traditional Psychometric Approaches

Traditional approaches to intelligence and giftedness continue to play the most important role in the research about and fostering of gifted children. These include psychometric measures, especially intelligence tests, which are the most often employed instruments for identifying gifted children in research and everyday practice. The most widespread tests are—with very few exceptions, e.g. the German Rasch-scaled test for “Adaptive Intelligence Diagnosis” by Kubinger and Wurst (1988)—based on formulae of classical test theory (e.g., Lord & Novick, 1974).

The background of these aptitude tests are Spearman’s (1904, 1927) theory of general intelligence, Thurstone’s (1931, 1938) theory of multiple intelligence factors, or Cattell’s (1957, 1963, 1965) two-factor theory of intelligence. Broadly applied tests related more or less to these theories (in many cases no explicit reference to a special theory of intelligence is made) are the Stanford-Binet (Thorndike, Hagen, & Sattler, 1986), the Wechsler tests (WPPSI and WISC; Wechsler, 1974, 1989), Raven’s Progressive Matrices (1983, 1986), etc. The Cognitive Abilities Test by Thorndike and Hagen (1987) is an example related to the theory of multiple intelligence. In addition, tests of specific abilities such as the Peabody Picture Vocabulary Test (Dunn & Dunn, 1981) are in use, and, in very young infants, developmental tests like the Bayley Scales of Infant Development (Bayley, 1969) are employed for the assessment of aspects of (cognitive) development.

Information Processing Approaches

In the framework of psychometric intelligence theories, primarily the relationship of various dimensions of intelligence as well as the concurrent and predictive validity of the tests is important. On the other hand, information processing or cognitive approaches aim at identifying and analyzing the components and processes which interact when cognitive tasks are solved (Pellegrino & Glaser, 1979; Waldmann & Weinert, 1990).

Frequently cited cognitive or information processing models of intelligence are those of Sternberg (see Chapters 8 and 12 of this volume) and Campione and Brown (1978; see also Borkowski & Peck, 1986) or Campione et al. (1982). Whereas Sternberg’s model certainly initiated fruitful research in the area of giftedness (Shore & Dover, 1987), the Campione and Brown model seems useful for classifying some often cited early indicators of giftedness, despite the fact that this model was originally derived from research with retarded children.

In the Campione and Brown model (1978; see also Campione et al., 1982; Borkowski & Peck, 1986) the “architectural” level, i.e., the “hardware” of the cognitive apparatus, comprises a three-storage space memory model (sensory register, short-term memory STM, long-term memory LTM; for summary see Wessells, 1984). The characteristics of these entities, i.e., their capacity, duration, and efficiency, do not underlay developmental processes. Therefore, they are neither changeable nor trainable. Under the term capacity, Campione and Brown (1978) understand the number of entities that can be stored in the STM or LTM.

The speed of information processing and retrieval represents the operative efficiency of the system. While capacity and duration are—according to the authors—not related to intelligence, the efficiency is regarded by Campione et al. (1982) as a determinant of intelligent behavior. Other authors (e.g., Jensen, 1969) put this speed of information processing in the center of their theoretical conceptions of intelligence. These and similar conceptions of intelligence refer directly to the unchangeable hardware properties of the cognitive apparatus.

The higher “executive” system in Campione and Brown (1978) is made up of the following components: (a) The knowledge base in which the whole world knowledge of the child is organized and represented, whereby the knowledge can be regarded both as a symptom and as a determinant of extraordinary achievement. Further components represent (b) rules and strategies and (c) metacognition/metamemory (knowledge about strategies, knowledge about the task, knowledge about characteristics of one’s own cognitive apparatus) and executive metacognitive control processes. The latter are used as metacognitive components in the regulation in memory tasks (see also Borkowski & Peck, 1986), processes of comprehension, or in problem solving. These components of the executive level which are considered, for example, to strongly influence memory performance, underlay “dramatic development” processes (Campione & Brown, 1978, p. 284), and can also be improved by training measures.

Borkowski (1985) modified Campione and Brown’s (1978) classification of the components of the executive system. He distinguishes (a) the knowledge base which contains the (declarative) world knowledge as well as (procedural) strategies, (b) schemas in the sense of Piaget, (c) control processes in the sense of Brown (1978, 1984), and (d) metacognitive knowledge in the sense of Flavell and Wellman (1977) or Flavell (1984). In many studies, however, the differentiation between metacognitive knowledge and control processes is problematic; the latter is very difficult to assess in any case.

Training was put in the center of the discussion by Campione and Brown (1978) or Campione et al. (1982). According to these authors, intelligence can be simply defined “in terms of speed of learning and/or breadth of transfer” (Campione et al., 1982, p. 436). In this context, concepts such as the learning potential (e.g., Feuerstein,

1980) or the zone of proximal development in the sense of Vygotsky (e.g., Day, 1983) have to be discussed (see also Guthke, 1974, 1992).

A second information processing model which seems to us to be appropriate for promoting research in gifted children is the comprehensive "Good Strategy User Model" (e.g., Pressley, Borkowski, & Schneider, 1987; Schneider & Pressley, 1989). In this model, task-specific and task-related strategies make up a fundamental part (for example, memory strategies like clustering, rehearsal, or the use of mnemonics). Good strategy users have huge metacognitive knowledge reserves about the rules of these specific strategies. In comparison with average learners, good strategy users also know about general strategies which support the efficient use of cognitive strategies. By this, the authors mean, for example, processes for directing one's attention, processes for examining how successful a strategy was in task solving, or simply the knowledge that strategy use is profitable and one must exert oneself in order to be successful.

The non-strategic knowledge base which includes the child's whole world knowledge is regarded as an element of major importance in the Good Strategy User Model. Along the lines of Pressley et al. (1987), broad world knowledge, in particular, enables the child to detect similarities between different tasks; this can be regarded as an essential prerequisite for strategy transfer to new task contexts (Schneider, 1989). Other determining parts of the Good Strategy User Model are work styles (reflexivity, impulsivity, anxiety) and motivational variables (self-concept, causal attribution). All these components interact with each other.

Achievement Oriented Approaches

A third approach for investigating gifted children is represented by the expert–novice approach (see Schneider, Chapter 16, this volume, who summarizes theories of acquisition of expertise and reports on experimental findings). In this research paradigm, the special abilities or skills of young experts, prodigies, or precocious children are investigated. Fields of interest for research on the gifted are early reading/writing, mathematics, music and arts (see Winner, Chapter 14, this volume), and so on. As many areas of infant and child expertise are covered by other chapters in this volume, we will concentrate on the promise of early reading and writing, precocious language development, as well as of extraordinary mathematical skills.

Methodologically, research using this approach compares young experts in a specific domain with average children who do not possess the skills under investigation, or to a lesser extent. One research question is to analyze what precocious children do when solving tasks, so that aspects of the cognitive component and the cognitive correlates approach are touched upon. The other question is whether intellectually precocious

children will maintain their advantage in later school years so that these extraordinary skills can be used as early indicators of high ability.

Identifying Young Gifted Using Psychometric Methods

Psychometric instruments for the assessment of high ability or rather intelligence are broadly used in research and practical attempts at identifying and nurturing gifted children. Nevertheless the psychometric approach in identifying the young gifted is crucial: We know from research with "normal" samples that we cannot assume either high reliability of intelligence tests nor stability of measured traits in preschool children (see Sattler, 1988, for a comprehensive review). The following short descriptions of different tests focus on test properties which are most important for identification of gifted children: above all reliability, norms, and predictive validity. Especially with regard to the latter, we have to face the fact that nearly no longitudinal studies have been conducted which followed preschool and early elementary school children for a minimum of several years to analyze possible indicators and determinants of giftedness and achievement. The volume by Subotnik and Arnold (1993) on newer longitudinal studies of giftedness, for example, lists only three projects which investigated the development of giftedness in young children (younger than 8 or 9 years); one of these is limited to the musical domain, a second to the evaluation of a gifted program, and only the third one covered a broad area of giftedness factors and achievement areas (Perleth & Heller, 1993).

Tests of "General" Intelligence

Although newer conceptions of giftedness or intelligence more frequently make use of multidimensional models, the tests generally used in the identification of gifted children represent measures of general intelligence subsuming verbal, mathematical, figural, memory, and other tasks in one or few global scores. While such a procedure can be criticized when applied to youth and adolescents, it can be considered less problematic in young children because factor analytic research seems to show that the structure of intelligence becomes more differentiated with increasing age. Therefore, multidimensional tests such as the Cognitive Abilities Test series (Thorndike & Hagen, 1987; German version: Heller & Geisler, 1983) also offer only a global intelligence score for young children. In the following we provide an overview of the intelligence tests most frequently used with young gifted children including information available on their reliability and predictive validity in this population. See Sattler (1988) for a comprehensive critical overview of intelligence tests

available in English-speaking countries (also Feldhusen & Jarwan, Chapter 13, this volume).

STANFORD-BINET INTELLIGENCE SCALE

The Stanford-Binet Intelligence Scale: Fourth Edition (SB:FE) by Thorndike et al. (1986) is the current version of the Stanford-Binet intelligence test originally developed by Terman on the basis of Binet and Simon's scale (see Binet, 1905). The SB:FE is the successor of the 1960 Stanford-Binet: Form L-M (SB:L-M) for which new norms were published in 1973 by Thorndike. These 1973 norms were used for much of the research reported in this chapter. According to the very informative manual by Thorndike et al. (1986), the new SB:FE provides the examiner with an overall score for general intelligence which is composed of three dimensions measuring crystallized abilities, fluid abilities, and short-term memory. The crystallized abilities contain two scales for verbal and quantitative reasoning, while fluid abilities are made up of items of abstract/visual reasoning. The test can be used with children from the age of 2 years.

Since Terman (1925) used the Stanford-Binet (SB) in his classical giftedness study, the SB is still very popular in the field of giftedness research and practice. Many authors stress that the SB differentiates better in the extremely high range of intelligence. This additional advantage could be concluded from the fact that the norm tables provide values up to IQ 170 (e.g., Freeman, 1979). In our view, this is too optimistic for the following reasons. First, the standard deviation (*SD*) of the SB is 16 so that in comparison with the "normal" IQ-scale (mean: $M = 100$, $SD = 15$) the SB provides slightly higher values. A SB-IQ of 130, for example, is equivalent to an IQ of 128 measured by a Wechsler test (see next paragraph). Second, the standardization samples of the older version SB:L-M as well as the current SB:FE are much too small to calculate IQ scores above 130 (see below).

To judge the predictive validity of the SB for gifted children, the classical study by Terman and Oden (1959) is often cited. These authors discovered a good concordance between childhood and adult IQ scores. Interpreting this, however, you must take into account that Terman (1925) did not begin his study solely with young children but with 4- to 14-year-olds (median between 9 and 10). Kangas and Bradway (1971) report for the preschoolers of the 1937 standardization sample of the SB correlations of $r = .59$ and $r = .41$ with SB-scores measured 25 ($N = 109$) and 38 years ($N = 48$) later.

Willerman and Fiedler (1974, 1977) analyzed children from the Collaborative Perinatal Study in which Boston children born between 1958 and 1966 were included. These children were given the Bayley Scales of Mental Development at age of 8 months, the SB at 4 years, and the WISC (see below) at age of 7. In Willerman and Fiedler's (1977) sample of gifted children only a correlation of $r = .33$ was found between the SB and the

WISC full scale, and even lower relationships between the SB at 4 years and the scores of an achievement test at age of 7. The general decrease in the intelligence scores from age 4 to 7 can be explained by the non-equivalent norms of the SB L-M and the WISC. Interpreting the low correlations, one should remember that Willerman and Fiedler (1977) did their research on a sample with gifted children only. Thus, the reduced variances of tests and criterion variables might be regarded as one cause for the weak relationship.

Robinson (1987) reported a retest correlation of $r = .75$ for gifted preschoolers assessed at age 2 and 6 ($N = 16$), $r = .59$ between children of age 3 and 6 ($N = 117$), $r = .61$ between age 4 and 6 ($N = 74$), and $r = .71$ between age 5 and 6 ($N = 25$). Although Robinson (1987) judges these results as "relatively low" (p. 162), they show in our opinion that intelligence as measured by the SB is a relatively stable trait even in the preschool age.

Shapiro, Palmer, Antell, Bilker, Ross, and Capute (1989) tried to predict WISC-R IQs measured at age 7½ (a sample of 200 children containing 36 gifted) with developmental indicators assessed at 7–12 months and SB:L-M scores evaluated at 3 years. While the correlation between the SB-scores and the WISC-R were medium at least for the WISC-R full-scale ($r = .53$), it was not possible to predict giftedness at age of 7½ with the SB in a discriminant analysis. The results were not better for the other indicators in the study. The authors conclude that "the expectation for precocious infants to become precocious children, while appealing, is not supportable" (Shapiro et al., 1989, p. 209).

Sometimes short-form versions of the SB as, for example, the Slosson Intelligence Test (Slosson, 1961, 1981; the test also includes some items from other tests) are used. In some studies these forms turned out to perhaps be appropriate for screening purposes (e.g., Tomsik & Rankin, 1985, who compared selection effects of the 1961 and 1981 restandardized versions; McCallum & Karnes, 1990, who found good concordance between the complete and brief form of the SB:FE) while other authors judge the Slosson as improper for that purpose (e.g., Bondy, Constantino, Norcross, & Sheslow, 1984). Hagen (1989) argued that it is, especially in primary school children, preferable to use a standardized group test for screening instead of short versions of individual tests with unknown statistical properties (although Thorndike et al., 1986, recommend several brief forms in the SB:FE manual).

WECHSLER INTELLIGENCE SCALE

The Wechsler Preschool and Primary Scale of Intelligence (WPPSI) (Wechsler, 1967; the revised WPPSI-R was published in 1989) and the Wechsler Intelligence Scale for Children—revised (WISC—R) (Wechsler, 1974) are the second most widely used intelligence tests in gifted children following the Stanford-Binet. The tests measure "the aggregate or global capacity of the individual to act purposefully, to think rationally

and to deal effectively with his environment" (Wechsler, 1958, p. 7). In consequence, the most frequently used indicators derived from the tests are the total score and the global scores for the verbal and performance scale. Although there have been some studies of the factor structure of the test (see Sattler, 1988, for a comprehensive overview), alternative scores or the profile are seldomly used for scientific or practical purposes.

As in the Stanford-Binet, the Wechsler scales have been shown to be sufficiently reliable and valid for the assessment of general intelligence. A problem, however, might be the fact that the norms of the WISC-R and the old WPPSI (about 200 children in each age group) are rather old, although the mean IQ scores of the new SB:FE composite IQ scores is only a little lower than those of the WPPSI full scale (difference: 5 points; verbal scales of both tests differ only by 0.5 points) or those of the WISC-R full scale (difference: 2.8 points; verbal scales of both tests differ only by 1.6 points) (Thorndike et al., 1986). Schneider and Gervais (1991) argue that the WPPSI-R is more realistic in identifying gifted children than the WPPSI.

A major problem in using the Wechsler test for studying gifted young children occurs when longitudinal research is planned. The WPPSI(-R) covers an age range from about 4-6;6 years while the WISC(-R) is constructed for 6-16;6-year-olds. As the WPPSI(-R) does not contain all subtests of the WISC(-R) and the two tests overlap only for the 6-month period between 6 and 6;6 years, it is problematic to switch between the two tests. Sattler (1988) questions the general interchangeability of both scales. In addition, over ten years lay between the gathering of the norms of the WISC-R and the WPPSI-R.

Hawthorne, Speer, and Buccellato (1983) judge the WPPSI as not appropriate for the identification of gifted children because of ceiling effects in nearly all subtests. In half of the subtests, the criterion to discontinue the test was not reached at all for two-thirds of the children with an IQ above 120. Woo-Sam and Zimmerman (1973) remarked that the WPPSI should not be abbreviated because the individual differences between full-scale score and short form are too large, although abbreviation formulae might work properly for group means.

As mentioned above, Schneider and Gervais (1991) examined the possibility of identifying gifted kindergarten children with the WPPSI-R as an individual test following two short screening tests. The results of the study indicate, as interpreted by the authors, that this procedure is useful as a part of a multimethod identification approach but that it should not be the only method for identifying young gifted children.

From their factor analytical findings, Schneider and Gervais (1991) conclude that the verbal and nonverbal part of the WPPSI-R should be considered separately. A similar suggestion is made by Brown and Yakimowski (1987) for the WISC-R although their method of using

the factor analyzed WISC-R results for the definition of the giftedness groups are highly problematic.

Tests of Specific Abilities

MCCARTHY SCALES OF CHILDREN'S ABILITIES

The McCarthy Scales of Children's Abilities (McCarthy, 1972) are individually administered intelligence tests for children from 2;6 to 8;6. They provide information about verbal abilities, nonverbal reasoning abilities, number aptitude, short-term memory, and coordination. Norms for a composite score as a measure for the so-called General Cognitive Index of the test person are also available. The fact that the standardization samples of the age groups contain only 100 children each, however, limits the differentiating power of the test in the upper (and lower) range of intelligence, although reliability and validity of the test can be judged positively.

KAUFMAN ASSESSMENT BATTERY FOR CHILDREN

The Kaufman Assessment Battery for Children (K-ABC) (Kaufman & Kaufman, 1983) can be used with children from 2;6 to 12;6. The four scales available give information on the sequential and simultaneous information processing, the child's factual knowledge and skills (so-called Achievement Scale), and nonverbal reasoning abilities (score composed of subtests from the sequential and simultaneous processing scales). The K-ABC was normed with 200-300 children for each age group. The reliability of the test is as sufficient as those for the SB or WPPSI/WISC-R, the validity with regard to the underlying information processing model of intelligence seems unclear (see Sattler, 1988, for a critical review of the test).

Swanson, Brandenburg-Ayres, and Wallace (1989) investigated the construct validity of the K-ABC in children from gifted classes ($N = 169$). They found a factor structure of the test which differs from the one reported for normal children in the manual. In the sample of Swanson et al. (1989) a hierarchical model was established by exploratory factor analysis. The model subsumed a verbal memory, nonverbal memory and nonverbal reasoning factor under a (weak) factor of general intelligence. Therefore, the usual K-ABC factor structure supporting the model of simultaneous and sequential processing was not confirmed for gifted children. From the methodological point of view, however, it has to be stated that the intercorrelations between the K-ABC subtests were very low (with the exception of one correlation all coefficients were between $-.18$ and $.22$).

With respect to the test fairness of the K-ABC, Nolan, Watlington, and Willson (1989) could not find indications of a systematic bias in the K-ABC items against

gender and race (black and white children) in gifted and nongifted children (using the standardization sample of the test). This confirms the results of McCallum, Karnes, and Edwards (1984) who found hints that the K-ABC is more suited for the identification of minority children than the WISC-R or the SB.

TESTS OF NONVERBAL REASONING ABILITIES

The Progressive Matrices (Raven, Court, & Raven, 1983, 1986) measure nonverbal reasoning abilities (inductive reasoning) without verbal, quantitative, or memory aspects. Therefore they are sometimes classified as tests for general intelligence in the sense of Spearman (Heller & Perleth, 1991). The Colored and Standard Progressive Matrices are available for the purpose of assessing intelligence in gifted young children. They cover an age range of 5–11 and 6–17 years, respectively. The fact that there are no verbal items makes the tests attractive for the assessment of children from minority groups or risk groups (e.g., foreign children, children from underprivileged families and so on). Götzlü (1986) showed that for Turkish children living in Germany, the language of instruction, the language of the test instruction (German and Turkish), and the children's knowledge of each of the languages do not produce significant interaction effects on the test scores in this type of test.

PEABODY PICTURE VOCABULARY TEST

The Peabody Picture Vocabulary Test—revised (Dunn & Dunn, 1981) is—in spite of its exclusively verbal character—sometimes used as a screening test for the selection of gifted children (see Hayes & Martin, 1986). Norms (based on 200 children in each age group) are available from 2½ years on to adulthood. Sattler (1988) judges the reliability and validity as sufficient, but warns, however, against the use of the PPVT-R as a “screening device for measuring intellectual level of functioning” (p. 350). Bracken, Prasse, and McCallum (1984) give an overview of research available on the PPVT-R.

Similar to Hayes and Martin (1986), Tarnowski and Kelly (1987) doubt the effectiveness of the PPVT-R as a screening instrument with the SB as the criterion for intelligence. In both articles the authors state that there are many misclassifications especially in the upper range of intelligence. Whereas we would warn against using the PPVT-R as a (screening) instrument for identifying gifted children, we would not do this on the basis of the data from the two studies (as the norms of the SB L-M provide inflated IQ-scores), but we would deduce this from the exclusively verbal character of the test.

Developmental Tests

As the intelligence scales described above are not available for very young infants, developmental scales such as the Bayley Scales of Infant Development (Bayley, 1969)

are sometimes used for the estimation of the cognitive level of gifted children. The Bayley Scales, from which an index for mental development can be derived, for example, can be applied from 2 months to 2½ years of age. In this age, however, the course of development is inter- and intraindividually very unstable—and thus the use of these scales is questionable for the detection of early signs of giftedness.

Willerman and Fiedler (1974) found no significant and substantial correlations between Bayley results gained with 8-month-old children and the SB-IQ assessed when the children were 4 years old. Following the sample further on, Willerman and Fiedler (1977) report that the Bayley results, in consequence, did not show any relationship to WISC-IQ scores measured in the children of the sample when they were 7 years old.

The above-cited longitudinal study of Shapiro et al. (1989) started with recording of developmental milestones in newborn children. At 13 months of age, children were administered the Bayley test. As mentioned above, the SB L-M was given at 3 years of age, although WISC-R results were collected when the children were 7½ years old. While the Bayley scale index for mental development correlated modestly but significantly ($r = .29$) with the WISC-IQ, the Bayley scores were not successful in predicting later giftedness in discriminant analysis.

Thus, the results of the prospective studies reported here indicate that developmental indicators of early infancy are not appropriate for prognosis of later intelligence or ability in gifted children. The overview by McCall (1979) for normal children shows that higher correlations could be obtained with children older than 18 months because in the first month the developmental tests assess sensorimotor more than cognitive functioning (Sattler, 1988; Shapiro et al., 1989).

Comparison of Different Measures and Problems Related to the Psychometric Approach

Nearly all studies in gifted young children employ tests of cognitive functioning. The results of these tests are, on the one hand used as indicators of intelligence, high abilities, or giftedness itself, on the other hand, if an alternative definition of giftedness is used, intelligence or abilities tests are used as reference variables, e.g., to make the samples of different studies comparable. There are several problems to be regarded if the psychometric approach is used in giftedness research.

As was mentioned above, many practitioners and researchers look for tests which provide them with differentiated norms in the upper extreme. Concerning the SB, the SB L-M is therefore sometimes preferred to the newer SB:FE because of better discrimination in gifted children (Kitano & DeLeon, 1988). A similar argument was, for example, expressed against the K-ABC by Roberson (1988, cited by Storfer, 1990). In our opinion, this seems to be an unrealistic expectation.

The 1973 standardization of the SB was done on the basis of about 2100 testees, the one of the SB:FE on the basis of about 5000. This means that, on the average, the norms for each age group were computed on the basis of only 100 or 300 persons. In samples of that size, you find on the average 2 or 6 persons with an IQ higher than 2 standard deviations (*SD*) from the mean (*M*), and you probably find no person with an IQ higher than $M+3SD$ (i.e., SB-IQ > 148). To be sure that a sample contains 10 gifted persons with an IQ over $M+2SD$ (SB-IQ > 132) you have to collect a representative sample of $N = 438$. In order to find a single person with an IQ higher than $M+3SD$ (SB-IQ > 148), respectively $M+4SD$ (SB-IQ > 164) on the basis of the deviation IQ you need a sample of 741 and 31,546 persons respectively. These examples show that it is not at all realistic to gain valid IQ-scores that are able to finely differentiate between persons with an IQ higher than $M+2SD$ (SB-IQ > 132, Wechsler-IQ > 130). Thus, norm tables that provide you with such extreme values are constructed on the basis of random extrapolation and smoothing but not on the basis of empirical data of representative samples.

The preference of many giftedness researchers to be able to differentiate in the IQ range over $M+2SD$ (SB-IQ > 132) seems to be a relict of the former ratio-IQ concept when IQs were computed by the formula $IQ = (\text{mental age MA})/(\text{chronological age CA}) \times 100$. This way a 5-year-old child (MA = 5) that was able to solve problems which an average 8-years-old could solve (CA = 8) scored an IQ of $8/5 \times 100 = 160$. But this ratio-IQ has statistically nothing in common with the modern deviation IQ, which is primarily defined by the mean and standard deviation of the standardization sample and which is used by all important well-constructed intelligence tests presently available.

As a consequence, profile analysis with gifted children is in most cases very difficult or even impossible as these children may score beyond the ceiling of the subtests. Reynolds and Clark (1986) propose a procedure with the help of which the subtest scores can be restandardized intraindividually using the norms of older children or those from higher grades and thus making profile analysis possible. Prerequisite for this is that age or grade norms of the test are available and the reliabilities and the structure of the subtests across age or grade are the same.

There is a great deal of evidence that there has been a shift in the mean IQs of children and adults. Flynn (1987; see also Storfer, 1990) reviewed research available for fourteen nations and reported massive IQ gains for countries all over the world. Analyzing data gathered from the thirties to seventies, Flynn (1987) found IQ shifts between 5 and 25 points within one generation. This means that a performance which would have been enough to get into a sample of gifted in the past would not be sufficient 10 or 20 years later or today. With current norms of a test, an objectively higher knowledge or ability is needed to be included in a gifted sample today.

There was a shift in the IQs from the SB L-M of about 10 points from the 1960 to the 1973 norms (see e.g., Roedell et al., 1989). As can be read in the SB:FE manual (Thorndike et al., 1986), a sample of gifted individuals which was administered the SB L-M and the SB:FE scored 13.5 points higher on the 1973 SB L-M than on the 1986 SB:FE (similar results are reported by Robinson, Dale, & Landesman, 1990). With respect to the other tests, the SB:FE manual contains information that children classified as gifted by their schools reached a mean composite IQ of 123.2. In comparison with the WISC-R full scale score, the SB composite score turned out to be slightly lower (1.4 points), while children scored even lower in the K-ABC composite score than in the SB:FE (4.7 points). As can be seen from Thorndike et al. (1986), the differences are smaller for samples of individuals with average ability.

The findings from Thorndike et al. (1986) on mean differences between the SB L-M, the SB:FE, the WISC-R, and the K-ABC were confirmed by McCallum et al. (1984) who reported that gifted children score lower on the K-ABC than on the WISC-R or the SB L-M. With respect to the PPVT, Knoff and Blednick (1986) found a difference of more than 10 points between the older PPVT and the newer PPVT-R, while in a study by Bondy et al. (1984) gifted children scored 8–20 IQ points higher in the Slosson test than in the McCarthy test.

Results of such studies are of major importance for giftedness practice and research as severe consequences for recruited samples of gifted children are related to the question of which test and which norms were used. If the IQ shift between the SB L-M and the SB:FE is 13 points in the upper extreme, a gifted sample gathered using IQ > 132 using the old SB L-M in 1985 does not contain the top 2% of the population but the best 10%.

Apart from the problem of the test norms, comparing samples recruited by different measures of intelligence requires "comparable" instruments. The question of concurrent construct validity, however, is difficult to solve for gifted children. For average, heterogeneous samples, Thorndike et al. (1986) reported high correlations between the SB:FE and the WISC-R ($r = .83$), the WPPSI ($r = .80$), as well as the K-ABC ($r = .89$). This is even higher than the correlation between the SB:FE and the SB L-M which is $r = .81$, these correlations are necessarily lower with gifted samples because of the reduced variance in such samples (Perleth & Sierwald, 1992). McCallum et al. (1984), for example, reported a correlation of $r = .5$ between the WISC-R and the K-ABC for gifted samples. For a sample of 82 gifted primary school students, Thorndike et al. (1986) found a correlation of only $r = .26$ between the SB L-M and the SB:FE which has to be explained by reduced variances and invalid IQ scores in the extreme upper range of the SB L-M.

Modern approaches in constructing measures of cognitive functioning—apart from the further development of traditional, well-accepted tests—can be described by at least three important trends (see also Heller, Chapter

3 in this volume). First, the results of the information processing approaches are used to establish measures for components of intelligence. The K-ABC may be given as a first illustration of this, (other examples are presented by Sternberg or Ruppell, see Sternberg, 1991; Ruppell, 1992). These are, however, more concerned with older children and adults and less with young children.

The second trend refers to the placing of training and transfer in the center of theories of intelligence. Using a pretest-treatment-posttest design, Guthke (1974, 1992) began in the sixties to develop so-called learning tests which assess the "learning potential" of the child in the sense of Vygotsky's theory of zone of proximal development. Later, a similar test-teach-test approach was developed independently in the Anglo-American countries under labels such as dynamic assessment or learning potential assessment device (Feuerstein, 1980; see also Campione et al., 1982; Day & Hall, 1987). The ideas common to both the German and the American tradition is the assessment of the level a child can achieve given ideal teaching or the advancements than can be obtained through training. Although tests of this type were used as standard measures of intelligence since the late seventies, this approach, however, has produced no instrument which can be employed in the assessment of intelligence in gifted children. Some applications, however, especially in underprivileged, very young, or extremely anxious children, seem to be on the verge of a breakthrough (Guthke, 1992).

A third trend is the development of adaptive or tailored tests. If tests of this kind are given to children, the children work only on these items that are best suited to measuring their ability. This means that gifted children only complete rather difficult items whereas retarded children are given the easier items. This normally necessitates computer-aided testing. With the help of probabilistic test theory, ability parameters for each child are available and comparable, even if completely different subsets of items are administered to every child (Weiss, 1983; Embretson, 1985). For German-speaking countries, Kubinger and Wurst (1988) presented a paper and pencil test for adaptive intelligence diagnosis (AID) which is already widely used. In this test, it is not the single items but blocks of items which are tailored according to the ability of the child (principle of branched testing). Following a concept similar to the WISC-R, the AID enables the measurement of intelligence in gifted primary school children with good precision.

With regard to the question of the extent to which later (superior) performance can be predicted on the basis of tests administered during preschool and early school years, we have to state that no precise answer can be given based on the presently available (or rather lack of) empirical evidence. There are too few prospective studies or at least combined longitudinal-cross-sectional studies which could provide practitioners and researchers with respective data.

In general, the abilities measured by intelligence tests

are quite unstable in preschoolers. While Sattler (1988) found a correlation of $r = .5$ from 7 to 8 years of age with youth and adult intelligence and achievements, the same author states: "The older the child is when first tested and the shorter the interval is between tests, the greater the constancy of the IQ" (p. 73). Thus, IQ scores measured prior to 5 years of age must be interpreted cautiously. Fluctuations of as much as 20 IQ points are possible, even if the oscillation of the IQ for the majority of children is lower after age 5 (Sattler, 1988). The same holds true for the relationship between intelligence and achievement (which can be moderated, for example, by external factors).

In view of this state of the art, further evaluation of relatively well-known tests in samples of gifted children are preferable to the construction of new instruments for identifying young gifted children. As the example of Mardell-Czudnowski and Goldenberg (1990) shows, even theoretically well-founded systematic measures can fail to show any (predictive) validity with respect to achievement measures.

It is our opinion that practitioners and researchers should be skeptical of too much optimism about the possibility of predicting high ability and high achievement from early age. According to Howe's (1990) critical summary on research which investigated the predictive validity of intelligence tests (in most studies administered to older children and youth) for real life achievement, prognoses must be made with extreme caution. Also considering the results from the Terman study, Howe (1990) concludes that "such tests are especially ineffective at making predictions that concern the achievements of individuals who are highly able" (p. 202).

Information Processing of the Young Gifted

The subsequent section follows the outlined information processing model of intelligence presented above. Since parameters of information processing in newborn and infants are measured primarily in habituation studies, we have included a subsection on this. We have also included a section on sleeping behavior under the topic architectural level as this is frequently reported as an important early indicator of giftedness, especially in German-speaking countries. Possible links of sleep parameters to giftedness have to be on this "hardware" level. With concern to the higher order components, we summarize knowledge base and strategies as declarative and procedural knowledge on the one hand and strategy use, metacognition, and executive control on the other hand.

Architectural Level

ATTENTION AND HABITUATION

As infant intelligent tests have little predictive validity, researchers have turned to other areas promising better

results. Indeed it would seem that cognitive functioning makes great developmental leaps during the first two years of life. In habituation studies, a stimulus (generally a visual one) is repeatedly presented until the subject ceases to attend to it. In the literature there is a discussion in progress about how such habituation phenomena should be interpreted. The length of time the subject spends on the stimulus could diminish because the processing of information has been completed or because interest in the stimulus decreases due to ineffective information processing.

Typically, infants placed in otherwise homogenous environments will orient and attend to a novel stimulus. This attention will diminish if the stimulus is presented continuously or repeatedly. Bornstein (1988) explains habituation using a two-component process. The infant develops a mental image of the stimulus and continually compares the mental image to the stimulus presented. A representational match will not hold the baby's attention, but mismatches maintain it.

From our point of view, it is important that habituation studies have linked intelligence or cognitive functioning to early habituation results. Lewis and Brooks-Gunn (1981) view habituation to redundant information and recovery when stimulus is changed as perceptual-cognitive ability or information processing. These are abilities which can be examined even in very young infants. The developmental theory upon which their research is based assumes that different skills develop at different ages and "those central to a specific age group are most likely to be predictive of the next major skill, even though the next skill might be quite different from the preceding one" (Lewis & Brooks-Gunn, 1981, p. 132).

To put it briefly, cognitive ability is a transformation of skills from one age level to another. The research of Lewis and Brooks-Gunn (1981) did, in fact, provide a better prediction of intellectual functioning at 24 months (Bayley scores) from 3-month habituation/recovery than 3-month (Bayley scales) global intelligence or object permanence scores. Their research results are also supported by Bornstein and Sigman (1986), who showed that attention focusing at 6 months may be used as a predictor of subject's IQs between 2 and 8 years of age, and Rose and Wallace (1985), Fagan and McGrath (1981), and Fagan and Singer (1983) also discovered a relationship between preference for novel stimuli and mental abilities.

Rose, Slater, and Perry (1986) investigated retest-reliability and predictive validity of different parameters for habituation. Although the results seem to be encouraging (e.g., some medium correlations between single habituation values in infancy and 4½ years of age) some facts should be considered when interpreting the data: First, the sample was rather small ($N = 16$) and second, the measures of habituation outperformed the indicators for novelty responses in contradiction to, for example, the Fagan and Krahe McGrath (1981) or Lewis and Brooks-Gunn (1981) studies. Bornstein's (1989)

review across ten reports indicates that measures of habituation are psychometrically acceptable and show a moderate median predictive correlation of $r = .49$ mainly with measure of intelligence and verbal abilities.

The relationship of habituation to later intellectual abilities was also shown for higher IQs, at 24 months in the Lewis and Brooks-Gunn study. In their discussion, these researchers suggest that attention ability may be one of the earliest components of intellectual ability with predictive validity for a later age. Bornstein and Sigman (1986) explain the early habituation and the later intelligence as both reflecting effectiveness in encoding information. Thus, more intelligent infants encode everything of interest or perhaps they more quickly match it to their mental representation.

Lécuyer (1989), however, judges these correlations as less substantial. Analyzing the correlations reported in the Bornstein and Sigman (1986) article, he found a correlation of $r = -.61$ between the sample size and the observed correlations of the studies cited by Bornstein and Sigman (1986). Lécuyer (1989) also points at the "0.05 syndrome" (p. 149) which might suppress the publication of lower correlations or studies in which no relationships between habituation and later cognitive indicators were found. All in all, Lécuyer (1989) links the habituation findings not to the speed of effectiveness of information processing (as for example Deary, 1988, does) but to the capacity in sustaining attention.

Of course, as Tannenbaum (1992), points out, neither habituation nor response to novelty actually requires reasoning or logic, but rather are viewed as being measures of efficiency in information processing. That is, they are a means of predicting later intellectual functioning without explaining the relationship between habituation and IQ.

MEMORY CAPACITY AND DURABILITY

Although it has often been shown that gifted children's memory performance is better than that of average children, these results are generally not interpreted as meaning higher memory capacity or memory durability in gifted children. Memory capacity here means the number of "slots" of the working and long-term memory rather than measures of the memory span where the number of recalled words or numbers can be increased, for example, by using appropriate strategies. On the contrary, there is much evidence that there are hardly differences in the capacity and durability of the short-term or working memory as well as the long-term memory of children and adults of different level of giftedness and of different ages (Howe, 1990).

All differences in memory performance reported in the literature have to be attributed to differences in speed of information processing (memory or cognitive efficiency) or in higher order components as knowledge, metamemory, and executive control which lead to a more efficient use of the limited capacities of the short-term memory (see the surveys of Campione et al.,

1982; Jackson & Butterfield, 1986; Borkowski & Peck, 1986; Brewer, 1987; Torgesen, Kistner, & Morgan, 1987). In addition, Schneider and Pressley (1989) argue that intraindividual development changes in memory performance cannot be linked either to changes in capacity or to speed of information processing.

MEMORY EFFICIENCY

Although Schneider and Pressley (1989) deny a causal relationship between intraindividual development of memory performance and speed of information processing, the efficiency of the memory system is considered to be the main cause on the architectural level of interindividual differences in the achievement of gifted, average, and retarded children (Campione et al., 1982; Jackson & Butterfield, 1986; Borkowski & Peck, 1986; Brewer, 1987; Torgesen et al., 1987). Memory or cognitive efficiency refers primarily to the speed of information processing. This includes properties of the sensory system and the short-term memory and, in consequence, the speed of registering, identifying, and analyzing incoming information, the speed of storing new information in long-term memory as well as the speed of retrieving information from memory, the speed with which information in the working memory is processed etc. All in all, cognitive efficiency enables one to make better use of the limited capacities of the working memory. Memory efficiency increases as cognitive processes become more and more automatic. Automation frees capacity of the working memory and at the same time attention for more complex problems. Thus, the superiority of gifted children may be attributed to higher cognitive efficiency, i.e., to a higher basic speed of information processing and a higher level of automation.

While aspects of attention, memory, and cognitive efficiency are regularly included in checklists for the early identification of gifted children, there is not much empirical evidence for the concurrent and predictive validity of these indicators in young children. In our opinion this is a consequence of the methods employed. Information processing in infants up to 1 year is measured using the habituation paradigm (see above); for a methodological discussion see Daehler & Greco, 1985) while recognition tasks, reaction time tasks and so on have normally been applied in children older than 9 or 10 years. Thus, there are few studies with gifted children under 8 or 9 years of age investigating cognitive efficiency. On the other hand, there are many more studies dealing with retarded or learning disabled children. Possible relations between cognitive efficiency and later achievements were demonstrated, for example, by Jackson and Myers (1982) who could show for 37- to 66-month-old preschoolers that rapid letter naming and backward digit span was a predictor of reading skills six months later while no relationship could be found for measures of IQ (e.g., Stanford-Binet, WPPSI-subscores).

Transferring respective results from one age group to another or interpolating results comparing retarded and average to gifted children, however, might be misleading. Although, for example, memory scanning differences between gifted and average were found in 9-year-olds, these differences were not observable in 17-year-old adolescents after practice (Keating & Bobbit, 1978). There is also some evidence that memory efficiency concerning retrieval processes cannot be associated uniquely with differences in the basic speed of information processing (Brewer, 1987). The superiority of the gifted in cognitive efficiency may be caused by a faster speed of information processing, enhanced attention processes, a superior organization of the knowledge base, more effective strategies, a better motivational structure, longer and more intensive practice, or the complex interaction of all these and other components. All in all, Brewer (1987) concludes that "more research is needed before firm conclusions can be drawn" (p. 43). Jackson and Butterfield (1986) state that none of the studies cited in their review "suggest any qualitative difference in the basic short- and long-term memory processes of gifted and average children" (p. 164).

SLEEP

Occasionally, descriptions of young gifted children include the idea that the gifted child sleeps less than other children and/or has sleep problems (see Freeman, 1979; also Louis & Lewis, 1992). Frequently, behavioral checklists, especially ones for the hands of parents and teachers, include an item such as the following from Geuß and Urban (1982): Needs comparatively little sleep and this irregularly (p. 94, checklist for early identification of giftedness). This continues to be reported by parents, practitioners, and is reflected to a certain extent in the literature. As a consequence of this reduced need of sleep and irregular sleeping times of gifted newborns and infants—according to respective literature—the parents of the gifted may be under considerable strain (e.g., Webb, Meckstroth, & Tolan, 1985; Heinbokel, 1988; Stapf & Stapf, 1988).

The empirical evidence for these indicators is rather poor. Despart (1949, cited along Busby & Pivik, 1983), for example, reported shorter sleep periods of the gifted but did not present any statistical or polygraphical evidence for this statement. On the contrary, Terman (1925) stated that his sample of gifted children (age 7–14) slept even longer than normal children. In accordance with this result, Freeman (1979) reports that in her study no differences were found concerning sleep behavior and sleep problems between gifted controls and non-gifted control children. Only the parents of the children of the so-called "target group" which consisted of gifted children whose parents were members of the English National Association for Gifted Children reported a lower amount of sleep and more sleeping problems for their children. In a similar way, the sample of Stapf and Stapf (1988), who also report a low sleep need

for young gifted children, was collected in a counseling center. Browder (1993), on the other hand, could not find a difference in the sleep length between gifted and average children, using reports of the parents who did not know that their children were gifted.

Freeman (1983) suggests that sleep problems tend to be more an indication of parental attitudes. The parents of the gifted children tend to be middle class, and at the same time expect their children to sleep more than working class parents. Thus they put their children to bed earlier. "Quantity of sleep depends on what parents expect and on the children's psychological adjustment" (Freeman, 1983, p. 30) and, therefore, in her opinion cannot be regarded to be an indicator of giftedness.

This view is confirmed by a look at the general sleeping behavior of infants and toddlers. As Wolke (1993) points out, the variance of sleeping behavior is intra- and interindividually, as well as interculturally, extremely high. Between 20 and 38% of all parents, for example, consider night-waking a mild or serious problem for their families' life; about 6–10% of all toddlers wake more than twice per night.

A major problem in the research on the sleeping behavior of gifted infants is the retrospective way in which the indicators were collected. To our knowledge, there are no prospective studies investigating the relationship between sleeping behavior of newborn or young infants which turned out to be gifted in later childhood or in primary school. On the other hand, there are some longitudinal studies on representative samples or on children at risk which can provide some information about the correlation between sleep behavior and intelligence and other indicators of cognitive capacity in school time.

Pollock (1992), for example, recently published results of the British Birth Survey, in which 98% of the births occurring in the week 5–11 April 1970 throughout the United Kingdom could be included and studied in early infancy (17,196 children). The parents of 86% of these children ($N = 13,961$, Northern Ireland was excluded) were given questionnaires in a follow-up 5 years later, and in 1980 93% of this original sample ($N = 14,906$) were administered a battery of tests and questionnaires. Although the emphasis in Pollock's (1992) study was on identifying factors that lead to sleeping problems, it is interesting that in spite of the huge sample size "this study has failed to show any association" (p. 165) between sleeping behavior at early infancy and intellectual abilities at age 10, only a slight superiority of the children with sleeping problems in a vocabulary test at the age of 5 and a reading test at age 10 was found.

Unfortunately Pollock (1992) prepared his data for analysis by dichotomizing most of the variables. Thus, he investigated only above and below average groups but no groups of gifted children in a narrow sense. It would be interesting to use this and similar data for further secondary analyses of possible early indicators of giftedness.

Researchers who compared not sleeping behavior

but sleep patterns and sleep variables of mentally retarded and normal children were a little more successful. From such research it seems to be obvious that the REM latencies are longer, the REM sleep is shorter, and the eye movement density during REM sleep is less in the mentally retarded (Busby & Pivik, 1983; Grubar, 1985b). Studying normal children alone, however, Borrow, Adam, Chapman, Idzekowski, and Oswald (1980) could not find any association between these parameters and intellectual ability. In general, however, the reliability and validity of such research is critical as the recording of physiological functions is stressful and often unacceptable in infants and young children so that their ecological validity has to be questioned (Wolke, 1993).

In consequence, sleep studies with gifted children under the age of 8 years are—to our knowledge—not available. Busby and Pivik (1983) compared six gifted and five average children ranging in age from 8 to 12 in several sleep parameters. The authors found that the gifted slept 20 min longer, and that their eye movement density during REM sleep was lower which was a surprising result. The authors interpret this finding as a more efficient level of information processing during waking and REM sleep of the gifted. As an alternative explanation in the sense of homeostatic-recovery theories, the authors take into account the possibility that the high cognitive activity of the gifted during waking makes a reduced activity during sleep possible.

While Busby and Pivik (1983) could not confirm significant differences between the gifted and average in REM sleep duration—although the REM sleep during the first REM cycle of the gifted was longer—Grubar (1985a,b) reported a higher proportion of REM sleep and also more REM cycles for five gifted children of a mean age of 10;8. Moreover the latency of the first REM sleep phase was shorter in the gifted, while Grubar (1985b) could not find any differences concerning total sleep time. In contrast to Busby and Pivik (1983), Grubar (1985b) found a significantly higher eye movement density during REM sleep in the gifted. The author interprets this finding by "a superior ability to organize information, and thus an advanced maturity of processing" (p. 154), referring to theories that interpret REM sleep as phases of the consolidation of newly learned material (Wolke, 1993).

All in all, the evidence from the sleep studies of Busby and Pivik (1983) and Grubar (1985b) is small and contradictory. Considerably more efforts have to be undertaken to clarify the sleep characteristics of gifted infants or children. At the present state of research, sleep variables cannot be taken as early indicators of giftedness, even if Grubar (1985a) hopes that the measurement of sleep variables may enable a new way of assessment of intellectual potential. In consequence, corresponding items in checklists reflect myths or more or less subjective impressions of the staff in counseling centers rather than empirical findings.

Higher Order Components

KNOWLEDGE BASE AND STRATEGIES

The knowledge base is frequently regarded as an important component of giftedness (e.g., Chi, 1984). Muir-Broadbent and Bjorklund (1990) see differences between gifted and average children not so much in the use of strategies or executive processes but in non-strategic aspects, above all the knowledge base. The authors report that their research results show that "typicalness" evaluation of concepts with regard to their categories of more intelligent 10- to 14-year-old children are similar to those of adults. In comparison with average children, this adult-like knowledge base can be observed primarily in the reproduction time of words of different categories, while no differences between giftedness groups could be found concerning words of the same category. On the other hand, with regard to clustering behavior, Muir-Broadbent and Bjorklund (1990) found no significant differences between the groups, whereby a trend in favor of the average students had to be reported.

The following chapter by Schneider deals with processes of knowledge acquisition and expertise and reviews the respective research in detail. In his chapter, however, Schneider reports mostly research conducted along the expertise–novice paradigm, generally with older children and adolescents. Concerning aspects of the knowledge base in gifted children, apart from a few studies with older children (e.g., Davidson & Sternberg, 1984), the complaint of a lack of research has to be made. McFarland and Wiebe (1987) state that "there is a certain irony here: the complexity and methodological sophistication used to study mentally retarded children clearly surpasses that used to study cognitively superior children" (p. 109).

STRATEGY USE, METACOGNITION AND EXECUTIVE CONTROL

In the tradition of Flavell and Wellman (Flavell, 1971; Flavell & Wellman, 1977; Flavell, 1978, 1984), we use the term metamemory or metacognition, on the one hand, to refer to the knowledge about the capacity/efficiency and about the function of one's memory or the whole cognitive set-up. Seen from an alternative theoretical point of view (e.g., Brown, 1978, 1984), metacognition means the cognitive processes which—referring to the respective demands—plan cognitive processes, which choose adequate cognitive strategies, which execute and control them in reference to their efficiency.

As demonstrated above, metacognitive knowledge and metacognitive control processes play an eminent role in newer theories of intelligence and giftedness (Sternberg, 1985, 1991; Campione & Brown, 1978). Quite surprisingly, however, there are only a handful of studies on metamemory or metacognition in younger gifted children, although some research has

been conducted in metacognition in (educable) mentally retarded or learning disabled pupils (see Borkowski & Day, 1987; Sperber, McCauley, & Brooks, 1984, or Ceci, 1987, for overviews in the mentally retarded and learning disabled). Studies with gifted pupils have been carried out mainly with adolescents older than 10 or 11 years.

One of the reasons for this might be the fact that research in metacognition—especially if one focusses on knowledge aspects—calls for a certain reflection ability which emerges only gradually during the course of childhood development. On the other hand there are a number of studies with average children (e.g., Sodian, Schneider, & Perlmutter, 1986; Schneider & Sodian, 1991; Sodian, 1990) that show that research in metacognitive knowledge can be carried out with preschoolers. This would indicate that it should be even easier with gifted children whose language might be more elaborate.

Some research, however, has been conducted in young children investigating metacognitive control processes. Here the way children cope with a problem, whether they adopt a trial-and-error strategy or whether they switch to systematically checking and comparing different possibilities, or whether they reflect on the problem-solving processes are aspects of metacognitive control with direct relations to success in the respective task. Such control activities are acquired in interaction with parents or other persons while the child is brought up (Karnes, Shwedel, & Steinberg, 1982; Kontos, 1983; Browder, 1993).

In order to increase our understanding of how the antecedents of metacognition are structured, we must deal closely with the caregiver–child interaction, in which metacognitive directions are provided as verbal or non-verbal aids. They help the child wake up to his/her own storage capacities. Gifted children eagerly seize on such metacognitive directions provided by a caretaker (information about task and strategy characteristics, and about the child's personality characteristics that interfere with the problem-solving process). Without subjecting them to much experimentation, gifted children use directives to expand their repertoires of verification procedures (Lehwald, 1992).

Moss (1990) and Moss and Strayer (1990) investigated the problem-solving behavior of 3- to 4-year-old gifted and average nursery school children of a (upper) middle class area in Montreal. They examined their play with blocks when the problem was solved in the presence and with the help of the mothers. As a result, Moss and Strayer (1990) determined that the mothers of the gifted focussed the attention of their children on important relations between problem aspects while the mothers of the average gave more hints about concrete solutions. All in all, the mothers of the gifted provided their children with a more favorable environment for the formation of metacognitive competencies. The gifted children used metacognitive strategies after the modeling of their mothers, but also more and more

spontaneously during the task (see also Browder, 1993). This way, the mothers of the gifted operationalize to some extent the principles of Brown and Palincsar's (1987) reciprocal teaching ("expert scaffolding" and "fading out").

Investigating primary school children, Geis and Corriher (1977; cited according to Waldmann & Weinert, 1990) hardly found differences between gifted and average children with respect to metamemory, although the more gifted children profited in higher memory performance from the more consistent use of a memory strategy. Similar results are reported by Robinson and Kingsley (1977) who moreover—although independent of the ability level—determined a qualitative difference between second and fourth graders with regard to the employment of preferred strategies: While the younger children employed a word-related strategy, the older ones made use of a clustering strategy.

Kontos, Swanson, and Frazer (1984) found in their small sample of 13-year-olds (14 average, 13 gifted) no superiority of the highly gifted in aspects of metamemory; however, these children were more aware of the role of effort. In a more recent study, Swanson (1990) was also unable to find a relationship between general intelligence and metacognition. Metacognitive competencies, however, seemed to be more important than intelligence with regard to different performance indicators of the problem-solving tasks under investigation.

The hypothesis that greater differences between gifted and average would be found with increasing age was confirmed by Swanson (1992). Studying problem-solving behavior and employing a metacognitive questionnaire with 11–12-year-old children, the author was able to demonstrate that gifted children scored significantly higher on the metacognitive questionnaire as well as on the problem-solving task.

In contrast, Borkowski and Peck (1986) report that gifted 7–8-year-old primary school students turned out to be better than their average peers in diverse aspects of metamemory. These advantages, however, were not reflected in better strategy use. Carr and Borkowski (1987) report independent impact (partial correlation) of metamemory and intelligence on achievement variables, but they did not find relations between metamemory and intelligence in their sample of ninety-eight 11- and 12-year-olds.

Kurtz and Weinert (1989) gave questionnaires about attribution, aspects of metamemory and a sort-recall task to fifth and seventh graders of high and average intelligence. The sort-recall task was to provide information about the use of organizing strategies in learning clusterable items and about the memory performance. In their analyses, Kurtz and Weinert only found a few significant differences in metacognitive knowledge. Intelligent pupils showed a better metareading and gifted pupils were superior to average pupils in the use of ordering strategies and in memory performance. Correlation analysis showed that the metamemory scores

employed are more closely correlated with the clustering and the recall scores than the intelligence tests used.

Shi Jiannong (1990a, 1990b) compared twenty students of a Beijing special school for the gifted with twenty students from a normal school (10–11-year-olds). The children of the elite school showed better memory performance, better strategic behavior, better memory monitoring, and better metamemory. This study has been criticized (Perleth, 1992) from the methodological and other points of view. Nevertheless, the study is one of the few which produced some evidence for a big clear superiority of gifted students in metacognition.

Perleth (1992) conducted a series of studies with primary school students to investigate differences in strategy use and metamemory between groups of different levels of giftedness and to analyze whether training and transfer effects depend on the level of giftedness. In the first study, strategy use and metamemory were investigated with the aid of a sort-recall task and a metacognition questionnaire in gifted and average children. The sample consisted of 204 second grade (approximately 8-year-old), and 260 fourth grade pupils. The major results were (a) determination of a relatively small relationship between metamemory scores, strategy use, and memory achievement, (b) for grade 4: the percentage of strategic children was higher in the more gifted pupils, and, (c) in comparison with metamemory, the intelligence test used turned out to be a better predictor of memory performance.

Because of some limitations and unclear results, as well as reliability problems in the metamemory group questionnaire used, Perleth (1992) conducted a second study on strategy use and metamemory in thirty-nine second and thirty-six fourth graders with different levels of giftedness ($IQ \leq 90$, $95 \leq IQ \leq 105$, $115 < IQ$) assessing strategy use and metamemory in single sessions. The results of the first study were more or less confirmed. Only for grade 4 a small superiority of the gifted in strategy use and metamemory was found; intelligence was more strongly correlated with amount of memory than metamemory. On the other hand, strategic fourth graders showed better memory performance, got better school grades, and were less anxious and more stress-resistant. The finding of larger differences with older children or adolescents confirms the results from Dover and Shore (1991).

In an intervention study, Perleth (1992) trained second graders in the use of a clustering strategy and investigated training effects on tasks of different transfer distances in dependence from the level of giftedness. While strong training effects for near transfer, and smaller training effects for middle and far transfer tasks were found in general, only small giftedness \times training interactions could be confirmed, indicating a tendency that more gifted pupils profit more with growing transfer distance.

The research reported to this point concentrated on the original issues of metacognition: memory and metamemory. Some more studies can be found on

metacognition in general (metacognitive knowledge and executive control), although most studies were conducted with adolescents or adults and not with (young) gifted children. As a result, on a very general level, one can state (e.g., Heller, 1991a) that gifted can be distinguished from the average by their better information-processing competencies (see the chapters by Shore & Kanevsky or Sternberg in this volume). They make use of relevant information for problem solving, they perform comparison processes more quickly, and spend, however, more time for the encoding phase (more careful problem analysis). Gifted use more and better strategies for problem solving in different areas, they substitute more favorable strategies for unsuitable ones more quickly, and their cognitive monitoring is better (for a summary see Waldmann & Weinert, 1990).

Davidson and Sternberg (1984; also Davidson, 1986), for example, report a series of studies which aimed at examining aspects of Sternberg's giftedness theory. The authors investigated performance on mathematical insight problems in elementary school children. The investigators analyzed the cognitive components of insight and knowledge acquisition, namely selective encoding, selective combination and selective comparison. The results confirm the summarized characteristics of gifted children.

The opinion above that there are hardly studies about metamemory and use of (memory) strategies in gifted children, is also shared by Muir-Broadus and Bjorklund (1990). These two authors establish a general deficit of research which compares the aspects of the memory performance of gifted and average children. At the same time they point out that such studies have thus far delivered an inconsistent picture. This is also valid for the studies mentioned in this section.

Motivational Characteristics

CASUAL ATTRIBUTION AND SELF-CONCEPT

"Little is known about the attributional beliefs of gifted children. However, research indicates that successful learners tend to credit their success to high ability, and their failure to a combination of lack of effort, bad luck, and task difficulty" (Borkowski & Kurtz, 1987, p. 144; see also Lewis & Michalson, 1985). In Covington's (1987) review on achievement motivation, self-attributions and exceptionality, for example, not a single study conducted with gifted or even above average children younger than 9-10 years is cited. In children of that age, Fincham and Barling (1978) found that gifted attribute less externally, while Karnes and Wherry (1981) report a higher self-concept for gifted children of grades 4-7.

In the above-cited study of fifth and sixth graders, for instance, Kurtz and Weinert (1989) were able to show that average children attribute success to effort, while highly gifted children attribute it to their

abilities. Using questionnaires comparable to Kurtz and Weinert (1989), Perleth (1992) found similar but weak trends and confirmed that the more gifted children attribute success to their abilities while they attribute failure to lack of effort. The results of these studies might, however, reflect specific German socialization. As Schneider, Borkowski, Kurtz, and Kervin (1986), as well as Carr, Kurtz, Schneider, Turner, and Borkowski (1989) pointed out for German and American elementary school children, attributional styles and strategy use as well as interdependencies between these variables vary with the culture.

Borkowski and Peck (1986) report that gifted children were more aware that self-interest effects learning results. According to Weed, Ryan, and Day (1990), intelligent fourth grade children with a high ability self-concept initially show advantages in new memory tasks, but with increasing experience, the influence of these factors diminishes in favor of strategy and metamemory variables.

In a representative and methodologically well controlled study in primary school children, Rost (1993; see also below) found that gifted children can be positively distinguished from average controls with respect to achievement motivation and causal attribution. Moreover, their strategies of working through their failure are more favorable. Concerning other aspects of personality, only a few differences were found, but when, then to the advantage of the gifted children.

CURIOSITY AND INTERESTS

An important motivational aspect important for development of high ability can be seen in the curiosity and interest of even the young infant, i.e., the attention and preferences which are given to objects in the environment (Howe, 1990). These motivational characteristics manifest themselves in a child's behavior. Because of their curiosity, gifted children already attract attention in early stages of development (Schneider, 1987). Berg and Sternberg (1985) view curiosity as an integral part of giftedness. In a meaningful and profound manner, the gifted children typically integrate the information acquired into their knowledge base. On the basis of their knowledge and a critical analysis of the consequences of their knowledge, they make decisions on courses of action geared to their original intention (acquisition of knowledge). Even at an early age, the behavior of gifted children is marked by a clear goal orientation. That orientation and its development is facilitated by these children's enhanced concentration power (Freeman, 1990).

During childhood, curiosity manifests itself in exploratory behavior. Therefore, the latter may be used as an early indicator of intellectual functioning. Exploratory acts are forms of active learning typical of young or preschool children. We are dealing with these when children expand and differentiate cognitive structures or when they incorporate these into a wider system

(Keller, Gauda, Miranda, & Schölmerich, 1985). In the course of mental development, the forms of exploratory behavior undergo change. These forms range from simple experimentation (mouthing, beating, shaking things) through functional/relational manipulations (assembling and integrating objects) to the asking of questions, a language-based information-seeking process. For differential diagnostic purposes, exploratory behavior may be used in a particularly impressive way, as a “response to novelty”. In such situations gifted children focus their attention on relevant pieces of information. It may be that this has to do with the exceptional ability of gifted children to identify problems (Renzulli & Delisle, 1982).

Empirical work (Lehwald, 1988, 1990) has shown that gifted, curious children make impressive use of their exploratory skills in puzzles. They relate single objects to complex units significantly more frequently than do less curious children. Thus, in a largely unstructured situation (at play, for example) they generate information themselves, and in doing so are engaged in an intensive information-gathering process about the properties of objects, how objects are interrelated, what functions they have, and what functional relationships can be established. In the long run, such active learning is conducive to the development of cognitive abilities. Follow-up studies using an intelligence test showed curious children to be clearly superior to less curious children. Thus, the exploratory actions which gifted, curious children engage in are of high “cognitive relevance”. If environmental conditions are fortunate, they perform a developmental function. If a child’s social environment provides an abundance of information, exploratory actions will build up a rich knowledge base, which is characteristics of gifted children (Sieglar & Kotovsky, 1986).

Child Expertise and Precocity

Language Development

There is much evidence in the literature (e.g., Bartenwerfer, 1978; Roedell et al., 1989; Terman & Oden, 1947) to suggest that gifted children differ from peers with regard to their language development. Freeman (1979, 1983), in particular, emphasizes that the intellectually gifted children she is familiar with were speaking early much more frequently than those of moderate intelligence. This precociousness includes not only children with proven verbal performance on IQ tests, but also those whose non-verbal performance scores are high are often found to be verbally precocious.

There are reports of a developmental superiority with respect to these children’s vocabulary and sentence formation, i.e., they allegedly have larger vocabularies and more complex sentence structure formation than is typical of their age level. Vocabulary development has long been correlated with intelligence (e.g., Terman,

1925). Guilford, Scheuerle, and Shonburn (1981) as well as Lewis and Louis (1991) report that linguistic abilities are often considered to be a manifestation of giftedness (and thus, often a subtest or subscale of various intelligence tests such as the Wechsler series [author’s note]). Particularly the following characteristics are emphasized: advanced vocabulary for age and grade level, use of language in a meaningful way, richness of expression, elaboration, and fluency. The above authors also report a high frequency of questions and good memory skills (see also Lewis & Michalson, 1985). Research by Milner and Elrod (1986) generally links giftedness in language production to improved competence in language comprehension even at the kindergarten level.

Retrospective accounts from parents of gifted children also indicate a great interest in language reflected in use of puns and rhymes as well as earlier first words and speech. Of course, such reports have methodical problems, but seem to indicate a parental awareness of child precocity (see also Louis & Lewis, 1992). Tuttle, Becker, and Sousa (1988) cite a mother of three highly gifted children as reporting that such children acquire language early which is typified by the following: large vocabulary, long sentences, early and frequent speech. Many of these children do not, however, speak early but wait until they are older and then display a remarkable talent for language. Research findings by Browder (1993), however, with an unselected group of preschool children age 4–6 are in sharp contrast to this. Parents did not differ significantly in their reports of children’s speech development regardless of whether their children belonged to the above-average group in intelligence (IQ > 125) or the average to below-average group (< 95).

In fact, other research does indeed link precocious language development to intelligence. Beginning with thirty children who were regarded as linguistically precocious, Robinson, Dale, and Landesman (1990) examined the validity of the Stanford–Binet: FE for young children. The toddlers here were selected for their advanced receptive and/or expressive language skills. This does not, of course, guarantee high performance on cognitive development tests (here: Bayley Mental Scales, Peabody Picture Vocabulary Test and Stanford–Binet L-M) since children at the age of 2 or 3 years develop rapidly in other areas such as nonverbal cognitive skills, etc. The children studied here received consistently high verbal scores and showed good short-term memory. And, impressively, these children had a mean Bayley Development Index at 20 months of 134.2, thus indicating that there are substantial contributions from non-language areas. This would suggest that *precocious language ability* should be considered as an indicator of giftedness when attempting to identify gifted children. Interestingly, research findings show a tendency for young gifted children to achieve significantly higher scores on the verbal than on the performance section of the WPPSI (Speer, Hawthorne, & Buccellato, 1986). This lends support

to the belief that the more substantial contribution to the IQ is due to advanced language skills.

Reading and Writing

The topic of reading and writing in gifted children is another of the myths/expectations that has established itself in the early identification of gifted children without empirical evidence. For example, language indicators are frequently subjectively felt to indicate giftedness by directors of preschool programs, preschool teachers, and parents. Abraham and Hartwell (1985, cited according to Urban, 1990) reported that the following language and number-related items were named by *all* three of the above-mentioned groups:

- can read, likes to read;
- knows which numbers are larger than other numbers;
- has a larger vocabulary containing more complex words than other children of that age;
- can carry on a meaningful discussion.

These four items make up almost half of the items selected by these directors, teachers, and parents out of those from the Preschool Gifted Behavioral Checklist (44 items total) as relevant and important indicators of giftedness in preschoolers.

If we consider the literature on gifted preschoolers' precocity, the majority focuses on early reading and rarely on early writing. The reason for this would seem to be the dysynchronous development of the two: reading develops faster and earlier than writing which requires not only comprehension of the letters/words but also fine motor control generally not yet perfected in 4- and 5-year-olds. As Terrassier (1985) comments: "The concomitant problem with children who read so early is their exceptional difficulty in learning to write. Their early attempts produce awkward hand movements, and they find it hard to coordinate writing with their natural, fast mental rhythm" (p. 267).

It is also somewhat difficult to approach the question of which age should be considered precocious in reading. Nancy Jackson, one of the leading researchers in this field, defined *precocious readers* "as children who have made substantial progress in reading comprehension before entering the first grade" (Jackson, Donaldson, & Cleland, 1988, p. 234). Advanced reading skill is complex and levels of subskills vary greatly. While there are great interindividual differences in this area, an additional difficulty in interpreting studies is a cultural one. School entrance ages vary from country to country (from approximately 5-7), so that the beginning of school teaching of reading may vary as much as two years. The definition of reading is also fuzzy, depending on whether letter or word recognition or reading comprehension is considered to be the criterion. "Reading encompasses a large number of separate subskills. . . . Consequently, it is not possible to state a precise age at which a child has mastered reading" (Howe, 1990, p. 77). Since

large numbers of children begin to read early (before formal school teaching), it is difficult to compare the gifted and average child in this area, i.e., it is not only children with higher intelligence who begin to read before school entry. "Although precocious reading ability is moderately associated with general intelligence, some highly intelligent children do not read early and some precocious readers are of average or subnormal intelligence" (Jackson, 1988, p. 200).

There are a number of tests used for measuring reading ability in studies of precocious readers, but these are seldom comparable in their content. On the one hand, early reading is considered to be an indicator of giftedness and related to other measures of verbal ability (Jackson et al., 1988), on the other hand differences are examined between gifted readers and nonreaders (Burns, Collins, & Paulsell, 1991; Salzer, 1984).

According to Howe (1990), most children seem to be capable of learning to read a minimum of one or two years earlier than it is usually taught. When a child has learned to read precociously, i.e., before attending school, it is usually due to someone working with a child closely, at least in an interpretive way (see also Freeman, 1979). Thus, despite claims to the contrary that early readers have taught themselves to read, this is discounted in the literature. "No child (and no adult either) can learn to read entirely on his or her own. There must be someone to draw the child's attention to the particular features and associations that reading draws upon. . . . Learning to read, like a number of other human accomplishments, is only possible if the learner receives a fair amount of help from people who can already do it" (Howe, 1990, pp. 79-80).

The increasing numbers of early readers is also having other effects on the identification of the gifted. As Whitmore (1985) points out, the early reader may be expected to be gifted and vice versa, the gifted child is frequently expected by educators to be an early reader. A gifted child with less precocious reading and writing skills may not be identified as readily as an advanced child. In addition, certain skills with letters, sounds, and phonemes are related to progress or difficulties in learning to read (see Howe, 1990). If teachers assume that preschoolers have such skills but are making poor use of them (instead of lacking in experience or exposure), then such children, including highly able ones, may be misdiagnosed as learning disabled or dyslexic.

The role of intelligence in learning to read seems to be unclear. Accelerated reading seems to be related to home environment and nurturance of reading and/or language skills (Grant & Brown, 1986; Mills & Jackson, 1990; Salzer, 1984) as well as to intelligence (Freeman, 1979, 1985). Influence from educational television programs such as Sesame Street (e.g., Jackson et al., 1988; Salzer, 1984), reading exposure at home (Grant & Brown, 1986; Jackson et al., 1988; Stroebel & Evans, 1988), preference for reading readiness toys, such as books and alphabet cards (Thomas, 1984),

and frequency of story reading in the home and child engagement therein (Crain-Thoreson & Dale, 1992) have frequently been correlated with early reading. Freeman (1979) reports that social class and sex affect reading learning (in favor of higher classes and girls). She also feels that not only background but personality structure and mental adjustment play a role in reading development. The high IQ children she viewed were more frequently early readers, being precocious in talking and reading. In a claim about their long-term development, Freeman claims that children who had been verbally precocious developed into more avid readers than usual. In a study by Crain-Thoreson and Dale (1992), however, although early talkers remained verbally precocious in preschool, they were not especially likely to read early. This is probably due to the fact that although verbal precocity would intuitively seem to be related to reading, in fact, learning to read requires several verbal, nonverbal and spatial skills. The later reading development of these children had not yet been measured at time of publication. In a later publication, Freeman (1985) points out that the quick and easy mechanical reading of the highly able children should not overshadow other cognitive and linguistic skills of reading in their importance for academic achievement (p. 179).

Other factors related to early reading include personality factors such as motivation in learning the alphabet (Salzer, 1984), recognition that reading/writing serves a purpose in their environment (see Burns et al., 1991), and cognitive components such as verbal ability, letter naming speed, and short-term memory factors such as forward and backward digit span (Jackson et al., 1988). Moore (1983) found that children developed marked metacognitive knowledge about reading between ages 7 and 11 and good readers were more conscious in a metacognitive sense of important reading parameters.

But with regard to the early identification of the gifted, Jackson (1988) raises an interesting question: Do precocious readers continue to perform exceptionally well later in life? The evidence is unclear especially with regard to the question of whether early reading is a cause of improved performance (e.g., closely related to schoolhouse giftedness or a statistical predictor of continued performance which might be correlated with other factors such as parental emphasis on achievement, intellectual abilities (see Jackson, 1988, p. 201). Conclusions from a more recent publication (Mills & Jackson, 1990) indicate that individual differences in later reading comprehension can be predicted from tests given 5 or 6 years earlier, but that verbal ability is at least as good a predictor. This would mean that early reading is perhaps not as important as early verbal abilities as a predictor. In addition, Mills and Jackson found that advanced readers continue to perform well on tests of comprehension, vocabulary and other language achievements but are not extraordinary. In fact, early reading seems to have some positive effects for the child but is no guarantee of later academic giftedness.

However, as Jackson (1988) writes, exceptionally early attainment of the ability to read is a demonstration of gifted performance as she (and frequently others) would define it.

Mathematics and Calculation

Although extraordinary mathematical skills are regularly considered very important items in checklists for the early identification of gifted children (e.g., Stapf, 1990), there is very little research on outstanding mathematical skills in young children. Most studies have apparently been conducted with students older than 10 years.

Studies by Benbow and associates in mathematically gifted 12- to 14-year-olds produced evidence that mathematically gifted boys and girls distinguish themselves from average by higher nonverbal reasoning abilities (Benbow & Minor, 1990) as for example measured with Raven's Progressive Matrices (see above). In addition they show outstanding spatial abilities and outperform their nongifted peers in memory performance. Dark and Benbow (1990) could demonstrate that mathematically gifted students have better skills for translating verbal problems into equations and that they are superior in problem representation and manipulation in working memory. Finally, Dark and Benbow (1991) confirmed the better working memory manipulation of the mathematically gifted, while the verbally and not the mathematically gifted showed enhanced encoding speed.

According to Krutetskii who conducted (longitudinal) studies with 6- to 16-year-old students, mathematically gifted children can be characterized by superior analytic and synthesizing perception of mathematical problems. They can generalize quickly and broadly about the content and method of solving mathematical problems and are able to easily switch from one cognitive process to another (see also Lester & Schroeder, 1983).

Case studies with calculating prodigies in which cognitive processes and aspects of memory were investigated are also rare (for a review see Radford, 1990). In his study with a 13-year-old girl with outstanding skills in mental multiplication, Hope (1987) found an exceptional memory for squares of 2- and 3-digit number as well as a high digit span. While Jensen (1990) could not find extraordinary large digit span, unusual high reasoning abilities, or superior reaction time in his female adult calculating prodigy, he also reported on the role of an outstanding long-term memory and the automation of cognitive processes needed for calculation. Bredenkamp, Klein, von Hayn, and Vatterrodt (1988) also stressed the fact that their 21-year-old male calculation expert does not have higher capacity of working memory but a well organized and highly specialized long-term memory (he has memorized, for example, all multiplications with two-digit numbers).

Automatic rules, highly effective retrieval from the long-term memory, and a relatively long space of time for processing or storing digits enabled the expert of Bredenkamp et al. (1988) to produce correct results for most difficult calculation tasks with enormous speed.

Bredenkamp et al. (1988) report that their calculation expert practiced calculation problems for at least 1 hour per day since he was 4. Moreover he used car signs, television reports on economic data, and other things for calculation practice as a sort of hobby. Jensen's (1990) prodigy also narrated that she had "played with numbers for hours every day since early childhood" (p. 269).

Radford's (1990) reports on prodigies in the domain of mathematics show that early self-directed dealing with numbers might be an indicator of later exceptional performance, but "calculating ability does not necessarily show itself early" (p. 88). This author also stresses that calculating skills are not necessary for becoming an outstanding mathematician and judges interest and motivation to be central factors. The interest and motivation which are necessary for an intensive occupation with mathematical problems often seem to develop (at the earliest) in adolescence. According to Marjoram and Nelson (1985), the work of Stanley and Benbow with youth in the seventies and eighties showed the eminent meaning of self concept and role taking for the development of gifted mathematicians, especially for gifted girls (see also Beerman, Heller, & Menacher, 1992). Marjoram and Nelson (1985) also cite indicators for early identification of mathematically talented children such as preference for logical connectives in their language, interest for and occupation with geometric patterns and order systems, pleasure in puzzles and construction toys. Empirical evidence for these indicators, however, is not cited.

Although most of the research reviewed in this section does not deal with young gifted children, it provides evidence for the hypotheses that innate abilities alone cannot explain outstanding mathematical skills. Instead, the results confirm the important role of effective organization of processes in (working) memory and the significance of a large and well-organized knowledge base. Hard training is necessary for many years to build up such a knowledge base. This necessitates high motivation and interest and even an emotional affinity for numbers. Moreover, the findings of Krutetskii on problem solving and transfer of the mathematically talented fit well with those of Campione et al. (1982) which define intelligence or ability in terms of transfer or generalization.

Social Environment of the Young Highly Able Child

As Tannenbaum (1992) pointed out, many children showing signs of giftedness as toddlers or in the preschool age, do not achieve an outstanding level of achievement in school and/or life. According to Lewis and Michalson (1985), one explanation for this

discrepancy between promise and fulfillment can be the family background and educational-career opportunities. Families select and produce opportunities and experiences for the development of their children, and thus play an essential part in the growing of giftedness. Consequently, the development of giftedness is a function of individual characteristics, environmental experiences, and the interaction between both factors (also Browder, 1993; Perleth & Heller, 1993).

Analyzing the socio-economic background of the families of gifted children and adults, a number of typical factors were identified. The majority of the students identified and traced by the classical Terman study turned out to stem from a wealthy and intellectual milieu. These findings of above-average education and socio-economically well placed families of the gifted was replicated regularly in giftedness studies (see Lewis & Michalson, 1985).

Birx (1988), for example, reports that her sample of mathematically talented youth have parents who are, in comparison with the population of German adults of that age, highly educated. Berger (1984) who investigated 10-year-old gifted students (identified by teachers on the basis of their academic achievement) states that the parents of these students are elite from the educational point of view, especially the educational level of the mothers. Similar findings were described by Freeman (1979). Willerman and Fiedler (1977) report for boys a correlation of $r = .51$ between educational level of the mothers and IQ measured at 7 years of age. No relationship was found for girls. Interestingly, the parents of the children whose IQ diminished in the course of the longitudinal study had completed less education. Howe (1990) also points out that among extremely successful scientists (e.g., winners of the Nobel prize) religion, size of the home city, etc. distinguish them from the population in general. Considering these findings that so many identified gifted children come from the middle and upper socio-economic classes, Roedell et al. (1989) address the problem of identification of gifted from other social and educational classes.

The structural aspects of the family during the childhood of the gifted also differ from the population average. At least in Germany, families with two children seem to be typical, where the mothers do not work but stay at home (in spite of their high education; Berger, 1984; Birx, 1988). Furthermore, more gifted are found to be first-born siblings (see also Lewis & Michalson, 1985), a fact which Pfouts (1980) explained by a higher amount of nurturing of the firstborn children (see also Storfer, 1990).

According to Howe (1990), individuals who later became scientists in particular come from intact families, enjoyed their childhood, and their career was straight and not interrupted by (family caused) critical life events. The parents of the gifted children from Berger's (1984) sample reported that their children were planned, and that pregnancy and birth were free from worries and problems. Most children had attended kindergarten.

The more sociological family characteristics described, however, cannot explain why they favor the development of highly able children. To obtain more insight into the shaping of giftedness, factors such as educational style, family climate, or attitude about learning and schooling have to be analyzed. Lewis and Michalson (1985) assume that an optimal amount and balance of freedom and pressure most favorably influences a child's motivation to learn and to explore the environment. According to Berger (1984), however, gifted German children have parents who favor either liberal or suppressive educational style, most parents stressing discipline from the early childhood on (e.g., early toilet training). From his interviews, it was noticeable that the parents view their families as the center of education and socialization, while school as educational and socialization instrument does not count much.

Findings like Terman's or some of the other cited here are often criticized because families of the gifted were compared nationally with average families. Beginning with a representative sample totaling more than 7000 8-year-old pupils recruited all over Germany (all of whom were tested individually), Rost (1993) compared 151 gifted elementary school children with 137 average control children which were matched by social class, age, school, grade, and sex. The findings were quite different from most of those reported above. Comparable family structures and family relationships were found in both the gifted and the control group. Moreover, the fathers and mothers of both groups had the same educational goals, and no differences were found with respect to patterns of parental behavior and parental beliefs.

In any case, Howe (1990) considers the sensitivity of a mother to the unique needs of her child to be a variable of major importance. According to Storfer (1990; see also Browder, 1993) the mothers (or parents) of gifted infants and toddlers initiate more interactions with their children, use more complex language when talking to them, they respond immediately, provide more related ideas. As they are better able to get the undivided attention of their mothers, the firstborn profit most. However, it should be kept in mind that not the total amount of stimulation but the amount of stimulation directed towards the infant or toddler is important. With secondborn children, American parents, for example, use television to a greater extent for stimulation. Howe (1990) pointed out that active, not passive activities are favorable for the development of giftedness.

Based on an example of Jewish families descending from Europe, Howe (1990) describes mechanisms of how giftedness can be fostered by the family environment and background factors such as educational aims, attitude towards achievement, religion, and so on (see also Storfer, 1990). The Jewish families are mostly intact and stable, with two parents at home. Their living circumstances in urban or suburban environments provide good cultural opportunities. As demanded by the Talmud, the fathers are the first to teach their

children and this takes place at an early age. The parents encourage activities that lead to success at school, while little emphasis is placed on sports. The whole lifestyle is one where scholastic activities are enjoyed and respected, the families witness the successful outcomes of sustained efforts to learn new skills. Most interestingly, studying is allowed on the Sabbath but other activities are forbidden.

Roedell et al. (1989) draw the conclusion from research on the family environment of the gifted that parents should spend a great deal of time with their children, read frequently to them, answer their children's questions in a proper way, support their children's own reading attempts and interests, and all in all, demonstrate a positive basic attitude towards intellectual learning. According to Howe (1990), however, girls are often confronted with traditional role models and encounter severe opposition to careers from their families. Encouraging and helping every child to acquire knowledge and skills should be the focus of parental educational efforts. On the other hand, Howe (1990) warns that some parents are too anxious and too ambitious about the development of their children (see also Perleth & Sierwald, 1992).

Discussion

Issues and Problems in the Identification of Young Gifted Children

Before putting the research on indicators of high ability in young children to use for identification purposes, the question needs to be answered of why and for what purpose gifted children in infancy, preschool age, or in the early elementary school years are to be identified. These are, of course, crucial questions and not trivial ones. Usually answers refer to the danger that children who are not identified early are not adequately stimulated so that their gifts will not develop (Karnes & Johnson, 1990). Thus, "the main purpose of identification is to provide educational experiences that can enhance the continuous growth of every gifted child" (Fatouros, 1986, p. 23).

Concerning infants and toddlers, however, Robinson (1987, see also Chapter 27, this volume) is skeptical about the usefulness of early training to force the development of giftedness. Nevertheless the author draws the conclusion "that successful parents are flexible, in tune with their children's progress, and ready to introduce a new idea when the child is ready, but that even those who are most planful also work with the children's own skills" (Robinson, 1987, p. 164). This means gifted children need stimulation, and they may require a variety of material so their intellectual needs can be fully met.

Expanding this to all family, preschool, and primary school education, the task is to find out how every child—whether gifted or not—can be supported by the educational environment for optimal talent development. This implies broad and continual diagnosis of

aspects and state of development of intellectual abilities and skills, motivational characteristics, and learning opportunities available in the educational environment. Such a continuous, non-selective diagnosis and related nurturance of every child corresponding to its individual needs would best help to develop the gifts and talents of all children.

Due to financial and organizational limitations such as individualized education has to be judged utopic and cannot be realized. Thus, fostering of gifted children will also have to take place in special, but relatively homogeneous groups or classes (see Part IV of this volume, especially Chapter 27 by Robinson). A couple of problems are related to the identification and selection of young children for special courses and classes. One problem is the relative instability of abilities and skills of young children, thus making every prediction a risky undertaking.

Fatouros (1986), for example, recommends a sequence of group tests as a screening procedure and an individual test for identifying gifted children following the psychometric approach, but favors a broad approach using a variety of types of diagnostic sources and information on indicators of giftedness. During the screening phase, the use of parents and/or teacher checklists are to be recommended in addition (see Roedell et al., 1989; Mathews & Burns, 1987; Robinson, Chapter 27 in this volume).

Information obtained by checklists, however, has to be used carefully. Especially for young children, the competence of teachers to identify gifted children is often questioned (e.g., Fatouros, 1986) or nearly denied (e.g., Rost, 1993). Rost (1993) also judges peer and self nomination as totally useless for the identification of gifted (primary school) children (also Fatouros, 1986; Gagné, 1989).

Although some authors argue that the best information on gifted preschool children is available from their parents (e.g., Hagen, 1989), according to the results of Johnson and Lewman (1990), parental perception of giftedness indicators in 3- to 4-year-old boys and girls has to be doubted, as the answers of parents showed drastic role stereotypes. While, in comparison with girls, boys are nominated twice as frequently in the category "remarkable abstract thinking", 140% more nominations in "extraordinary curiosity", and 150% more nominations in "problem solving", girls are perceived as possessing a "large vocabulary" (30% more nominations).

As shown above, ability, skills, and knowledge develops in interaction with the child's environment, which is initially the family. Special attention has to be paid to children of risk groups (Heller, 1993): apart from girls, these include, in particular, handicapped children and children from low income homes (Karnes & Johnson, 1990). Especially the latter ones are difficult to identify, whereby the educational level of the parents seems to be the key variable. It is obvious that, with these children, conventional testing as well as the use of

(behavioral) checklists are not suitable. Both of them focus, as a rule, on the child's intellectual status not on its learning potential (Guthke, 1974, 1992). The repeated findings that the most gifted stem from middle or higher classes should be alarming for those engaged in the identification of gifted children.

Practical and Research Desiderata

Early identification of young gifted children necessitates methods which are able to discover those children who promise high achievement in later school or professional careers. With respect to psychometric tests and as well to other early indicators of giftedness described in this chapter or in (behavioral) checklists, this requires first of all high reliability, fairness, and high predictive validity. To prove that a test has sufficient reliability for purposes of identifying promising children, it is not enough to determine its parallel test or consistency reliability. Instead one has to show that the retest reliability is high since the assumption is that the measured trait or indicator is stable over the course of time and that the individual scores do not depend on the moment of measurement. The German WISC-R, for example, shows good consistency but considerably poorer stability so that irreversible selection decisions should be avoided.

For identifying young gifted children, proving prognostic validity of the test and the giftedness indicators used plays a central role. This seems to be a main problem as the predictive power of a method can only be demonstrated in longitudinal studies. In the case of identifying gifted children, such studies would require very large samples and the tracing of the sample over many years. Moreover, all tests and questionnaires should be completed under the supervision of trained researchers, as for example Rost (1993) did in his study. To check the prognostic validity of an instrument, it is not enough to watch a sample of gifted and checking whether they indeed achieve outstanding but it is necessary to do such research with appropriate design including different control groups (if not representative samples). If identification methods are used for selecting children for special programs, for example, at the very least, the levels of achievement which selected children are able to achieve with and without the program need to be examined, as well as the progress made by the non-selected with and without the program.

Therefore longitudinal studies with representative samples are extremely crucial for the evaluation of methods suited for the early identification of gifted children. Unfortunately, such research is difficult to organize, expensive, and requires a great deal of manpower. A possible solution therefore could be to reanalyze data of big representative longitudinal surveys to obtain information on the usefulness of the identification methods (e.g., the British Birth Survey cited earlier). In spite of their primarily pediatric character, such studies

collect numerous variables on the motor and cognitive development as well as on the academic achievement of the children. Their size enables the investigation of groups of gifted children recruited without dubious screening by parents or teachers as has to be done in most giftedness studies for practical reasons.

While most considerations up till now are valid for tests and behavioral indicators of high ability, two additional aspects would be desirable for psychometric methods. The first is the application of probabilistic test theories, for example the Rasch-model, to the construction of tests used for the identification of gifted children. Such tests would enable tailored testing and, in this way, above all lead to higher precision of the test results (see above; Weiss, 1983). Especially with regard to children from underprivileged families, the learning test approach (see above) would help to better fairness of the psychometric methods (Day & Hall, 1987; Guthke, 1992).

If indicators of giftedness—for example in the form of (behavioral) checklists—are employed, effective and practical statistical methods for the combination and weighting of the single information have to be used (see Hany, Chapter 11, and Feldhusen & Jarwan, Chapter 13, this volume). One possibility could be Bayes' rule which combines given probabilities of the occurrence of indicators in gifted and non-gifted children to evaluate the probability that a single child exhibiting some indicators and not exhibiting others is gifted. Modern statistics has provided more methods for combining probabilities. The mechanisms of these should be cautiously examined by practitioners and researchers. For example, especially with extremely seldom events (or indicators) the Shafer–Dempster theory which is widely used in expert systems, produces spurious results and thus seems to be inappropriate for the purpose here discussed.

At any rate, such a combination of probabilities demands knowledge about the frequency of the indicator in gifted and unselected or non-gifted population (or in every group which is diagnostically relevant) and therefore necessitates respective research with representative samples. It should be noticed, that especially with indicators used for checklists, sometimes myths arise and are spread (e.g., Tannenbaum, 1992, cites a table from Lewis & Louis, 1991, who report that Freeman, 1985, found that gifted children are characterized by their sense of humor, although Freeman, 1979, 1985, states the opposite; or see the section on sleep above).

As a quintessence, the literature reviewed and possibilities described in this chapter show that identification of young gifted children is problematic. Psychometric measures as well as diverse indicators of giftedness have up till now not proven to be suitable to identify these children who promise exceptional achievements later in school or in professional career. As early as 1896, the German founder of the experimental psychology, Wilhelm Wundt (1914) wrote: "The experimental method is almost without application

for early childhood, and the results of experiments which have nevertheless been undertaken should be more or less considered purely coincidental because of the unbelievable weighting of error sources" (p. 364). Even if, nevertheless, much research with high standards has been undertaken, psychometric measures as well as diverse indicators of giftedness have—to date—not proven to be suitable for identifying those children who promise exceptional achievements later in school or in professional life.

Aside from possible principal obstacles to early identification, this is due to a considerable lack of appropriate research. There are too few prospective longitudinal studies and too few studies with representative samples or at least with adequate control groups. Giftedness research in young children too often fall back on to samples of counseling centers with their highly preselected clientele, thus finding and generalizing results which are not representative for the population of gifted children (see for example, the different results which Freeman, 1979, found for her gifted target and her gifted control group). In addition, too little effort in giftedness research is made in minority groups, in underprivileged children, in the handicapped, and in other risk groups. A possible way out of this dilemma could be the reanalysis of data from large surveys and other representative studies at least to generate hypotheses which can be tested in following giftedness studies.

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Acquiring Expertise: Determinants of Exceptional Performance

WOLFGANG SCHNEIDER

University of Würzburg, Germany

Introduction

This chapter focuses on the respective roles of cognitive ability and domain-specific knowledge in predicting exceptional performance. Since the beginning of this century, educational researchers and psychologists have tried to locate the sources of outstanding (academic) behavior and performance. At least two different ways of tackling this problem can be distinguished.

The earlier research paradigm explored the impact of giftedness on exceptional performance. According to this scientific approach, general intellectual abilities assessed in early childhood or adolescence strongly influence later academic or professional performance. As noted by Ericsson and Smith (1991), this approach is guided by the basic belief that behavior is predominantly influenced by inherited qualities. The paradigm seems particularly attractive because of its implicit assumption that only a few general, basic abilities are sufficient to predict and explain a large variety of specific performances. The longitudinal study of gifted children carried out by Terman and his colleagues (to be described below) is representative of this line of research (cf. Terman, 1925, 1954; Oden, 1968).

A second, more recent scientific approach differs from the giftedness paradigm in that exceptional performance is assumed to be primarily acquired. Accordingly, specific educational experiences and intensive as well as extensive domain-specific training and practice determine the acquisition of skill in particular domains. General abilities play a minor role in this explanatory approach (cf. Anderson, 1990; Ericsson & Crutcher, 1990). Since the late sixties, the study of expertise has attracted many researchers interested in human information processing. In particular, research on chess expertise has enriched our knowledge about the acquisition of domain-specific skills and the preconditions for outstanding performance in this domain.

Given the popularity of the expertise approach in current cognitive psychology, the merits of research on the impact of early intellectual ability on later academic performance seem dubious. Proponents of the expertise approach (e.g., Ericsson & Crutcher, 1990) claim that individual differences in intellectual ability do not account

for much of the variance in exceptional performance. Difficulties with evaluating this view are related to theoretical problems, that is, problems with defining and operationalizing intelligence and cognitive ability. Recent reviews on this issue emphasize the fact that research on intelligence has abandoned traditional lines, focusing on cognitive task analysis, processing strategies and features of context (see Ceci, 1990; Gruber & Mandl, 1992).

Although there seems to be broad agreement in the contemporary literature on exceptional performance that the old concept of basic intellectual ability has lost its importance and should be replaced by the concept of acquired skill, the relationship between cognitive ability and the acquisition of expertise has not been sufficiently considered in most of these studies. It is the major purpose of this chapter to explore this relation in more detail. In a first section, developmental research on giftedness and its impact on later performance is briefly reviewed. Next, an overview of research dealing with expertise in adulthood is provided. After a summary of the most important findings, theoretical assumptions and models concerning the process of acquiring expertise derived from this research with adults will be discussed in more detail. In the next section, developmental research on knowledge acquisition based on research with children will be reviewed. Here, the basic goal is to assess the generalizability of findings from work with adult experts to child samples and to broaden the perspective by adding data from prospective studies on the development of expertise to the predominantly retrospective inferences of acquisition processes derived from studies with adults. In the final section, theoretical models are introduced that describe possible relationships between aptitude and the acquisition of expertise.

Prospective and Retrospective Approaches Explaining Giftedness and Exceptional Performance

Prospective Studies

As noted above, the well-known Terman Gifted Children Study can be conceived of as the most impressive

attempt to explore the predictive power of high intellectual ability for subsequent academic performance and success in later life. In this study, about 1500 young Californian children with an IQ of 135 and above were recruited in the early twenties of this century and followed up until recently. Although the theoretical focus of the study changed over the years, the body of data seems suited to evaluate the relevance of high aptitude for academic and professional performance. At first glance, the findings seem to support Terman's expectations: On average, the gifted children performed very well in school and were rather successful in later life. However, a closer look at the findings revealed that the expected collection of "eggheads" and outstanding personalities was not found (cf. Sears, 1984). As noted by Howe (1982), the data collected by Terman and his colleagues provided little information that would have helped one to predict which of the children under study would be most successful in later life. Thus the conclusion to be drawn from this study is that educational achievement and success in life cannot be sufficiently predicted by indicators of high intellectual ability measured at an early point in time.

Further research indicated that the quality of the IQ predictor does not change much when aptitude is assessed considerably later, that is, during the college years (cf. Samson, Grane, Weinstein, & Walberg, 1984). In this study, an average correlation of about .15 was found between college students' aptitude and their professional productivity assessed several years later, indicating that the subsamples representing "schoolhouse giftedness" and "production giftedness" do not have much in common (cf. Siegler & Kotovsky, 1986). Obviously, information about intellectual ability alone does not allow for reliable predictions of later academic and professional success.

Retrospective Studies

Another line of research focused on subjects with reliably superior performances, with the goal to reconstruct their cognitive and noncognitive abilities. Most of that research was similarly motivated by the belief that exceptionally high levels of performance should reflect some basic cognitive ability like general intelligence, attention, or memory (e.g. Cox, 1926). Some researchers studied other stable individual characteristics, such as aspects of personality and motivation (Roe, 1952, 1953). In short, the results of these retrospective studies seem to confirm the outcomes of the prospective studies in that individual differences in intellectual abilities did not show up as the crucial determinant of outstanding professional careers. For example, Roe's analysis of the careers of outstanding scientists showed that noncognitive factors like endurance, concentration power and commitment to work turned out to be more important for professional success than the individuals' cognitive abilities,

despite the fact that the latter were generally above average.

More recently, Roe's findings were confirmed in an interview study with excelling scientists, sportsmen and artists organized by Bloom (1985). The data obtained from these subjects and their parents did not support the view that outstanding basic abilities were solely responsible for success in later life. Instead, the study provided strong evidence that no matter what the initial gifts or basic abilities of the individuals, extreme levels of capabilities in their fields of expertise were not attained unless there was a long and intensive process of encouragement, education and training. Bloom concluded from these findings that his research has raised serious questions about earlier views of special gifts and innate aptitudes as necessary prerequisites of talent development (1985, p. 3).

Taken together, prospective and retrospective studies focusing on the impact of intelligence and other stable cognitive factors on academic and professional success have been largely unsuccessful in identifying strong and replicable relations (see Ericsson & Smith, 1991, for more evidence on this issue). Instead, most of these studies have shown that noncognitive factors like motivation, concentration and endurance as well as parental and school support systems seem responsible for exceptional performances in later life.

Evidence From the Expertise Approach

Studies With Adult Experts and Novices

Undoubtedly, the pioneering work on chess conducted by de Groot (1946, 1978) and Chase and Simon (1973) has stimulated numerous studies on the nature of expertise. For most cognitive psychologists, an approach based on acquired characteristics seems much more suited to account for outstanding and superior performance than research on giftedness relying on stable inherited characteristics. The game of chess appears particularly attractive for researchers interested in the preconditions of outstanding performance because it is rather easy to produce and observe outstanding performance under standardized conditions. One advantage of this game over others is that it is possible to measure a subject's chess-playing ability from the results of matches against different opponents in different tournaments (cf. the index developed by Elo, 1978). Another, related advantage is that groups of chess players differing reliably in chess skill can be easily selected. As chess skill can be measured with remarkable precision, the domain of chess seems ideal for the study of acquired skill. Models of chess skill have strongly influenced investigations of expertise in other domains like physics, medical sciences, music and sports. The most important findings concerning cognitive and noncognitive characteristics of expertise in chess and these other domains will be discussed below. Before doing so, however,

general theoretical and methodological problems with the expertise approach will be briefly summarized.

PROBLEMS WITH THE EXPERTISE APPROACH

Despite its obvious advantages, the expertise approach still suffers from several problems. One of the problems is that the term "expertise" has a number of popular definitions, which all are somewhat vague (cf. Gruber, 1991; Saltouse, 1991). Although the broadly accepted definition that expertise refers to extreme or exceptional performance implies that the evaluation of expertise should represent some measure of actual competence, rather than a possible correlate of competence such as amount of experience, the categorization of a subject as an expert is still relatively arbitrary given that researchers disagree with regard to the particular level of competence that qualifies one as an expert. Although attempts to specify subcategories of expertise like layperson, novice, intermediate, subexpert and expert (cf. Patel & Groen, 1991) seem to represent an improvement, this classification does not solve the problem because the boundaries between categories remain unknown. In many empirical studies, the definition problem becomes obvious when the median of the distribution of a competence measure is taken as the critical boundary for expert-novice distinctions.

As noted by Ericsson and Smith (1991), another critical issue in the expertise approach is how to identify standardized tasks that will allow the real-life outstanding performance to be reproduced in the laboratory. As our knowledge of complex domains of expertise like writing, physics, or medical reasoning is incomplete, it seems impossible to specify a population of tasks to capture such expertise. The problem is also apparent in the domain of chess. For example, de Groot (1978) designed the task of selecting the best move for a number of different chess positions in order to simulate "real-world" problem solving behavior. Although the task seems valid at first glance, its problems relate to the fact that it is very difficult—if not impossible—to evaluate the quality of chess moves for an arbitrary chess position (cf. Ericsson & Smith, 1991). Given the vast number of possible sequences of moves and the fact that chess players employ a wide variety of chess-playing styles, it seems impossible to identify a single "best" move. Despite these obvious problems, however, it should be noted that de Groot was able to localize a few differences in cognitive processes between the grand masters and the other class experts in his study, by analyzing think-aloud protocols from his best-next-move task. Although the ecological validity of the task remains uncertain, it at least can be used to illustrate differences in thinking processes of more or less eminent chess players.

The same validity problem also holds for the various memory tasks repeatedly used in studies of expertise. Undoubtedly, performance on such tasks (i.e., recall or recognition) is much easier to evaluate than, for

example, a protocol of thinking processes obtained for the next-best-move task. It is questionable, however, whether those aspects of memory assessed in the laboratory really capture the crucial features of expertise in real-life situations. The reader should keep in mind that despite the popularity of the expertise approach, these problems have not been solved yet.

PERFORMANCE DIFFERENCES BETWEEN EXPERTS AND NOVICES

In the classic studies by de Groot (1946, 1978) and Chase and Simon (1973), exceptional performance in the domain of chess was linked with exceptional memory for information related to that domain. In order to capture skill differences in chess, de Groot used a task that assessed memory for briefly presented chess positions. He found that when chess masters were shown a chess position consisting of 20–30 pieces for a very brief duration (e.g., 5 seconds), they were able to remember the position far better than less experienced chess experts. Chess masters were able to recall the positions of all pieces virtually perfectly, whereas the positions recalled by the less experienced chess experts ranged from 50–70%.

Chase and Simon (1973) followed up de Groot's finding that there were major memory differences in regard to recall of briefly shown game positions. They added an important control, showing expert and novice players also random arrangements of pieces. As the experts' advantage in recall with structured positions disappeared when random positions were reconstructed, it could not be attributed to superior visual short-term memory on the part of the experts.

In order to understand the chess master's recall superiority for meaningful chess positions, Chase and Simon attempted to uncover the structure of his chess knowledge. They showed that the recall advantage depended on the master's ability to recognize familiar patterns or "chunks". That is, the master was able to recall pieces more effectively than the novice because groups of pieces, rather than single pieces, formed his chunks. According to this finding, quantitative differences in the memory performance of experts and novices can be largely explained by *qualitative differences* in memory behavior.

Research on expert-novice differences in the use of complex knowledge in other domains like electronics or architecture has also revealed the importance of higher-order chunk structures for superior performance (cf. Chi, Glaser, & Rees, 1981). Although the notion of chunking as a major determinant of expert-novice performance differences seems broadly accepted in the literature, findings from more recent studies have seriously questioned the assumption that chunking affects experts' short-term memory. Carefully designed studies of superior memory performance for chess positions have shown that experts store information about chess positions in long-term memory, not solely in short-term

memory as Chase and Simon (1973) originally proposed (see for a review Charness, 1991). These findings do not cast doubts on the basic assumption that there are qualitative differences in memory behavior of experts and novices. However, they indicate that Chase and Simon's (1973) original theoretical assumptions need to be replaced by more sophisticated views of skilled memory like those by Chase and Ericsson (1982; see also Ericsson & Staszewski, 1989), stressing the importance of domain-specific, easily activated retrieval structures in recall performance.

Qualitative differences in the problem-solving and memory behavior of experts and novices have also been reported in studies dealing with other domains like physics and medical diagnosis and reasoning (see Anzai, 1991; Chi, Glaser, & Rees, 1981; Patel & Groen, 1986, 1991). Evidence on such differences has been based on tasks different from those used in the domain of chess.

Basic differences in problem representations between physics experts and novices were suggested in an experiment by Chi, Feltovich, & Glaser (1981). Chi et al. were able to show that experts and novices in physics differ in their categorization of physics problems: Whereas experts classified the problems with respect to underlying principles, novices tended to use superficial meanings of words and diagrams for the purpose of classification. Expert–novice differences in the domain of physics can also be seen in procedural knowledge for problem solving. For example, Simon and Simon (1978) found blatant qualitative differences in experts' and novices' solution processes. That is, experts solved problems in a "forward" way from the given data to the goal, whereas novices tried to solve problems in a "backward" way, starting from the goal (e.g., an equation containing the unknown of the problem) in search for appropriate data to satisfy each subgoal. Although this finding seems counterintuitive at first glance given that the novices appear to use the more sophisticated strategy, there are at least two explanations accounting for the experts' problem solving behavior. The first is that experts know that they can achieve the goal simply by direct calculations of the unknowns from the given. Another interpretation is that experts do not require complex planning for simple tasks. Evidence for this explanation stems from research showing that experts change to very sophisticated means-end analyses when the physics problems become more difficult (Larkin, McDermott, Simon, & Simon, 1980). In summary, the studies on expert–novice differences in the domain of physics thus show that the superior performance of experts on a variety of problem solving tasks is mainly due to the experts' well-organized declarative and procedural knowledge. As a consequence, performance differences between experts and novices can be explained by qualitatively different strategies.

Further empirical evidence concerning qualitative differences in the way experts and novices recall and comprehend domain-related information stems from studies on medical expertise (cf. Lesgold, 1984; Patel & Groen,

1986, 1991). The work by Patel and colleagues seems related to the research on expertise in physics outlined above in that one focus of expert–novice comparisons was on reasoning strategies. Patel and colleagues used a basic experimental procedure where subjects were presented with a written description of a clinical case and were asked to study the text for a specific period of time, after which it was removed. The dependent measures used in the various experiments on medical expertise were free recall, diagnosis and diagnostic explanation. Diagnostic explanation was included to identify the direction of the reasoning strategy (forward or backward method). Here, subjects were requested to explain the pathophysiology (causal patterns) underlying the clinical case.

Based on their fine-grained classification of expertise (i.e., laypersons, beginners, novices, intermediates, subexperts and experts), Patel and colleagues analyzed differences among the subgroups concerning recall, diagnosis and reasoning strategy. When experts and subexperts were compared on these measures, no recall differences were found. Below that level of expertise, substantial recall differences could be demonstrated (i.e., for the novice and intermediate subgroups). On the other hand, diagnostic accuracy was considerably higher in the experts, as compared to the subexperts (for confirming evidence, see also Lesgold, Glaser, Rubinson, Klopfer, Feltovich, & Wang, 1988). In addition, forward reasoning was closely related to diagnostic accuracy. Patel and colleagues inferred from their results that diagnostic accuracy is monotonically related to expertise, whereas recall performance is nonmonotonically related to expertise. Reasoning strategies, on the other hand, should be considered an all-or-none phenomenon that may be related to the two extremes of the expert–novice continuum.

Taken together, research on expertise in different domains like chess, bridge, music, has shown that experts display superior memory performance for stimuli from their domain of expertise when adaptations of Chase and Simon's (1973) original procedure have been used (for a review, see Ericsson & Smith, 1991). Other studies using the expert–novice paradigm have shown superior recall of domain-related information as a function of the subject's amount of knowledge of the domain. Examples include the domains of baseball and soccer (e.g., Voss, Vesonder, & Spilich, 1980; Morris, Tweedy, & Gruneberg, 1985). Most of these studies have found evidence supporting a monotonic relation between recall of domain-related information and domain-specific knowledge. They have also supported the view that the main differences among experts and novices in a wide range of domains concern the speed of access to relevant knowledge as well as the sophistication of knowledge-based strategies.

THE ROLE OF BASIC ABILITIES

What do the studies on expertise tell us about the *impact of basic abilities* on exceptional performance? The empirical evidence for such an influence is rather scarce.

In the case of exceptional chess performance, superior spatial ability often was assumed to be important (Chase & Simon, 1973; Holding, 1985). However, a recent study by Doll and Mayr (1987) does not confirm this view. Doll and Mayr compared about thirty of the best chess players in Germany with those of about ninety normal subjects of similar ages, using an IQ test with seven subscales. As a main result, Doll and Mayr (1987) found no evidence that chess players were selectively better on spatial tasks. In general, the relation of IQ to outstanding performance seems rather weak in several domains (for a review, see Ericsson & Crutcher, 1990).

Although general abilities do not seem to make a major difference, the results of several studies suggest that *special abilities* like speed of information processing or basic memory abilities could be a source of individual differences. Regarding reaction times, for instance, it has been repeatedly shown that experts are faster and more accurate than less experienced subjects. A closer examination of these studies, however, does not confirm the view that experts outperform novices with regard to information processing speed. For instance, it was shown that experts' superior speed in their domain of expertise does not transfer to other tests of speed, like simple reaction times, or to general tests of perception (cf. Starkes, 1987).

Similarly, the exceptional memory performance shown by many experts for materials from their domain does not generalize to materials outside their domain, as demonstrated by Chase and Simon (1973). Studies focusing on exceptional memory performance have described in detail how subjects with initially normal memory skill acquired exceptional memory skill through extensive practice (cf. Chase & Ericsson, 1982; Staszewski, 1988, 1990). In these studies, subjects were provided with several hundred hours of practice on the classic digit-span task. After 50–100 hours of practice, subjects were able to increase their digit spans from about 7 to over 20 digits. Subjects going through a very extensive training program were even able to attain digit spans of over 100.

How was it possible to acquire this skill? The explanation is that these subjects were experienced long-distance runners with a rich knowledge base for running times. They were able to use their knowledge for recoding and interpreting incoming digit sequences as specific running times. The fact that exceptional memory performance can be successfully trained was further demonstrated in a recent study by Kliegl, Smith and Baltes (1986). Kliegl et al. trained young and old adults to memorize digits using phonemic recoding of digits into concrete words, which were stored in long-term memory using the ancient "method of loci". It could be shown that with extensive training, speed of memorization dramatically increased, approaching a rate of 1 digit per second.

Accordingly, exceptional memory performance demonstrated by many experts cannot be attributed to inherited basic abilities but has to be conceived of as an acquired

competency, that is, as an outcome of extensive practice and training in the domain of expertise. This competency was labeled "skilled memory" by Chase and Ericsson (1982) who identified three basic principles in the acquisition process. First, information is meaningfully encoded in terms of knowledge structures in semantic memory. Second, retrieval cues are constructed during the encoding process, which are explicitly associated with the encoded information and can be easily retrieved from long-term memory. Third, encoding and retrieval processes can be considerably accelerated by extensive practice. As a consequence of long training, the speed of these encoding and retrieval processes are assumed to approach those observed in short-term memory.

All in all, research dealing with the relevance of biological dispositions, innate talent and basic abilities for exceptional performance has been rather unsuccessful in establishing such relationships. The best evidence for the importance of inherited characteristics comes from the domain of sports, for example, the domains of basketball or gymnastics, where anatomical characteristics such as height obviously make a difference. For a few abilities, such as perfect pitch in music, tapping speed in the case of typists and specific abilities revealed by children and idiots savants, innate "talent" may be a plausible explanation. However, recent research on expert performance has convincingly shown that exceptional performance in many fields is primarily due to a vast body of acquired knowledge and experience as well as to acquired skills (Ericsson, Krampe, & Tesch-Römer, in press).

What follows from this is that practice plays a crucial role in the acquisition of expertise. Across a wide range of tasks, improvements in performance seem closely related to the amount of practice. Reviews of skill acquisition indicate that the relationship between performance and practice is monotonic (Anderson, 1982; Newell & Rosenbloom, 1981) and that a power function provides a very good fit for a variety of tasks and skills.

However, taking the amount of practice as the only important predictor of performance probably oversimplifies the problem. Our everyday experiences show that not all people practicing and working extensively in a specific domain end up as eminent experts in that area. Similarly, observations from laboratory experiments have indicated that providing motivated subjects with repeated exposure to a task does not ensure that they will attain the highest levels of performance on that task (Chase & Ericsson, 1981). In particular, inadequate strategies often account for suboptimal performance. The available evidence indicates that subjects can either discover or deduce superior strategies for performing tasks, or learn them through instruction. For instance, the training study by Kliegl, Smith, and Baltes (1989) showed that subjects were able to improve rapidly and attain exceptional levels of performance only after being instructed to use adequate strategies. Thus the *amount* of practice may be a necessary but not sufficient condition

for expert-level performance. Obviously, the *intensity* and *quality* of practice are at least equally important in order to reach ambitious goals. Recent theoretical models dealing with the acquisition of expertise have tried to take these different aspects of practice into account.

Theoretical Models Describing the Acquisition of Expertise

MODELS OF SKILL ACQUISITION

There have been several models of skill acquisition in the literature. The classic model developed by Fitts and Posner (1967) proposed three different acquisition stages: The “cognitive stage” can be characterized by an effort to understand the task demands and to distinguish between important and unimportant aspects of the task. The focus is on the acquisition of declarative knowledge about the task. The “associative stage” involves making the cognitive processes more efficient to allow rapid retrieval, thus transforming declarative knowledge into procedural forms. During the third and final phase, labeled the “autonomous stage”, performance is automatic and conscious cognition and control is minimal. See Anderson (1982) for a similar theoretical model.

Although these models of skill acquisition have been attractive for many researchers in the field, stimulating much important research, it remains unclear whether the learning mechanisms and developmental stages they propose do generalize from adult learners to children. We know from numerous reports on the careers of chess experts, eminent musicians, or world-class tennis players that these individuals have started their careers at a very early point in life, that is, between 6 and 10 years of age (e.g., Bloom, 1985). We also know from several sources that the time between experts’ first experiences with their domain of interest and attaining international-level performance is about 10 years (Chase & Simon, 1973; Krogus, 1976; Sosniak, 1985). As pointed out by Ericsson and Crutcher (1990), this 10-year rule is supported by data from a wide range of domains, including sports, music, chess and science.

Given that the attainment of exceptional performance in real life usually takes place in childhood and adolescence, it seems important to identify the learning mechanisms, rules of practice and support systems that enable this rapid development. Recent research conducted by Anders Ericsson and his colleagues (Ericsson, 1990; Ericsson & Crutcher, 1990; Ericsson, Tesch-Römer, & Krampe, 1990; Ericsson et al., in press) has led the authors to propose a theoretical framework for the acquisition of expert-level performance. The attractiveness of this model stems from the fact that hypotheses about the developmental history and practice intensity of expert-level performers have been systematically

evaluated against empirical evidence on exceptional performances in various domains.

A THEORETICAL FRAMEWORK FOR ACQUISITION OF EXPERT-LEVEL PERFORMANCE: THE ROLE OF DELIBERATE PRACTICE

The model presented by Ericsson and colleagues differs from the skill acquisition models presented above in that it explicitly considers developmental issues within a life-span perspective. Whereas skill acquisition has, for the most part, been studied with college students, most information relevant for Ericsson’s theoretical framework stems from observations and retrospective reports dealing with performances in childhood and adolescence.

Ericsson and colleagues adopt and extend the basic characteristics of a framework first developed by Bloom (1985b). Accordingly, the preparation period for reaching exceptional performance can be conceived of as a sequence of states, each representing rather stable characteristics for a specific time period in the individual’s life. The first stage corresponds to the playful introduction to the domain, the second to the start of systematic practice supervised by a coach or a teacher and the third and most crucial stage to attaining exceptional levels of performance (cf. Ericsson et al., 1990).

This model suggests that the type and intensity of training may differ as a function of developmental stage. Whereas it is most important to keep children motivated and interested in the domain during the first stage, methods of instruction and the quality of teachers become more relevant with increasing levels of performance. An early start as well as parental interest and support seem particularly important for the earlier stages. With increasing skill, factors like availability of excellent instruction, quality of practice equipment and access to practice facilities become most relevant. As noted by Bloom (1985b), performers at an international level have almost always been instructed by master teachers who themselves had once achieved that level.

Ericsson et al. (1990) provide multiple evidence from the domains of chess, sports and music that is in accord with the core assumptions of this model and that shows surprising parallels in developmental patterns observed across these domains. For example, the available data indicate that the average starting age for exceptional performers is uniformly young across the three domains (about 7 years of age), with the best performers on average having the youngest starting ages. Similarly, retrospective estimates consistently showed that the amount of practice increases as a function of age and expertise, regardless of domain. It appears that systematic practice is most often initiated by parents, who very actively support and reward the acquisition of practice habits. Increases in the weekly amount of practice occur throughout adolescence and reaches

its peak around the age of 20. In most studies, the reported amount of practice was often highly correlated with levels of performance and comparable amounts of practice were reported for subjects of the same performance level across domains. The empirical evidence collected and discussed by Ericsson et al. (1990) not only supports Bloom's original assumptions but also extends the findings by Bloom (1985b) and his collaborators, in so far as performers at levels below international level were shown to engage in less practice.

One apparent problem with this account is that it focused on the *extent* of practice, although individual differences in the *intensity* of practice were also observed. In a more recent review paper, Ericsson et al. (in press) take care of this problem in that they focus on the role of *deliberate* practice. This term refers to practice activities that aim at maximizing improvement. Deliberate practice is conceived of as a highly structured activity which requires effort and is not inherently enjoyable. According to Ericsson and Krampe, individuals are motivated to engage in deliberate practice only because practice improves performance, not because of monetary reward.

Ericsson and colleagues point to several methodological problems involved in demonstrating the fact that performance changes as a consequence of deliberate practice. During the first decade of preparation necessary for attaining exceptional performance, many aspects of training and evaluation change. It is important to note here that one reason for the difficulty to predict adult performance from early performance is that the criteria used to evaluate performance change with increasing level of performance. For example, whereas beginners in the domain of music are mainly judged on their technical skills, expert adult performers are predominantly judged on their interpretation and their ability to express emotions through music (Sloboda, 1991). Similar considerations may explain why mathematical prodigies can be unsuccessful as adult mathematicians.

According to the theoretical framework established by Ericsson and colleagues, other constraints inherent in the attainment of exceptional performance concern resources, effort and motivation. In many cases, it has been shown that parental support is a major variable and that extraordinary commitments by parents may be necessary to cope with the demands (cf. Bloom, 1985b). Further, as deliberate practice requires effort, fatigue is a frequent result. The success of deliberate practice seems to depend on a careful balance of intensive practice and recovery. Disregard of the effort constraint on deliberate practice may result in maladaptation, injury and even failure. Finally, as deliberate practice is not inherently enjoyable, the motivational constraint has to be given special attention. The loss of the goal to improve can have different causes. Problems with external support may be as relevant as problems due to a temporary stagnation of performance despite continued practice. These problems seem particularly related to the initial stages of the preparation period and may loose

their importance when individuals get more involved in a domain. As noted by Ericsson et al. (in press), at this point the motivation to practice becomes closely connected to the goal of becoming an expert performer and integrated in the daily routine.

The framework presented by Ericsson et al. (in press) differs from earlier views in that deliberate practice is the important factor mediating the observed relation between experience, full-time engagement and exceptional performance. Accordingly, extended experience or practice (the 10-year rule) is necessary but not sufficient for attaining the highest levels of performance in a domain.

In an attempt to test the validity of this framework, Ericsson et al. (in press, Study 1) compared three groups of elite, adult violinists regarding their current and past levels of deliberate practice. The group labeled "the best violinists" were rated by music professors as having the potential for careers as international soloists. The music professors also nominated a second group of "good violinists" with less potential but still very promising perspectives. A third group of students with comparably lower admission standards were called "the music teachers" because teaching was the most likely future profession for this group.

It was predicted that the highest improvement of performance and indirectly the highest attained performance, should be associated with the largest weekly amounts of deliberate practice. The assumption was that even among individuals with more than 10 years of practice, performance should be closely related to the amount of deliberate practice.

The analysis of interview data concerning the amount and distribution of deliberate practice confirmed this assumption. The best violinists estimated more practice hours per week than the good violinists during early adolescence and more than the music teachers during their entire developmental period. Regarding the diary data which included the practice hours for a full week, clear differences between the music teachers and the two best groups, but no differences between the two best groups were found. Also in accord with the expectations, the top violinists rated sleep as highly relevant for improvement of violin performance. As a matter of fact, the two best groups of violinists with the highest levels of deliberate practice were found to nap more in the afternoon than did the group of music teachers. All in all, the results of this study are in line with the predictions derived from the theoretical framework developed by Ericsson and colleagues.

In their discussion of results, Ericsson et al. (in press) emphasize the fact that individual differences in expert performances should not be attributed to individual differences in natural, innate abilities. Instead, they argue that expertise has to be conceived of as the result of extensive and intensive practice activities and that individual differences in ultimate performance can be accounted for by differential amounts of past and current levels of practice. The claim is that once individuals have

started deliberate practice, it is virtually impossible to distinguish the role of natural, innate ability from that of acquired skill in their current level of performance. According to Ericsson and colleagues, it is not the innate talent but rather the *perception* of talent that motivates parents to invest time and money to support deliberate practice. Needless to say, perceptions of talent should not be equated with objective indicators of innate ability.

Although Ericsson et al.'s theoretical framework for the acquisition of expert-level performance seems impressive and well-suited to account for much of the empirical evidence on the causes of exceptional performance, one possible problem with the empirical evidence described above is that it mostly consists of cross-sectional studies predominantly dealing with retrospective estimates of past behavior and interview data obtained from adults. In our view, prospective studies carried out with child experts and novices may add substantially to our knowledge about the origins and determinants of exceptional performance, particularly as far as the role of domain knowledge and basic abilities is concerned. As a consequence, the empirical evidence on determinants of exceptional performance based on cross-sectional as well as longitudinal developmental studies with child experts and novices will be summarized next.

Studies With Child Experts and Novices

Most developmental studies using the expert–novice paradigm focused on the impact of domain-specific knowledge on memory. In the field of memory development, numerous studies conducted during the past two decades have demonstrated the importance of the knowledge base for various aspects of memory performance (for reviews see Chi & Ceci, 1987; Schneider & Pressley, 1989). According to many developmental researchers, the knowledge base seems to be one of the crucial sources of memory development in childhood and adolescence, probably outweighing other relevant factors like capacity, strategies, or metamemory (cf. Bjorklund, 1990; Siegler, 1991). Although the number of developmental studies based on the expert–novice paradigm is still small, as compared to the number of studies on expertise with adults, their findings have attracted much attention in the developmental literature. In the next section, developmental studies focusing on the role of knowledge will be presented first, followed by those studies that explored the importance of basic ability in addition to that of the knowledge base.

DEVELOPMENTAL STUDIES EXPLORING THE IMPACT OF DOMAIN KNOWLEDGE ON PERFORMANCE

From a developmental perspective, the major advantage of the expert–novice paradigm is that knowledge and chronological age are not necessarily confounded. It is

not only possible to recruit adult chess novices but also to find young chess experts for experimental studies. The classic developmental study was conducted by Chi (1978) who recruited experienced and inexperienced chess players and gave them Chase and Simon's chess board reconstruction task (see above). The most interesting aspect of this research was that subjects' knowledge correlated negatively with age; the children were the experts and the adults were the novices. As a main result, Chi found that the children's short-term memory for chess positions was superior to that of the adults. On the other hand, the typical adult superiority in short-term memory capacity could be demonstrated for the memory span control task, dealing with a domain (i.e., digits) that adults were more familiar with. Chi concluded from her results that short-term memory capacity was not inherently a function of the subjects' age, but rather of their knowledge. The most impressive finding was that the impact of the knowledge base on recall resulted in a reversal of the typical age effect.

From a methodological point of view, both the small sample size of Chi's study and the fact that only two of the four possible groups (i.e., child and adult experts and novices) were included called for a replication and extension of Chi's work. Two subsequent developmental studies on chess expertise (Roth, 1983; Opwis, Gold, Gruber, & Schneider, 1990) found supportive evidence. Roth (1983) did not assess memory performance but tested child and adult experts and novices on a chess board comparison task. The magnitude of the knowledge effect was sufficient to eliminate any significant differences between child and adult experts. Further, the knowledge effect accounted for between-age group differences in that child experts outperformed adult novices. Thus Roth's findings for the area of perceptual speed seem to validate Chi's results obtained for short-term memory processes.

In the study by Opwis et al. (1990), groups of child and adult chess experts and novices were compared on various chess board and control board reconstruction tasks which included both replications and extensions of Chi's original work. The major extension concerned a procedure that aimed at identifying possible sources of the experts' superior memory performance. Opwis et al. believed that several aspects like the experts' greater familiarity with the constellation of chess pieces on the board (i.e., meaning of constellations) and their greater familiarity with the characteristics of the chess board (i.e., geometrical pattern, form and color of chess pieces) all contribute to superior performance. They expected all these factors to be effective in the meaningful chess board reconstruction task. The effects of expertise on performance should be considerably smaller (but still significant) in the random board reconstruction task because only familiarity with the basic characteristics of the chess board was assumed to be greater for the experts, as compared to the novices. Finally, no performance differences between experts and novices were expected for a control task that required

the reconstruction of wooden pieces on a board that had little in common with a chess board.

The results of the study basically confirmed these assumptions. Similar to the findings by Roth (1983), no performance differences between adult and child experts were found. Expert–novice differences on the chess board reconstruction task were most pronounced for the meaningful chess positions and considerably smaller but still significant for the random board positions. In accord with their hypothesis, Opwis et al. found that experts and novices did not differ in immediate reconstruction of items on the control board. Opwis et al. concluded from this finding that experts' performance on the chess board reconstruction tasks is facilitated by the two context factors described above. Probably due to these factors, experts are able to process information faster and in larger semantic units.

Although the results were inconsistent with those by Chi (1978) and also Chase and Simon (1973) in that no pronounced expert–novice differences in chunking were observed based on inter-response latency measures, the analysis of videotapes suggested qualitative differences in the reconstruction strategies used by the expert and novice groups. While most experts seemed to start with the reconstruction of specific meaningful units, the novices focused on aspects like color of pieces or specific positions on the board. From a developmental perspective, it seems particularly interesting that no qualitative differences in the strategies of the child and adult experts were detected.

Taken together, the findings from the developmental studies on chess expertise corroborate those obtained from studies dealing with expert/novice differences in adults in that performance differences can be attributed to qualitative differences in strategic processing. Due to their rich knowledge base, child experts seem to process information in a way very similar to that of adult experts. Although most developmental studies did not focus on the interplay of knowledge components (i.e., declarative and procedural knowledge) in the determination of performance, a recent developmental study on expertise in tennis (McPherson & Thomas, 1989) provides information on this point. McPherson and Thomas compared expert and novice tennis players (10–11 and 12–13-years-old) on tennis performance and tennis knowledge. Declarative knowledge about tennis was related to the development of procedural knowledge, that is, the quality of decisions and selection of actions made within the context of a game. Regardless of age, both knowledge components discriminated between experts and novices and were significantly related to tennis skill.

The developmental studies on expertise discussed above all have demonstrated the fast development of domain-specific knowledge in child experts and its close relationship to performance in the domain of interest. However, they do not inform about the relative importance of ability because this variable was not included in the design. As a matter of fact, only a

small number of developmental studies considered the impact of basic ability intelligence on performance in addition to that of domain knowledge. These studies will be summarized next.

DEVELOPMENTAL STUDIES EXPLORING THE IMPACT OF APTITUDE AND KNOWLEDGE ON PERFORMANCE

A series of developmental studies investigated the importance of domain knowledge and general ability for processing of text information related to the domain of expertise. They can be conceived of as replications and extensions of studies on text processing carried out with adults. As already mentioned above, Jim Voss and his colleagues (Spilich, Vesonder, Chiesi, & Voos, 1979; Voss et al., 1980) had used this paradigm in their studies on expertise in baseball. Voss and colleagues assessed subjects' declarative knowledge about baseball in order to form groups of baseball experts and novices. Next, a passage dealing with a baseball game was presented, which had to be recalled some time later. Not surprisingly, the baseball experts recalled more information than the novices. The more interesting finding was that the quality of experts' and novices' recall protocols differed considerably. Whereas the baseball novices recalled as much unimportant as important information, the experts mostly recalled important information.

A group of researchers at the Max Planck Institute for Psychological Research in Munich adopted this paradigm for developmental studies with soccer experts (see Körkel & Schneider, 1992; Schneider, Körkel, & Weinert, 1989, 1990). More than 500 third, fifth and seventh graders participated in this project. According to their performance on a questionnaire tapping knowledge about soccer rules and important soccer events, these children were categorized as either experts or novices with respect to soccer. The students at each grade level were asked to recall a story about soccer. In addition, information about metacognitive knowledge (i.e., knowledge about text processing) and subjects' intellectual ability was obtained. A second assessment using the same instruments followed about a year later.

The analysis of free recall data yielded significant effects of grade and expertise for each measurement point. While seventh graders recalled more text units than both third and fifth graders, experts outperformed novices at each grade level. The findings also confirmed Chi's (1978) result in that a reversal of developmental trends was demonstrated: third grade experts recalled more text information than seventh grade novices.

The measures of intelligence and metacognitive knowledge were included to explore the impact of these variables relative to domain knowledge. With regard to metacognition, the expectation was that in both the expert and novice groups, subjects with high metacognitive knowledge on text processing should outperform those with low metacognitive knowledge. The results clearly confirmed this prediction, indicating

that the combination of rich domain knowledge and metacognitive knowledge lead to optimal performance on the recall task.

The results concerning the impact of general ability were different. The experts and novices were classified into high-ability and low-ability subjects on the basis of their performance in the intelligence tests. Thus, four groups resulted at each grade level: high- and low-ability soccer experts and high- and low-ability soccer novices. When the longitudinal recall and comprehension data were analyzed using grade, expertise and general abilities as independent factors, only effects of expertise and grade were found. Most strikingly, neither a single effect was found for general ability, nor were there any significant interactions. Schneider et al. concluded from these findings that rich domain-specific knowledge can sometimes compensate for overall lack of general cognitive abilities.

As supporting evidence for this has been provided in a number of recent studies with children and adults (e.g., Ceci & Liker, 1986; Recht & Leslie, 1988; Walker, 1987), it appears that individual differences in general ability do not make a difference when the task is to process new information in a highly articulated domain. Please note that this is also the conclusion Ericsson and colleagues have drawn from their research on adult expertise. Thus research on exceptional performance in adults and developmental studies on text processing in child experts and novices lead to similar insights, as far as the role of basic abilities is concerned.

One problem with the developmental studies on the roles of domain knowledge and general ability in affecting text processing is that they have been based on a small number of tasks and paradigms. The question remains whether their main finding concerning the role of general ability can be generalized across different tasks and domains. A recent study by Schneider and Bjorklund (1992) shed some doubts on this assumption. Schneider and Bjorklund adopted the basic design used by Schneider et al. (1989). However, instead of assessing text processing, they tested second and fourth grade soccer experts' and novices' performance on a sort-recall task dealing with soccer words.

In accord with their expectations, Schneider and Bjorklund found significant effects of expertise on recall, thus confirming the results of the previous studies. However, soccer expertise did not modify a significant effect of IQ level, with high-IQ children recalling more than low-IQ children for all contrasts. The results thus demonstrate that domain knowledge played an important role in children's memory, but could not fully eliminate the effects of IQ on sort-recall tasks using domain-related materials. That is, although rich domain knowledge seemed to compensate for low aptitude, in that low-aptitude experts performed at the level of high-aptitude novices, its effects were not strong enough to eliminate performance differences between high- and low-aptitude soccer experts.

Schneider and Bjorklund (1992) concluded from their work that the findings from developmental studies

dealing with text processing did not generalize to the sort-recall paradigm, at least as far as the aspect of general ability was concerned. One difference between the text recall task used in the previous studies and Schneider and Bjorklund's sort-recall task concerned the role of strategies and memory capacity. Whereas neither strategies nor capacity seem particularly important in the case of gist recall (text recall), they are certainly more relevant when verbatim recall is required, as is true for sort-recall. It appears, then, that being an expert does not eliminate the effects attributable to individual differences in intelligence when deliberate strategies play a role in task performance.

One problem with most developmental studies using the expert-novice paradigm concerns the extent of expertise. For example, no official chess ratings were available in most developmental studies on chess expertise, making it difficult to judge the competence of child experts as compared to that of adult experts. Also, most developmental studies on text processing experienced problems with defining expertise. Taking the median of the distribution of scores in domain-specific knowledge tests as the critical boundary for expert-novice distinctions not only creates the possibility of misclassifications but can also imply that the average level of expertise is rather low.

This problem was not an issue in two recent developmental studies on the impact of domain knowledge and aptitude on domain-specific performance (Horgan & Morgan, 1990; Schneider, Bös, & Rieder, 1993), which thus will be considered next. Both studies included samples of true child experts, that is, young promising subjects with already extraordinary competencies in their domain of interest. In Horgan and Morgan's study, official ratings were available for all child chess experts ($N = 113$). The elite subsample consisted of the twenty best players of this sample. Most of the young elite players had skill ratings of 1300 and more (the mean for all U.S. tournament players of all ages is 1500 and the standard deviation is 200). The Schneider et al. study consisted of a reanalysis of data on the development of a group of 109 tennis talents collected about 10 years ago. At the beginning of the study, the children's age ranged from 10 to 14 years of age. As we know today, the careers of most of these tennis talents were very successful. Most players are still listed in the national rankings and more than 10% of the sample have made it to the top 100 in the world, with a few players even belonging to the best ten players in the world.

Furthermore, the two studies seem theoretically interesting because they were longitudinal in nature. In their correlational study, Horgan and Morgan (1990) examined children's chess records for one academic year. The reanalysis of tennis talent data by Schneider et al. (1992) was based on a 5-year longitudinal study, including repeated measurements of basic motor abilities, skill-related tests, psychological tests concerning achievement motivation and concentration skills and interview data focusing on parental support and amount of practice.

What does the chess study by Horgan and Morgan tell us about the roles of IQ and experience in developing chess skill? The elite subsample was given two tasks that tapped general abilities and one test of domain-specific skill. The Raven's Matrices test was used as a measure of intelligence because it was considered a measure of logical abilities as well as spatial abilities. The authors felt that the type of reasoning required was similar to chess reasoning. In addition, a Piagetian task measuring combinatorial logic in formal reasoning was used. Finally, the Knight's Tour, that is, a chess-specific test that is believed to be closely related to chess skill was provided.

As one main result of the longitudinal study based on the total sample, it was shown that improvement in chess skill was significantly correlated with experience. Using age and pretest ratings as covariates, Horgan and Morgan could demonstrate a close relationship between experience in terms of games played and posttest chess rating. In sum, the more improved players played more and won more.

Additional stepwise regression analyses carried out for the elite subsample showed that pretest chess skill accounted for about 65% of the variance in post-test chess skill. When the Raven's test was added as a predictor, the amount of variance explained in the dependent variable increased to 77%. Another 10% of the variance were accounted for by the addition of numbers of games played. Horgan and Morgan concluded from this finding that both experience and nonverbal intelligence significantly contribute to improvements in chess skill. As the Piagetian task showed no significant correlation with chess skill in the young elite players, it appears that the type of reasoning assessed in general ability tests makes an important difference in this regard.

One of the goals of the study by Schneider et al. (1993) was to test Ericsson and Crutcher's (1990) assumption that the basic findings concerning expertise in chess can be generalized to other domains, including sports. In particular, the reanalysis of tennis talent data aimed at estimating the relative impacts of basic motor ability and tennis-specific skills on performance in tennis, as indicated by national rankings. Indicators of motor ability included assessments of sprint ability, whereas measures like string-frame bouncing tests and target hitting tests were used to tap tennis-specific skills. In addition, variables like parental support, estimated intensity of practice, achievement motivation and concentration skill were considered in the analyses.

Results of causal modeling procedures showed that tennis-specific skills explained most of the variance in the tennis rankings obtained for the last year of the longitudinal study (1982). Similarly, intensity of practice and parental support during the early stages of the children's tennis career significantly predicted the tennis rankings. The impact of basic motor ability on tennis performance was comparably small but reliable. That is, when the basic ability construct was omitted from the model, it no longer fitted the data. The same pattern of

results emerged when tennis rankings obtained 7 years later were used as the dependent variable. Rankings obtained in 1982 and in 1989 correlated with $r = .70$, which indicates high stability of individual differences in tennis skill during adolescence and early adulthood.

Taken together, the findings by Horgan and Morgan (1990) and Schneider et al. (1993) basically confirm the theoretical framework developed by Ericsson and colleagues. They all highlight the importance of deliberate practice in developing domain-specific expertise in children. The results provided by Schneider et al. additionally prove the significance of parental support systems for skill development. However, both studies do not support the assumption that individual differences in basic ability can be completely neglected when it comes to predicting the development of expertise. In the case of chess expertise, intelligence as measured by the Raven's test accounted for a small but significant amount of variance explained in the dependent variable, that is, improvement in chess skill within a year. Similarly, the study by Schneider et al. showed that the relative impact of basic ability on performance was small but reliable. This finding seems particularly impressive given that the basic abilities found for the two elite samples in chess and tennis were clearly above average and that the range of scores was small due to the homogeneity of the samples. The results of these studies thus seem to indicate that experience, while extremely important, cannot completely substitute talent. As emphasized by Horgan and Morgan, no amount of experience will make an ordinary player into a grandmaster. Thus the message is that one should come up with models of skill acquisition that account for possible influences of individual differences in cognitive abilities. Theoretical models including the basic ability component will be discussed in the final section of this chapter.

Conclusion

In this chapter, it has been shown that exceptional performance usually is based on an extremely rich knowledge base, acquired through a very long lasting process of motivated learning. In order to reach this point, cognitive personality characteristics like high intellectual ability seem less important than noncognitive factors like endurance, dedication, concentration and motivation. The most important accomplishment of the skilled memory theory was to highlight and demonstrate the relevance of acquired skills in explaining exceptional performance. The findings by Ericsson and colleagues even suggest that individual differences in basic abilities can be ignored in view of the overwhelming effects of expertise on performance. However, one problem with most of the studies on adult expertise was that individual differences in basic abilities were not explicitly measured. Given the evidence from developmental studies on expertise which took those abilities into account, one is inclined to believe that the impact of innate, basic

abilities should not be completely ignored in theoretical models dealing with the acquisition of expertise. But as even the developmental studies do not show substantial influences of high ability or talent, one can easily accept that the original approach of prospective research in giftedness outlined above does not pay off in the long run. In most theoretical models relating giftedness to exceptional performance, the impact of early basic abilities on performance later in life has been largely overestimated.

On the other hand, it does not seem to require much effort to change developmental models derived from giftedness research into models compatible with the expertise approach. For example, Renzulli's (1986) three-ring model of giftedness includes several components highly important for the acquisition of expertise. According to Renzulli's model, aptitude, creativity and a motivation plus context component determine giftedness or talent. If one replaces talent by exceptional performance and also gives a low weight to the aptitude and creativity factors, as compared to the motivation and context factor, one only needs to add a big knowledge component in order to be in line with core assumptions of the expertise approach.

Another modification of the theoretical framework of expert performance was suggested by Schneider (1988, 1992). Schneider emphasized the fact that most studies in adult expertise dealt with subjects of at least average intelligence (e.g., physics professors, chess players). He voted for a "threshold" model of exceptional performance that can be described as follows: If the ability parameter of a subject is close to or beyond a critical or "threshold" value of ability (typically assumed to be slightly above average), then individual differences in noncognitive variables like commitment, endurance, concentration, or motivation decide about peak performance. In this case, it does not matter at all whether the subject is gifted or only of normal intelligence. Although this model appears intuitively plausible, one of its problems lies in the definition of critical or "threshold" scores for different domains (cf. Weinert, 1992). The boundaries may be well above average for domains/tasks where complex problem solving activities and strategy utilization are necessary components and may be clearly below average for less complex domains or tasks that mainly rely on automatic processes (e.g., pattern recognition processes or text processing).

Another model concerning the acquisition of expertise and including ability components was developed by Ackerman (1987). Following the theoretical assumptions of Fitts and Posner (1967), Ackerman assumes that three stages of skill acquisition can be distinguished: a first cognitive stage deals with the acquisition of declarative knowledge. This is followed by an associative stage, where elements of declarative knowledge are composed into larger units and procedural knowledge is gradually acquired and improved. Although the final, automatic stage of skill acquisition does not differ from the second as far as qualitative aspects of information

processing are concerned, its unique features may be seen in increased, optimal speed of processing as well as fine-tuned and automatized problem solving activities.

According to Ackerman (1987, 1988), different aptitudes are necessary to master the three stages described above. Regarding the first cognitive stage, individual differences in general intellectual ability seem to be most important. That is, the higher the general intelligence of an individual, the faster declarative knowledge about a specific domain should be acquired. During the second, associative stage, indicators of perceptual speed appear to be particularly important for combining elements of declarative knowledge and initializing the procedural knowledge component. Finally, individual differences in psychomotor abilities seem most relevant for mastering the stage of automatization.

This model suggests that the impact of individual differences in basic intellectual abilities on the process of skill acquisition diminishes as a function of time. Supporting evidence for this assumption can be derived from experiments conducted by Ackerman (1988, dealing with a variety of cognitive tasks. Although these findings confirm Ackerman's core assumption concerning the changing role of basic intellectual abilities during the process of skill acquisition, it still remains unclear whether the role of perceptual speed and psychomotor ability components can be generalized across a wide variety of domains.

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Prediction of Excellence in School, University and Work

GÜNTER TROST

Institute for Test Development and Talent Research, Bonn, Germany

Introduction

The central questions to be tackled in this chapter are: (a) How predictable is excellent performance in school, university, and work? (b) What is the predictive value of a variety of information gathered in a variety of ways with respect to excellence in these three areas? The contribution will focus on measures of ability as predictors, but information on other variables such as previous achievement, motivation, further personality variables, and environmental factors will also be taken into account.

Before the empirical data can be reviewed, a clarification of the criterion named "excellence" and a brief discussion of some methodological problems inherent in studies on the prediction of excellence seem appropriate.

The Criterion of Excellence

"Excellence" is not a scientific term, and a clear-cut, unanimously accepted definition of it does not exist. In none of the standard textbooks on giftedness except one (Sternberg & Davidson, 1986) does the key-word "excellence" appear in the subject index. Nevertheless, the term is frequently used in literature and mostly in the sense of outstanding, exceptional achievement, brilliant performance as well as of "eminence" (Feldhusen, 1984; Hunt, 1983; National Commission on Excellence in Education, 1983; Tannenbaum, 1986). Ochse (1990) uses the term "excellence" in the title of her book as a synonym of creativity: ". . . creative people excel—they go beyond what others have done" and "produce something of cultural value" (Ochse, 1990, p. 3).

The borderline between "excellence" and "above average achievement" or "average achievement" has been drawn at very different points of the achievement continuum, depending on the author. Some set it extremely high, admitting only the epoch-making achievement of a genius brought forth once in a century, some use the fact that a person is listed in the *Who is Who?* as a criterion for that person's excellence, some have recourse to more or less exclusive awards or to peer nomination.

Another approach is to define excellence statistically, e.g., as an achievement which can be measured on a discrete scale and exceeds a certain value or as a characterization of persons who, when rank-ordered according to their respective accomplishments, reach positions beyond a certain percentile rank.

The small common denominator of all definitions is achievement far above average. Consequently, excellence can be observed in all domains of human performance. The scope of this chapter is restricted to the predictability of excellence in school, in extracurricular activities, in higher education, and in work.

Methodological Problems

Empirical research into the determinants of excellence faces several methodological problems.

It is a triviality that within a given unselected population only a relatively small number of persons will meet the criterion of exceptional performance. It takes great effort to gather samples of sizes large enough to promise statistically significant results, particularly if excellence is considered an area-specific rather than a "cross-domain" phenomenon. Case studies for the analysis of the development of single "eminent" persons, on the other hand, are useful heuristic tools for forming hypotheses about the predictors of excellence, but they do not yield generalizable results which can be used immediately as a basis of prediction in cases of persons other than those under study.

Another troublesome issue—which is connected with the one mentioned above—is the appropriate design of studies about the predictability of excellence. By far the largest part of research published in this area consists of retrospective analyses: Persons are selected on the basis of excellent performance, and documents of their personal, educational and vocational history (diaries, notes, certificates, expertises, marks, products of all kinds, biographies and autobiographies) are examined; the subjects themselves—and, in some instances, persons in their environment—are interviewed about various aspects of their past. As an alternative approach prospective studies can be designed in which samples are defined long before part of the subjects might achieve outstanding accomplishments, a set of potential

predictor variables are measured and the subjects are subsequently observed over a certain time span.

Even though retrospective analyses are economic in terms of time and effort, their disadvantages are ponderous: Many individual traits that are potentially relevant (e.g., abilities, motives, aspects of self-concept) cannot be properly assessed in retrospect. As a contrast, prospective designs imply a high investment of time and effort. Ideally such longitudinal studies start with very large unselected samples in order to insure that they contain the few who will later perform extraordinarily well. Their main advantages are that a great variety of potentially relevant factors—both individual and environmental—can be recorded at the time they appear and that control groups of “non-eminent” peers can be included right from the start.

In reality most longitudinal studies started with strongly pre-selected samples characterized, for instance, by extremely high scores in ability tests (e.g., Benbow, 1983; Terman, 1925). Comparable information on unselected control groups are for the most part missing. It is therefore difficult to judge “what really makes the difference”.

It should be kept in mind that because of the stiff pre-selection of the samples a strong restriction of range in both ability and achievement scores takes place. The reported correlation coefficients are usually not corrected for that effect and thus underestimate the “true” strength of the respective relationships.

In connection with pre-selection of samples, the “ceiling effect”, i.e., poor differentiation at the top end of the ability or achievement continuum, on both the predictor and the criterion side is another methodological problem, especially when ability or achievement tests are applied (Stanley & Benbow, 1986).

A further methodological problem is inherent in studies that cannot be carried out under controlled experimental conditions: Individual and environmental factors are almost inseparably intertwined at practically any given stage of development—a common problem in all educational research; in addition, in both prospective and retrospective studies on the predictability of outstanding achievement the measurement of the predictors as such has an impact on the variables that are being measured and on their predictive qualities: For instance, if in a longitudinal study pupils take an intelligence test, those who excel in the test will probably be influenced by this experience in their future self-concept and behavior and so will the behavior of other persons in their environment who learn about the test results. Or, in retrospective analyses, “eminent” persons asked about features of their biographies will certainly perceive the facts and experiences of their careers from the perspective of their later accomplishments.

As a consequence, clear-cut and generalizable figures on the precise size of effects certain predictor variables or their combinations have on future excellence cannot be expected. The researchers have to be content with rough estimates.

Prediction of Excellence in School

Excellence in school, defined as outstanding overall achievement, can be measured by grade point average, by rank in class or by teacher ratings. Excellent performance in particular subjects is reflected in top grades, teacher ratings or achievement test scores.

The predictors that have gained the most attention in this context are intelligence tests, scholastic aptitude tests, creativity tests, measures of interests, motivation and other personality traits, parent and teacher ratings.

Lewis Terman (1925) started his famous longitudinal study in 1922 on 1528 children who had scored at least 140 in an intelligence test before the age of 12; he and his co-researchers followed the persons in this sample over their entire life span. On an average, the highly intelligent children performed very well in school, but not exceedingly so (Terman, 1965).

In the context of the Munich Study of Giftedness (Heller & Hany, 1986) the predictive validity of a battery of cognitive ability tests and creativity measures was determined on three samples of 11-, 13- and 15-year-old secondary school students. The criterion was the average of school grades in German, mathematics and English three years after the assessment of the predictor data. The validity coefficients for the combined test score were 0.48, 0.45, and 0.32.

In the well-known Study of Mathematically Precocious Youth (SMPY) initiated by Julian Stanley (Keating, 1974) and carried on under the directorship of Camilla Benbow the predictive value of the quantitative section of the Scholastic Aptitude Test (SAT-M) with respect to high school achievement could be examined (Benbow, 1983). Students at the age of 12 whose results in the SAT-M were above the average score of the (5 years older) reference group of twelfth-graders and who were estimated as doing better in mathematical reasoning than 99% of their age-mates (Stanley & Benbow, 1986) were first followed up for five years until they had graduated from high school. The SAT-M, although designed for another age group, proved to be a good predictor of excellent performance in mathematics and in science during high school (Benbow & Minor, 1986; Favazza, 1983).

Teacher ratings on the achievement in a special mathematics course offered to gifted tenth-graders were the criteria in the Hamburg study on mathematically precocious youth carried out by Bix (1988). Among the predictors were the score in a German version of the quantitative section of the Scholastic Aptitude Test (GSAT-M) and the total score in an intelligence test. For two cohorts and a prediction period of two and three years validity coefficients of 0.43 and 0.17 were found for the scholastic aptitude test score and 0.37 and 0.17 for the intelligence test score.

From the many studies covering the whole range of general cognitive abilities it can be concluded that intelligence and related ability test scores are satisfactory predictors of success in school with correlations around

0.40 to 0.50 (cf. Bloom, 1976; Cattell & Butcher, 1968; Kuusinen & Leskinen, 1988; Parkerson et al., 1984). Not only in the average range but also for the prediction of high level performance in school, intelligence and scholastic aptitude tests seem to be useful instruments. The findings indicate, however, that even though high intelligence is a necessary prerequisite for top achievement in school, it is by far not sufficient. Other, noncognitive factors are needed in addition (cf. Helmke, 1992; Schiefele et al., 1992).

Not surprisingly, teacher ratings turned out to be fairly good predictors of later achievement in school.

In the Munich Study of Giftedness a combined teacher rating of the students' cognitive and creative abilities proved better than the combined results of the battery of ability and creativity tests as predictors of the average grades for the three subjects German, mathematics and English which were assessed after a three year interval; the coefficients were, for three cohorts, 0.56, 0.56, and 0.71 (Perleth & Sierwald, 1992; see also Perleth & Heller, 1993). Denton (1988) reports good agreement between teacher ratings of excellent students and their classroom achievement two years later. In two concurrent validity studies using teacher ratings as "predictors" and performance in achievement tests as criteria, correlations ranging from 0.39 to 0.60 were found (Renzulli et al., 1971; Swenson, 1978).

In a recent meta-analysis, Schiefele et al. (1992) examined the results of longitudinal studies from eighteen countries on the predictive validity of interest scales with respect to achievement in school, measured as grades or achievement test scores. As this review includes a great number of studies initiated by the International Association for the Evaluation of Educational Achievement (IEA) using achievement tests with a fairly high ceiling as criteria, the authors' findings deserve to be mentioned here even though the studies were not specifically focused on outstanding achievement. The mean value of 121 correlation coefficients was 0.31, after correction for attenuation it amounted to 0.40.

A similar average coefficient (0.34; 40 studies) was reported by Uguroglu and Walberg (1979) for the correlation between measures of motivation as well as self-concept and achievement in school. Hansford and Hattie (1982), in their meta-analysis of data from 128 studies on the predictive validity of self-concept measures, found an average value of 0.21. In Bloom's study (1976), "self-concept of ability" was the strongest predictor of success in school among three types of self-concept. For "affective characteristics" as predictors of school achievement, Fraser et al. (1987) found in their meta-analysis of 335 studies a mean validity coefficient of 0.12.

In summary, the findings suggest that teacher ratings, cognitive tests and measures of noncognitive features such as interests, motivation, and self-concept can be used for the prediction of outstanding achievement in school and that they should be used in combination. What the optimal combination is cannot be derived

from the available data. However, cognitive abilities far above average seem to be indispensable for excellence in school.

There is only indirect evidence as to the contribution parent ratings can make to the prediction of outstanding achievement in school. Jacobs (1971) and Cihra et al. (1974) report findings indicating that parents are reasonably successful in identifying gifted children. Other studies raise doubts about the predictive value of parent judgments (e.g., Ferdinand, 1961; Miles, 1965). In general, parents tend to overestimate their children's giftedness rather than to underestimate it (Ferdinand, 1961), while highly-educated parents tend toward an underestimation (Martinson, 1975). In all, parent ratings do not seem to be very valid predictors of achievement in school. However, parents are apparently in a position to identify, at an early stage of their children's development, high potential in music or in the arts, as the results of retrospective studies on eminent concert pianists (Sosniak, 1985a) and sculptors (Sloane & Sosniak, 1985) suggest.

Several studies dealt with the prediction of extracurricular achievement during school age.

A checklist of creative achievement outside the school curriculum was developed by Wallach and Wing (1969); Torrance (1981) constructed a scale measuring the number of such achievements.

In a 10-year follow-up study starting in 1965 with 400 seventh graders, Howieson (1981) found a correlation of 0.30 between the total score in the Torrance Tests of Creative Thinking (TTCT; Torrance, 1974) and the total score in the Wallach and Wing checklist. In another long-term validity study on 211 pupils who took the TTCT in elementary school, the correlation between the total test score and the number of creative achievements during high school was 0.38 (Torrance, 1988).

If it is agreed that high scores on the above-mentioned scales are indicators of outstanding extracurricular achievement, it can then be concluded that creativity tests such as the TTCT can make a useful contribution to the prediction of excellence outside the classroom.

The above-mentioned Munich Study of Giftedness (Heller & Hany, 1986) also investigated the predictability of excellence in extracurricular activities. Over a time span of 3 years the correlations between aspects of cognitive abilities and creativity measured by tests as well as by teacher ratings on the one hand and extracurricular achievements (in the fine arts, writing, music, social activities, natural sciences and mathematics, technical areas, and sports) assessed by an inventory on the other hand were analyzed on three pupil cohorts. The validity coefficients for the combined test score range from 0.21 to 0.56 (median: 0.36), those for the teacher ratings from 0.12 to 0.64 (median: 0.28) (Perleth & Sierwald, 1992).

Only a small number of studies have been conducted on artistically and musically precocious children and adolescents. In their 10-year longitudinal study of creativity on a group of young artists Getzels and

Csikszentmihalyi (1976) found that, besides perseverance, problem finding (flexible exploration of many options before settling on a particular problem to work on), esthetic ability, and originality were good predictors of eminent performance in the visual arts. Hendrickson (1986) reports results of a 14-year longitudinal study on four musically precocious children and a control group of musically able children with exceptional general abilities. Among the characteristics differentiating the two groups in their first decade of growth were psychomotor control, musical memory, and motivation towards goals of excellence.

In a retrospective approach Walberg (1969) identified, from a national sample of high school students, a group winning competitive awards in science, another group winning awards in the arts, and a control group not winning awards and investigated their biographies. Both high-achievement groups differed from the control group in that they were more self-confident, more interested in reading, more persistent in their activities, and did their work faster. Between the two groups of high achievers there were differences in social habits, interests, and in their self-concepts: The scientists had more confidence in their intelligence, the artists tended to higher confidence in their creativity.

Prediction of Excellence in Higher Education

Excellence in higher education can be operationalized by outstanding grade point averages or average marks in intermediary or final examinations as well as by awards and honors degrees.

It was possible to follow up on the participants in the above-mentioned Study of Mathematically Precocious Youth (SMPY) after graduation from high school, for another 5 years (Benbow & Arjmand, 1990). They had been selected, at age 12, primarily on the basis of above-average performance in the quantitative section of the Scholastic Aptitude Test which has been designed for a much older age group (Stanley & Benbow, 1986). Eighty-five percent received their bachelor's degree, over three times the rate of the general population; almost half of them ranked among the top 10% of their graduating classes; approximately 47% of the graduates continued their education beyond college. Eleven percent reported awards or honors in mathematics, 10% in science. Creative accomplishments were reported by 24% of the male and 15% of the female college students (Benbow & Arjmand, 1990). It can be concluded from the data that by an extremely strict selection on the basis of performance in a scholastic aptitude test, persons can be identified who will subsequently achieve academic accomplishments far above average.

Among the college graduates, two extreme groups were defined by high academic achievement (22%) and low academic achievement (8%); the canonical correlation for the SAT-M—when administered at high school

age—as a predictor of this achievement criterion was 0.30. Other important predictors were attitude towards mathematics and science, encouragement to pursue academic and career goals, and paternal educational level (Benbow & Arjmand, 1990).

In a 4 year follow-up study on 1,200 German students who had ranked among the top 10% in the final class of upper secondary school low, but highly significant correlations were found between both the average grade in the twelfth school year and the average grade in the first university examination (0.25) and between the total score in a scholastic aptitude test and the same criterion (0.16). Forty percent of those persons whose test scores were in the top quartile within the pre-selected group subsequently earned top grades at university (Trost, 1986).

Chauncey and Hilton (1965) examined validity studies on samples of highly able students; they concluded that scholastic aptitude tests can discriminate reliably even among very gifted students and predict their academic performance.

Willingham (1985) summarizes his review of empirical data on the predictability of success in college as follows: "The two traditional academic predictors, high school rank (HSR) and admissions test score (SAT) were by far the best at forecasting the scholastic types of achievement. In a comparison of the two, HSR was a somewhat better predictor of college honors (based on cumulative grade average), while the SAT was a somewhat better predictor of departmental honors. The latter were based on independent scholarship, arguably more characteristic of preprofessional work in the discipline than is grade point average" (p. 179). Willingham also presents data demonstrating that both high school records and scores in the Scholastic Aptitude Test have their highest predictive validities within student subsamples above 90% (p. 29).

There is also some evidence on the relation of superior intelligence with outstanding achievement in higher education. Hollingworth (1942) studied the educational development of twelve children up to their early twenties who had scored 180 or above on the Stanford-Binet intelligence test before the age of 12. They did exceedingly well in college, won a long list of prizes and honors, in short, constituted "the 'top' among college graduates" (p. 249).

Feldman (1984) identified those twenty-six persons in Terman's group of highly intelligent children of the year 1922 with an IQ of above 180 and compared their educational careers with those of twenty-six subjects selected at random from Terman's original group of 1528 persons. On the whole, both groups were highly successful throughout their college years, with a markedly larger percentage of persons winning honors and receiving advanced degrees in the above-180 IQ group.

For his total sample of highly intelligent persons Terman (1965) reports that "close to 90% entered college and 70% graduated. Of those graduating, 30%

were awarded honors and about two-thirds remained for graduate work" (p. 12).

The relative importance of noncognitive factors for achievement in higher education has been demonstrated in various studies (see, e.g., the reviews done by Cattell and Butcher, 1968; Khan, 1969; Lavin, 1965; Steinkamp and Maehr, 1983).

Nichols and Holland (1963) and Nichols (1966) attained a considerable improvement in the prediction of college grades of a highly selective sample of finalists and scholars of the National Merit Scholarship program when they included attitude, interest, and personality scales into the set of predictors: "For predicting college grades, high school grades were the best predictor (average validity 0.33), followed by the nonintellectual scales (average validity 0.27), and finally by the aptitude test (average validity 0.12)" (Nichols, 1966, p. 911).

Nichols (1966) also examined the predictability of extracurricular achievement at college age and found that the nonintellectual scales were the best predictors with an average validity of 0.19.

Another study of post-high-school creative achievements was carried out by Torrance (1988). As this author does not differentiate between achievements during the college and university years and achievements in the following years his results will be presented in the next section on "excellence in work".

The overall conclusions which may be drawn from the findings on the predictability of excellence in higher education are: Achievements in secondary school and performance in scholastic aptitude tests are the best predictors: high scores in intelligence tests also have satisfactory predictive validity. Other factors, particularly in the domains of interest, motivation, and self-concept, have, on their own, a lower predictive power, but they do add to the overall prediction of academic success, and, among the highly intelligent students, they seem to make the difference between the very good ones and the excellent ones. For the prediction of extracurricular achievements, noncognitive predictors such as interests, task commitment, and aspects of creativity seem to be most relevant.

Prediction of Excellence in Work

There is a great variety in the ways different authors operationalize excellence in work. Operationalizations can be: recognition as geniuses having revolutionary impact in their fields, more or less distinguished awards persons have won for their work, ratings of the persons' work by experts in the field, number of publications, patents, or exhibitions, etc.

One of the ways to find out about the determinants of excellence in work is the analysis of the biographies of eminent persons. The first study of this type is Sir Francis Galton's famous work on "hereditary genius" (1869). In the biographies of highly renowned representatives of various fields who he had selected with the help of

popular directories, he found three common elements: capacity, zeal and the power of hard work. His study on eminent scientists (1874) led to the conclusion that "these people were endowed with superior intellectual ability, tremendous energy, good physical health, a sense of independence and purposefulness, and exceptional dedication to their fields of productivity", as Tannenbaum (1986, p. 27) summarizes.

Half a century later, information on the early development of 300 famous persons from the past 450 years who had made outstanding contributions to their cultures were examined under the directorship of Catherine Cox (1926) as part of Lewis Terman's genetic studies of genius. The sample included Byron, Cromwell, Darwin, Kant, Luther, Michelangelo, Mozart, Newton, and Robespierre. From the information given in the biographies, estimates were made as to the persons' IQs and more than sixty other personal traits. Within her sample, Cox compared a subgroup of the most creative subjects with the total group. The intelligence ratings assigned to the persons in the total sample were high: For the subgroup of eminent philosophers the average IQ estimate in childhood was 173, for the scientists 164, for the statesmen 159, and for the soldiers 133. However, the estimated IQ did not differentiate between high and exceptionally high achievement. Cox concluded from her data that with high intelligence given, it depends on the individual's degree of persistence of motives and effort whether the highest level of accomplishment will be achieved or not. Other features that she found particularly characteristic for the 100 leading geniuses in her sample were confidence in their abilities, and strength of character. Subsequently, several authors selected persons from Cox's sample for their own research (e.g., McCurdy, 1957) or re-evaluated the Cox data (Simonton, 1984; Walberg et al., 1978).

Twenty-five years after the Cox study Anne Roe (1951a, 1951b, 1952a, 1952b, 1953) selected, on the basis of nomination by panels of experts in each field, 64 of the most eminent living American scientists: 20 biologists, 22 physicists, and 22 social scientists (psychologists and anthropologists). They had "received a staggering number of honorary degrees, prizes and other awards" (Roe, 1952a, p. 21). She examined them comprehensively by interviews and tests. Although there were marked group differences between the natural scientists and the social scientists, as well as between the biologists and the physicists, certain common patterns did appear in the group as a whole.

The scientists typically came from middle and upper middle class families. Fifty-three percent of the individuals were the sons of professionals, another 19% the sons of businessmen. Learning for its own sake was highly valued in their families. As to their early extracurricular interests no common pattern across fields showed up but there were rather typical configurations for each of the three groups. The final vocational decision was only made at junior or senior college level, mostly after the first personal contact with research.

The intelligence level of the eminent scientists—as measured at the time of the study—was very high, the average scores in verbal and quantitative tests equalling an IQ of approximately 160. Furthermore, the interviews revealed that one of the features all 64 eminent scientists had in common was the “driving absorption in their work” (Roe, 1952a, p. 25).

MacKinnon (1960, 1978) conducted a series of both retrospective and cross-sectional studies on creative architects, engineers, industrial researchers, mathematicians, physical scientists, and writers nominated by experts in the fields. Apart from features that were characteristic to each of the respective groups, he found the following traits common among the highly effective persons in all of these fields: openness to experience, independence in goal-setting and high tolerance of frustration on the way to creative solutions.

Goertzel and Goertzel (1962) and Goertzel et al. (1978) examined the biographies of 314 eminent personalities of the twentieth century. In their analyses they laid the stress on environmental rather than individual factors. Their results confirmed many of the previous findings. In contrast to other authors, however, they found that 85% of the eminent persons came from disturbed homes. Nevertheless, parents—as well as other mentors—seemed to play a significant role in evoking the children's and adolescents' motivation to achieve.

Walberg et al. (1981) asked biographers working for the *Encyclopedia Britannica* to rate the presence or absence of traits in the childhood of those persons from Cox's sample whose biographies the authors had written. According to the ratings, the most distinctive trait common to 97% of the 221 eminent men was intelligence; they also had superior communicative skills. Eighty-two percent were permitted by their parents to explore environments on their own. Eighty percent were very successful in school.

Simonton (1984, 1987) re-analyzed the Cox and the Goertzel family data. According to his findings, the eminent persons came from intellectually and culturally stimulating homes; they acquired numerous demanding hobbies and were omnivorous readers. In their later educational and professional careers they displayed an immense productivity. Simonton also gathered evidence that “intelligence is the single best personological predictor of leadership in general” (1988, p. 399). For all subgroups of eminent persons except for “celebrities” (including athletes, businessmen, editors, and performers) he found an inverted U-shaped curve for the relation between the attained educational level and eminence.

A series of retrospective studies on living persons who, before age 40, had attained high distinctions as concert pianists ($n = 21$), sculptors ($n = 20$), swimmers ($n = 21$), tennis-players ($n = 18$), research mathematicians ($n = 20$), and research neurologists ($n = 20$) has been carried out under the directorship of Benjamin Bloom (1985). Interviews with the individuals and their parents revealed a number of communalities over the six groups

of exceptional achievers. The majority of their parents placed high value on achievement, success, and persistence at work. The parents can be described as child-oriented. They encouraged and supported the interests their children pursued and were willing to devote time, resources and energy to provide the best conditions for the development of their children's talents. They viewed their children as gifted and expected hard work and high attainments from them. In terms of parental interests and activities the climates were favorable: The parents of the swimmers and tennis-players were interested in athletics (Kalinowski, 1985; Monsaas, 1985); in the homes of the concert pianists music played an important part (Sosniak, 1985a); there was a certain emphasis on the arts in the sculptor's homes (Sloane & Sosniak, 1985); the parents of the mathematicians and neurologists had themselves attained high levels of education and offered a wide range of intellectual stimulation to their children (Gustin, 1985; Sosniak, 1985b).

The children can be characterized as rather self-guided and independent in their interests and activities; they had soon become highly self-confident with respect to their abilities. In their adolescence they were strongly motivated to learn, to practice and to improve upon their accomplishments. The academic records of the pianists, sculptors and athletes were inconspicuous; those of the research neurologists were very good but not necessarily brilliant; most of the research mathematicians had attained excellent results both in high school and in higher education.

Several retrospective studies comparing exceptional managers with average managers yielded fairly consistent results as to the predictors of outstanding managerial achievement: superior cognitive abilities, high interpersonal skills, vigorous need of achievement, and strong self-confidence (Cascio, 1987; Klemp & McClelland, 1986).

While the studies mentioned so far were designed as retrospective analyses, other studies started with more or less selected samples of children or adolescents which were followed up in their careers until later life achievement could be measured.

The most famous longitudinal study of this kind covering a whole life span is the one by Lewis Terman. He started it in 1922 on a sample of 1528 6–12-year-old children with an IQ of at least 140 (Terman, 1925). For the 800 males in his sample (only a minority of the women had gone out for professional careers at that time) he found impressive records of adult life achievement: “By 1950, . . . they had published 67 books, . . . more than 1,400 scientific, technical, and professional articles; over 200 short stories, novelettes, and plays . . . They had also authored more than 150 patents . . . Of the scientists, 47 are listed in the 1949 edition of *American Men of Science*. Nearly all of these numbers are from 10 to 20 or 30 times as large as would be found for 800 men of corresponding age picked at random in the general population” (Terman, 1965, p. 12). According to Terman these figures prove that tests

of general intelligence, given at school age, "tell a great deal about the ability to achieve either presently or 30 years hence" (1965, p. 13).

However, comparing the 150 most successful and the 150 least successful men in his sample, Terman found that "the less successful subjects do not differ to any extent in intelligence as measured by tests" and concluded that "notable achievement calls for more than a high order of intelligence". Some personality factors turned out to be "extremely important determiners of achievement". The most and the least successful subgroups differed to the greatest extent with respect to "persistence in the accomplishment of ends, integration toward goals, self-confidence, and freedom from inferiority feelings" (Terman & Oden, 1959, p. 148).

In a different approach, Feldman (1984) compared the careers of the subgroup of twenty-six persons from Terman's sample who, before age 12, had scored above 180 in the intelligence test with the careers of a control group of twenty-six persons drawn at random from the same sample. For the men in both groups he found a "consistently high degree of professional achievement"; there was "a small number of distinguished men in the above-180 IQ group" but not in the control group (p. 520). In the female higher IQ group, there was much more evidence of professional involvement than in the female lower IQ group but no outstanding career was found in either of the female subgroups. The author summarizes: "In terms of professional achievement, then, the men as well as the women seemed to gain some margin of benefit from the extra IQ points . . ." But "the overall impression is one of lower achievement than the traditional view of IQ would have predicted for both groups" (p. 520).

Tomlinson-Keasey and Little (1990) factor-analyzed, in Terman's set of data, parent and teacher trait ratings from the year 1922, characteristics of the family of origin retrospectively given by the subjects, and variables of adult accomplishment, and they represented the relations in a path model. Of all the "early" predictors the factor "parental education" showed the highest correlations with the criterion factors "educational attainment" (0.26) and "occupational achievement" (0.13).

In a combined prospective and retrospective study Trost and Sieglen (1992) selected, from a nationally representative sample of 9000 graduates from secondary school in 1973, 166 adults who have been exceptionally successful as scientists, engineers, or businessmen. The greatest differences between the top group and the representative group, at school age, were problem-solving ability and motivation, initiative and leadership, search for knowledge, direction towards activity and independence at home, school record, and performance in the quantitative part of a scholastic aptitude test.

Torrance (1988) also conducted longitudinal studies on unselected groups. He operationalized "creative adult achievement" in various, however less exclusive ways, than the researchers who focused their attention on eminent persons. One of the criteria he used was

"quantity of publicly recognized and acknowledged creative achievements", another was "quality of creative achievements" on the basis of quality ratings by three judges of what subjects had identified as their most creative achievements (p. 58). On a sample of 254 high school seniors who had taken the Torrance Tests of Creative Thinking, two intelligence tests and a school-based achievement test in 1959 and were followed up until 1979, Torrance (1988) obtained correlations of 0.32 and 0.36 for the total score in the creativity test battery, of 0.21 and 0.38 for the total intelligence score, and of 0.27 and 0.47 for the total achievement test score with the quantitative and the qualitative criteria of adult creative achievement respectively. On another sample of 211 subjects tested at elementary school level and followed up for 22 years, Torrance (1988) found validity coefficients of 0.46 for the total creativity score with respect to the quantitative criterion and of 0.58 with respect to the qualitative criterion of achievement.

Empirical findings as to the predictability of job success in general (i.e., not only in view of excellence) complete the picture. They indicate that "general intelligence" is the best single predictor; for managers and professionals the predictive validity of intelligence measures is higher (with coefficients of about 0.30) than for semi-skilled or unskilled workers (Ghiselli, 1966, 1973). The correlation between college grade point average and job success is considerably lower; the coefficients typically range between 0.10 and 0.30 (Hoyt, 1965; Klitgaard, 1985; McClelland, 1973; Reilly & Chao, 1982).

Among the noncognitive variables, biographical data on past attainments in particular areas tend to be the best predictors of similar attainments in adult life, the validity coefficients being about 0.30 (Hunter & Hunter, 1984; Taylor & Ellison, 1967). The predictive validity of interests measured by questionnaires is lower, the respective values ranging from around 0.20 or below (Hunter & Hunter, 1984). The relation between general personality traits as they are assessed by personality inventories and measures of job success seems to be rather weak (Ghiselli, 1973; Klitgaard, 1985; see also Rutter, 1989).

Summary and Conclusions

What are, then, the characteristics which can be assessed at earlier stages of a person's life and contribute to the prediction of excellence at later stages?

In the first place, the results of all pertinent research clearly show that there is no such thing as the one exclusive predictor of outstanding achievement. Instead, excellent performance is the product of a highly complex intra-individual interaction of a variety of traits (cognitive and noncognitive abilities, motivational and emotional attributes, further personality variables) as well as of an interaction between these individual traits and environmental factors (influences of family,

peers, school, university, extracurricular experiences, the media, etc.). The prevailing conceptions of giftedness as they are proposed, for instance, by Feldhusen (1986), Gagné (1985), Heller (1989), Mönks et al. (1986), and Tannenbaum (1986) emphasize these interactions and thus are in line with the findings reported in this chapter.

Secondly, there is hardly any single predictor that accounts for more than 30% of the variance in any criterion of achievement if predictors and criteria are measured in longitudinal studies. And, in cross-validation studies, even optimal combinations of several predictors rarely explain more than 50% of the variance in later achievement. These statements hold true for the predictability of the total range of achievements; within the range of extraordinary performance, the expectations with regard to the degree of predictability have to be even lower because of the special methodological problems mentioned at the beginning of this chapter. It is therefore safe to say that even by using the best predictors available (both individual and environmental) and combining them in the most appropriate way, less than half of "what makes excellence" can be accounted for.

Within these limits, though, certain variables have fairly consistently proved to be more predictive than others.

For a large number of areas of excellence, intelligence and other cognitive abilities are the most important single predictors. This is particularly true for outstanding performance in school, in higher education, in vocational training, in the professions, in business, and in all fields of scientific research: "It appears that individuals who end up known in history as highly productive achievers in those fields requiring extensive formal schooling are likely to have an IQ of at least 145" (Albert & Runco, 1986, p. 349). Other abilities, e.g., psychomotor, perceptual and social abilities, hold the highest rank positions as predictors of exceptional performance in sports, in the fine arts and the performing arts, in music, and in some areas of leadership. Abilities assessed by tests are better predictors than abilities rated by parents or teachers. Whenever the accomplishment of something novel is the criterion, creativity is an important additional predictor. However, a fairly high, though not exceptional level of intelligence is also necessary for high degrees of creative achievement (Barron, 1969; Cattell, 1963; Roe, 1952b).

While the predictive value of specific abilities can be different, depending on the particular domain of achievement, some motivational, affective, and environmental characteristics are obviously relevant predictors across fields.

Aside from ability variables, probably the most powerful predictor of excellence is a high and task-oriented motivation. Its importance has been confirmed in practically all studies searching for the determinants of outstanding achievement. Aspects of it are the willingness to work hard and persistently on things that

are of particular interest to the individual, perseverance in the face of obstacles, a high level of aspiration, competitiveness, and ambition: the "desire to excel at performances . . . in which the person has his chief interest" (Cox, 1926, p. 173). High motivation without high abilities will not bring about extraordinary accomplishments; inversely, even persons endowed with maximum abilities but who lack "task commitment" (Renzulli, 1986) will never excel.

The link connecting abilities and motivation seems to be the individual's self-concept. It is a set of perceptions and evaluations of one's own traits. Persons characterized by outstanding accomplishments were, as a rule, quite aware of their extraordinary capabilities at the time of their childhood and adolescence. As a consequence, their self-confidence was boosted which encouraged them to set their stakes higher and improve their achievements. Thus self-confidence is another relevant predictor of excellence.

Persons who later excel in their educational records, their extracurricular achievements or their vocational accomplishments differ from their peers in childhood and adolescence with regard to some further personality traits. One of them is independence, both emotionally and intellectually. They are more self-directed in setting their goals and in choosing the objects of their activities and the problems they are going to tackle; they are more willing to work alone and to accept responsibility for their products. A tendency toward non-conformity, unconventionality, even radicality of thinking goes along with this independence.

However, the predictive validity of these personality traits as they are assessed by interviews or questionnaires is not very high.

Interests as measured by inventories can make a useful contribution to the prediction of outstanding achievement. They are obviously domain-specific predictors; in general, the predictive validity of interests is considerably lower than the validity of abilities.

Lastly, there are some aspects of home environment that can serve as predictors of excellent achievement, not just by themselves but rather as "catalysts" (Gagné, 1985) helping potentials to become manifest and abilities to develop. One relevant aspect is the parents' value system: Positive attitudes toward learning, practice, and achievement in general shape and foster the children's achievement motivation. A second aspect is stimulation in that the children are exposed to a variety of experiences—e.g., by frequent discussions, shared hobbies and other leisure time activities—that are incentives for the children to discover and develop their own interests and abilities. A third aspect is relative freedom left to the children to pursue their interests. The fourth relevant aspect is the parents' support of the children with respect to the development of their abilities. In the course of adolescence and thereafter, the importance of the home environment diminishes whereas the influence of role models outside home increases. It has to be pointed out that virtually all of the research data leading to

these conclusions were obtained in retrospect. The contribution of information on home environment to the prediction of excellence in longitudinal studies is presumably very modest, for two reasons: Home environment is a moderator rather than a genuine predictor variable; and it is difficult to assess reliable indices of the situational factors mentioned above.

There is a group of predictors that might be called "second-order predictors" because they are, in a way, predictors as well as (early) criteria of achievement: performance in school and in higher education and extracurricular accomplishments during all stages of education. Quite naturally, past achievement is the best predictor of similar future achievement. This is why teacher ratings of classroom performance are good predictors of school grades, school grades are good predictors of college grades, early accomplishments in the arts, in sports or in music are good predictors of later accomplishments in these areas, etc., especially in the upper part of the achievement continuum. Yet, whenever the prediction of outstanding achievement is attempted before the first accomplishments in a closely corresponding area can be observed, it is necessary to have recourse to the individual and environmental predictors discussed above.

An Outlook

Much has been done to uncover the predictors of excellence since Galton set out to study geniuses more than a century ago. Much still remains to be done. Most of the knowledge about this issue that has been accumulated so far stems from retrospective studies. The few longitudinal studies that have been carried out started with very narrow sets of virtual predictor data. There is an urgent need for more long-term longitudinal studies starting with large unselected samples and assessing a broad spectrum of predictor variables; or, if the samples of the prospective studies are already highly selected, at least unselected control groups ought to be included.

There is also a need for better instruments of assessment: Complex tests of cognitive abilities with high ceilings, i.e., discriminative power in the area of high performance, ought to be developed. Most of the tests presently used in studies on giftedness are based on concepts that were developed during the first four decades of our century when little was known about the specific ways of information processing and problem-solving in the heads of the highly gifted. Furthermore, better instruments are needed in order to assess the motivational, affective and environmental variables that have proved to be essential for outstanding performance.

Finally, more use should be made of methods of modeling the complex interactions of predictors and of their relations with the criteria of outstanding achievement which have been developed during the last three decades, such as structural models using path diagrams (e.g., Joerskog, 1979). Only very few researchers have

applied such models to the analysis of longitudinal data on the predictability of extraordinary achievement so far.

More longitudinal studies, better instruments of assessment and the use of more complex models for the analysis of longitudinal data could contribute to a better prediction of excellence in school, university, and work. A better understanding of the predictability of outstanding achievement is a precondition to more effective methods for identifying and nurturing individuals with an extremely high potential.

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Suggested Further Reading

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PART IV

Programs and Practices of Nurturing the Gifted and Talented

Theories and Practices for Differentiated Education for the Gifted and Talented

LEONORA M. COHEN

University of Melbourne, Australia

DONALD C. AMBROSE

Pacific University, Forest Grove, Oregon, U.S.A.

Introduction

Other chapters in this book relate to research and practices in identification, program provision, curriculum applications, and other aspects of serving gifted children. This chapter explores the role of theory in education for the gifted. The following questions guide this exploration: Why does gifted education need a theory? What is a theory? What theories are extant for education of the gifted? What are the key questions or issues that a theory for education of the gifted must answer? What criteria might be used to analyze or develop a theory for education of the gifted? What is the relationship of theory to research and practice? What should be the scope and scale of a theory for gifted education? Should a theory for gifted education be focused on intelligence, giftedness, or creativity? What are the contextual influences on theory development? How might the various theories be unified? Finally, what are the implications of theory for practice?

Why Does Gifted Education Need a Theory?

Much emphasis has been placed on the provision of qualitatively different educational experiences for gifted children. Yet Busse and Mansfield (1980, p. 132) described programs for the gifted as "little more than patchwork collections of random practices and activities", a statement still true today. In light of major cuts in funding to gifted programs, particularly during the recent world-wide economic recession, special provisions based on qualitatively differentiated curricula and services for gifted children must be justified for their very survival. Without such justification, the gifted child movement may be doomed.

According to Gowan (1979), gifted children can only be given qualitatively different educational programs on the basis of "differential cognitive structures that are

functional in gifted and in gifted alone" (Gowan, cited in LeRose et al., 1979, p. 478). This statement suggests that research is needed to ascertain whether the gifted truly have different cognitive structures and ways of thinking. Although useful research efforts have been carried out to this end (e.g., Borkowski & Peck, 1986; Davidson, 1986; Rabinowitz & Glaser, 1985; Rogers, 1986) research alone is not sufficient. Because research in gifted education all too often has dealt with small issues in a piecemeal approach, it has not portrayed the whole picture. Although important meta-analyses of major research questions such as effects of grouping or acceleration on the gifted have been carried out (e.g., Kulik & Kulik, 1992; Rogers, 1992), researchers in this field have thus far failed to provide a coherent picture; hence, they have been unable to offer justification for many practices currently espoused as particular to the gifted. Even the landmark work by Shore, Cornell, Robinson, and Ward (1991) only provides answers about whether research has been found to justify specific practices. Justification of qualitatively different programming and practices for gifted children is built on shifting sands due to a lack of coherent theory. Without theory, the "so what" of research doesn't become integrated into a cogent whole.

Theory provides the big picture for researchers and practitioners by illuminating the context needed for transcending the important but scattershot empirical findings upon which researchers necessarily focus. In a similar fashion, theory can unite the bits and pieces of fragmented practices that characterize the field. Theory is also needed to (a) provide a research heuristic; (b) explain the underlying reasons that gifted children might have different cognitive structures; (c) offer suggestions for identification; (d) provide a base for qualitatively distinctive educational experiences; and (e) explain the complex cultural, social, emotional, physical, perceptual, and intuitive relationships that underlie the distinctive nature of the gifted child.

The need for theory development in the field of gifted education has been well-documented (Borland, 1989; Cohen, 1985; Feldman, 1982; Gowan, 1977; Horowitz, 1987, 1992; Horowitz & O'Brien, 1985; Le Rose et al., 1979; Passow, 1983, 1986; Renzulli, 1980; Ronvic, 1989; Shore & Dover, 1987; Shore, Cornell, Robinson, & Ward, 1991; Sisk, 1980; Sternberg & Davidson, 1986; VanTassel-Baska, 1988; Ward, 1961, 1962, 1986). Although Ward (1986) has been calling for conceptual analysis and theory development for the field since the early 1950s, very little was written in this area until 1983 when *Frames of Mind*, the breakthrough work of Gardner, was published. The exceptions are the pioneering efforts by Ward (1961) and those of Gowan (1972, 1974). These works, and seeds in the writings of Feldman (1980), Gruber (1981, 1982), Jellen and Verduin (1986), and Sternberg (1981, 1985, 1986), may have catalyzed theory development in the field, or perhaps it was the recognition by curriculum experts such as Maker, Passow and VanTassel-Baska that a theoretical base was necessary. Despite the importance of theory development,

One of the least discussed but most glaring holes in gifted and talented education is the lack of theory. No overarching theoretical framework exists for the development of gifted and talented programs. The absence of a theoretical base makes the development of gifted and talented programs a vulnerable and shaky proposition at best. Without such a framework, a specific gifted program may show little relationship between a given curriculum and the development of intelligence (Fetterman, 1988, pp. 62–63).

A theory for differentiated education of the gifted is like a beautiful necklace—each link, each pearl and jewel must be crafted into an elegant whole which will be of immense value to the field. Each golden link of the necklace represents an aspect to be explained by theory. The jewels, like proverbial gems of wisdom, are research efforts; the pearls are the pearls of practice. While each pearl or jewel has intrinsic value, its value is immeasurably enhanced when it is linked with others, becoming an exquisite whole.

What is a Theory?

A theory is a unified explanation for complex, observed phenomena that systematically describes the underlying relationships or principles of those phenomena (Castetter & Heisler, 1980). A description of surface characteristics and their logical extension or application—for example, the characteristics of the gifted child such as the ability to generalize, related to the type of curriculum to be provided—is not sufficient to be a theory. This is because the underlying structures and their relationships must be uncovered: the reasons behind both the characteristics and the curriculum.

The purpose of theory is to summarize and order

extant knowledge; to provide provisional explanations for observed events by showing the variables and how they relate to each other, allowing prediction of yet unobserved events; and to stimulate development of new knowledge by offering leads for inquiry (Ary et al., 1990). It should allow going “beyond the present data both retrospectively and prospectively” (Bruner, 1973, p. 221). This means that a theory should account for research data already collected, and provide a source for formulating hypotheses, organizing research, and predicting results.

A theory can be as narrow as a personal explanation for dealing with information and events in the world, for example, a little child’s “theory” that chipmunks enter the record player when the speed is switched from 33 to 45 rpm. More commonly, however, a theory is considered to be a way of organizing existing multiple phenomena, and of generating predictions that can be empirically tested.

A broad theory will necessarily be complex, a narrow one should have the quality of simplicity. In both cases, a theory should be characterized by elegance, in that the parts and pieces fit the events and “hang together” in a clear, esthetically satisfying way. Difficulties with broad theories include understanding their complexity, communicating their essence to others, and applying them to specific events. A problem with narrow theories related to giftedness is that they account for only a small fraction of the complexities of human behavior. An important issue is whether prediction can be made on the specific level or only on the general level. For example, a theory of giftedness that describes the important role of responsive parenting, such as that of Clark (1992), could be applied to the development of gifted children in general, but probably not to a particular child.

Theories are evolving explanations created by the mind. “Scientific theories like humans are dynamic organic systems that must grow and change as new information and new insights arise” (Sigel, Brodzinsky, & Golinkoff, 1981, p. xiii). The same applies to theories of human behavior and learning. Piaget (1971) noted that “the organism only succeeds in preserving its form through a continuous flow of exchanges with the environment” (p. 350). If a theory is considered to be analogous to an organic structure, that theory must adapt to new elements or data in its environment in order to preserve its organization. In short, a theory must assimilate discordant data and be modified to deal with the discrepancies—a process of adaptation and reorganization. New pearls or jewels can be linked into the theory necklace, or old ones can be removed or replaced. A theory, therefore, must have both stability and flexibility, both a stable framework and the capacity to be modified to deal with elements that do not fit. In essence, a theory can be likened to a structure (Piaget, 1970) characterized by:

(1) Wholeness—The principles of the theory all fit together into a coherent, logical whole.

(2) Self-regulation or maintenance—The principles

and boundaries of the theory are firm and clear, providing a framework for integrating new data and giving stability to the whole.

(3) Transformation—Aspects of the theory change to accommodate discordant data.

This notion of theory as an evolving structure can be observed in several recent theories that are applicable to gifted education, such as those of Clark, Gardner, Sternberg, or Tannenbaum. These theories have been developed over time as the proponent of a particular framework evolves and transforms his or her own point of view. Little by little, the pieces are put together, usually within a rough or partial structure first, and then by adding on and changing elements and areas of focus. For example, Sternberg's first theory framing in 1981 dealt with only the componential aspect of his triarchic theory. The contextual and experiential aspects were added several years later as he struggled to account for other aspects of intelligent behavior.

Models on the other hand, "are not modified as empirical data are accumulated; they are either retained if the data confirm them or abandoned if the data do not confirm them" (Ary et al., 1990, p. 17). A model is a "conceptual analogue generally of a physical or mathematical nature which is used to suggest research" (Marx, 1966, p. 4, cited in Ary et al., 1990, p. 16). A model could also be used as a heuristic for appropriate practice, such as Williams' Cognitive-Affective Interaction Model (1986). Models aid understanding by providing simplified representations of complex phenomena.

Although a major distinction between a model and a theory is modifiability, when a theory can no longer explain a wide range of data, it may be overthrown. A new theory founded on different explanations may be constructed, possibly leading to paradigm change. Referring to the necklace metaphor, the links of the theory necklace may be broken apart. Some of the gems of research and pearls of practice may be eliminated and new ones included. The whole may become reconstructed as a very different necklace, or perhaps in a different form altogether such as a new theory tiara.

Finally, a theory offers the possibility of transcendence to a higher plane of understanding. By linking together the multiple facets that must be considered with explanation, a theory offers a change in context to a higher plane, as the principles underlying observable phenomena are provided. By describing the underlying relationships, by relating the facts to each other, a whole greater than the sum of the parts is established.

In summary, a theory is a construction of the mind that provides a heuristic for dealing with information. On a grander scale, a theory is a unified explanation for complex phenomena, systematically describing the underlying relationships and principles of what is observed in behavior. It links together past research and practice and provides a basis for future efforts, transcending the present context. It evolves to accommodate new data, unless it no longer can account for new data provided through research and practice.

What Theories Do We Have in Gifted Education?

There are three groups of current and past theories that have implications for educating gifted children: theories of intelligence, theories of giftedness, and theories of creativity. This section briefly outlines theories being used, or theories with potential for use, in the field. This is not an exhaustive list; rather, the theories highlighted here are particularly relevant to the education of gifted children. The nuances and implications of each theory may be fully explored through the references provided at the end of the chapter.

Theories of Intelligence

Theories of intelligence deal with the ability to adapt successfully to the environment and to solve problems related to one's particular setting. These theories have been evolving in an interesting direction in recent years. Most early theories were primarily based on the results of psychometric tests. More recent theories emphasize multiple abilities and modes of information processing, modified by cultural context (Sternberg, 1990). Another new development is a movement beyond an emphasis on mere adaptation to include a focus on modifying the environment to meet the individual's needs (Gardner, 1983; Sternberg, 1988). Six basic categories of intelligence theories focus on abilities that differentiate the gifted from others: (a) specific, stable cognitive traits characteristic of intellectual functioning; (b) factors or underlying latent variables that explain individual differences; (c) specific intellectual components, elementary information processes that operate on internal representations of objects or symbols; (d) biological explanations; (e) underlying cognitive structures that develop as a result of interaction in the world to an advanced or more extensive degree; and (f) social interaction and motivation theories that view intelligence as developing through interchange with others, or through the influence of motivational elements.

COGNITIVE TRAIT THEORIES OF INTELLIGENCE

Galton (1869, 1883) was the first modern theorist to focus on giftedness. His theory of "the human faculty and its development" is based on two general inherited traits, the abundance of which makes one intellectually able. The first of these is sufficient energy, or a high capacity for labor. The second is sensitivity. The highly able are more perceptive than their less-gifted peers, taking in more sensory data which provides a broader range of information. A broader information base, in turn, provides a stronger basis for intelligent action.

Binet's conception of intelligence emphasizes the importance of good judgment (Binet & Simon, 1916). A person of good judgment shows initiative, is practical, and adapts well to varied circumstances. An intelligent individual combines three essential strengths—direc-

tion, adaptation, and control. A person with strength of direction knows what tasks are important and how to go about accomplishing them. Strength of adaptation means the individual can effectively select and monitor strategies while performing a task. Control is the ability to critique one's own thoughts and behaviors, ensuring that they are appropriate to the task. In addition, there are two types of intelligence. The first, ideational intelligence, is based on logical analysis and verbal reasoning, and operates in the realm of words and abstract ideas. The second, instinctive intelligence, is based on intuitive feeling. Binet's theory, expressed through the Stanford-Binet intelligence test (Terman & Merrill, 1973), has been very influential in selecting intellectually gifted students for gifted programs and services.

Terman was more a researcher than a theorist, but his Genetic Studies of Genius led to conceptions of giftedness that had important influences on education. These conceptions emerged from a longitudinal study of almost 1500 gifted individuals (IQ 140+). For Terman, intelligent people are effective abstract thinkers. They tend to be physically superior, emotionally stable, and trustworthy. They cultivate interests in a spontaneous manner, and these interests are multi-faceted. In comparison with their less-able peers, the highly intelligent are generally superior in mathematical reasoning, reading, language usage, and mastery of the sciences, literature, and the arts (Terman & Oden, 1951).

Cattell (1971) conceived of fluid and crystallized intelligences as subfactors of general intelligence, suggesting that fluid abilities provide a basis for the development of crystallized abilities. For instance, the fluid abilities of general reasoning, association, and memory skills can combine, providing an individual with a strong mechanical aptitude. The latter is part of a set of crystallized aptitudes that have emerged over time through the individual's interests and efforts. In essence, people of great talent have crystallized and focused their fluid abilities upon particular fields of endeavor or domains of interest. This theory drew attention to the role of environmental context. Some programs in gifted education emphasize fluid intelligences but ignore the crystallization of those abilities through long-term experience, effort, and interest in a particular domain. A focus on the latter may be particularly beneficial to children of exceptional ability.

FACTOR THEORIES OF INTELLIGENCE

Guilford's (1967, 1977) Structure of the Intellect (SOI), which Meeker (1969) effectively applied to the education of the gifted, is a three-dimensional model featuring a total of 120 possible intellectual abilities derived through factor analysis. In the model, there are five primary intellectual processes called operations. These include memory, cognition, convergent thinking, divergent thinking, and evaluation. There are four primary contents of intelligence including semantic (language

and speech), figural (imagery and visual-spatial abilities), symbolic (representational mathematical, musical, or coded thought), and behavioral (understanding the self and others). There are also six products in order of complexity from units to classes, relations, systems, transformations, and implications. Guilford and Meeker moved beyond the early IQ test emphases on memory and cognition, broadening conceptions of intelligence and giftedness. They did so by suggesting many different types of intellectual abilities, and by portraying the gifted as good problem solvers who excel in productive thinking, both convergent and divergent, and in evaluative thinking.

COMPONENTIAL THEORIES OF INTELLIGENCE

Sternberg's (1988, 1990) Triarchic Theory of Intelligence portrays integrative relationships among the following subtheories:

(1) The componential subtheory relating intelligence to the individual's internal world—The mental states or processes that underlie intelligent thought include three types of information processing components—metacomponents (higher-order executive thought processes), performance components (lower-order processes that serve as tools for the metacomponents), and knowledge-acquisition components that enable the individual to learn how to do what the metacomponents and performance components eventually do.

(2) The contextual subtheory relating intelligence to the external world of the individual—The intelligence of an individual is normally applied to one or more of three goals: (a) adaptation to an existing environment, (b) shaping an environment to better suit one's needs, and (c) selection of an environment with optimal conditions for living and working.

(3) The experiential subtheory relating intelligence to experience—Effectively dealing with novelty and automatizing information processing are signs of intelligence. An individual who can efficiently automatize conserves mental resources that can be allocated to dealing with novelty. Conversely, a person who effectively deals with novelty can apply more intellectual resources to automatization.

Sternberg's work has generated a great deal of interest in the field. The triarchic theory promises an expanded and more coherent basis for identification and program development.

BIOLOGICAL THEORIES OF INTELLIGENCE

Gardner (1983), in his theory of multiple intelligences, claims that a collection of biologically-based intelligences make up the overall intelligence of an individual. An intelligence is defined as "an ability or set of abilities that permits an individual to solve problems or fashion products that are of consequence in a particular cultural setting" (Walters & Gardner, 1986, p. 165).

These intelligences are: (a) linguistic (reading, writing, listening, and talking skills), (b) logical-mathematical (computing, deriving proofs), (c) spatial-visual (discerning orientation in space), (d) musical, (e) bodily-kinesthetic, (f) interpersonal (understanding others), and (g) intrapersonal (understanding the self). Each intelligence develops and can be enhanced. Each has its own locus in the brain, its own symbol system, and its own transmittable cultural history. Each intelligence is universal to the human species, but is reinforced by the degree to which it is valued by a culture.

Each of these intelligences is a separate system, distinct from the others. Although independent of each other, they interact to produce solutions to problems, or to create products that are of value in a particular cultural milieu. Crystallizing experiences play a role in the manifestation of intelligence. An experience can be crystallizing if it involves remarkable and memorable contact between a person with unusual talent or potential, and the materials of the field or domain in which the talent will be used. The notion of multiple intelligences has expanded conceptions of giftedness by emphasizing that intelligence can manifest in alternative modes of thought.

Eysenck's (1988) Psychophysiological Theory of Cognition is a radical departure from most theories of intelligence and is based on extensive research with average evoked potentials and reaction-time experiments. By combining information processing notions within a biological framework, Eysenck relates levels of intelligence to the speed of error-free information processing. Perceptual channels and musculature support the necessary mental speed and error checking.

STRUCTURAL-DEVELOPMENTAL THEORIES OF INTELLIGENCE

Piaget's (1977, 1980) constructivist-developmental theory portrays intelligence as adaptation. Intelligence develops through the interaction of the child with the environment as a result of the child's actions (both mental and physical) and reflections on those actions using the mechanism of reflective abstraction. The individual evolves through distinct levels or stages of organization over time, actively assimilating and accommodating aspects that relate to its idiosyncratic organization. The individual develops to higher levels of organization through the mechanism of equilibration, a balancing process in which elements that do not fit the knowing structures are accommodated by modifying those structures (Piaget, 1977). Development is based on conflicts, disturbances or gaps that provide the impetus for reorganization. Thus, the organism adapts to the environment by modifying itself. In the process of reflective abstraction, the individual constructs relationships not inherent in the elements it is putting together. This represents a discontinuity with what was before. Each equilibration leads toward higher and broader levels of understanding. Related to gifted

education, giftedness may involve higher stages beyond formal operational thought, faster or perhaps somewhat different movement through the stages, or a difference in the construction of the structures (Cohen, 1985).

Feuerstein's (1980) Instrumental Enrichment Model focuses on the nature of retarded learners but it could be useful in identifying and serving the gifted. According to Feuerstein, intelligence is dynamic and modifiable, not static. The intelligent person is able to effectively gather needed information and to use that information to express solutions to problems, or to generate new information. Direct intervention in an individual's cognitive development through the mediation of a caring adult is needed to optimize the effectiveness and efficiency of that development. Through the benefit of such mediation the individual becomes more open to experience and more adaptable to new situations. Feuerstein proposes that several basic skills underlie learning.

SOCIAL INTERACTION AND MOTIVATION THEORIES

Social interaction theories portray intelligence as developing through interaction with others (Sigel, 1981; Youniss, 1981). Social growth and cognitive growth have a reciprocal relationship, and cognition is framed by social understanding. The recent debate about cooperative learning for the gifted, as well as the role of parents in metacognitive and cognitive development would be enriched by understandings of the role of social interaction in intellectual development.

Several theories attempt to explain motivation. Competence Motivation Theory focuses on humans as biologically motivated to master tasks in their environment in order to feel competent without external rewards (White, 1959). Bandura's (1982) Theory of Self-Efficacy looks at people's perceptions of their own success, suggesting that the highly able feel capable of succeeding at a task, and believe that their skill level is increasing. Cohen (1989) focuses on intrinsic interest as motivating. The individual attempts to answer profound questions through intense, long-term interests, which motivate the type of active, energetic involvements characteristic of gifted children. Weiner (1985) suggests Attribution Theory as the basis for motivation. Individuals attribute success or failure to luck, effort, or ability, and their perception determines how they will approach a new task. Csikszentmihalyi (1990) claims that humans, through deep involvements that stretch their capacities, experience a state of "Flow" that is profoundly pleasurable and motivating. Jenkins-Friedman and Tollefson (1992) have created a model that combines social interaction, cognitive, and motivation theories among others to explain the resiliency factor critical to full development of talents. These theories that focus on the non-intellective factors would be particularly important in counseling, and in dealing with underachieving gifted students.

Theories and Models of Giftedness

These theories all have direct applications to the identification and/or provision of curriculum and programs for gifted students. Some focus on particular aspects of education for the gifted while others are broader in scope.

Ward's (1961, 1980) *Differential Education for the Gifted* is a theory of curriculum differentiation. In a series of propositions, Ward highlights the need for a differential theory that recognizes gifted individuals as different from their non-gifted peers in their capacities for learning. The gifted are faster, more accurate, and more independent of thought. Their capacity for abstract thought is superior, and they are intrinsically motivated to a high degree.

Ward's theoretical framework implies a number of curricular adaptations to meet the needs of the gifted learner including flexible program planning based on the nature of the individual; and emphases on intellectual activity, high expectations, philosophical mindedness, the development of a scientific disposition, mastery of an extensive knowledge base, personal adjustment, social adjustment, character development, and teaching students how to learn.

Based on the work of Polish psychologist, Dabrowski, Piechowski (1979, 1986) theorizes that extreme sensitivity or overexcitability indicates potential for high levels of development, particularly for self-actualization and moral vigor. Five dimensions of psychic life provide the basis for development from lower to higher levels. These are (a) psychomotor (energetic restlessness), (b) sensual, (openness to the world), (c) intellectual (love of ideas and a quest for knowledge), (d) imaginational (vivid imagery and rich association), and (d) emotional (a wide range of feelings and compassion).

In Piechowski's theory, there are five levels of personality development from lowest to highest: Level (1) self-centered; Level (2) inner fragmentation and conforming to expectations of others; Level (3) vulnerable autonomy; Level (4) self-actualization, and Level (5) universal compassion and self-sacrifice. By considering personality characteristics that are beyond the scope of intelligence tests, Piechowski provides a rationale for scrutinizing identification procedures for the gifted from a wide-angle perspective.

Jellen and Verduin's (1986) *Taxonomical Approach to Differential Education for the Gifted* portrays giftedness as the confluence of three primary components—cognition (intelligence and imagination), affect (empathy and sensitivity), and conation (interest and motivation). Gifted individuals may develop a strong sense of values along with powerful specific aptitudes and talents. They may also develop general intellectual abilities such as personal and social knowledge and expertise, moral knowledge, or philosophical-historical knowledge. The gifted are excellent knowledge producers, and they are generally more cooperative, rational, and socially responsible than their less-able

peers. Jellen and Verduin provide useful suggestions for curriculum development.

Clark's (1986, 1992) *Integrative Education Model* synthesizes recent findings from brain research, the new physics, general systems theory, and psychology to develop a model of giftedness that emphasizes wholeness and integration. The model portrays the individual as one system of energy in a vast, intricately interconnected complex of systems. From this holistic perspective, the potential of the individual is expansive. Arbitrary disciplinary boundaries should not become impediments to learning. The optimal development of human potential depends upon the integration of all facets of the brain-mind system including cognition (both linear and spatial), intuition, feeling or emotion, and the physical-sensing function. Clark's model illuminates the growth potential of the mind, the importance of the responsive environment, and the significance of some degree of creative self-direction for the learner in a safe, supportive environment. It is one of the few models developed for gifted education that has been applied to regular classrooms.

Milgram's (1989) *Four by Four Model of the Structure of Giftedness* defines four categories and four levels of giftedness. The categories include general intellectual ability; specific intellectual ability; general, original creative thinking; and specific creative talent. General intellectual ability includes overall general intelligence, the ability to carry out logical problem solving, and abstract thinking ability. Specific intellectual ability enables one to become competent, but not necessarily original, in a given area. People with high levels of ability in general original creative thinking can perceive problems in unique ways; generate unusual, high quality problem solutions; and produce a profusion of ideas. People with specific creative talent can, over long periods of time, become creative within a specific domain or field. The four levels of giftedness identify the level of competence or expertise an individual has reached within each of the four categories. The levels are, in ascending order, non-gifted, mild, moderate, and profound. Eminence is associated with the profound level in the category of specific creative talent. Realizing one's potential depends upon a favorable confluence of environmental opportunity, cognitive ability, and personal-social characteristics.

Renzulli (1985) began with practical considerations and research to evolve the *Schoolwide Enrichment Model* for providing gifted education programs. In the model, the gifted are perceived to be producers rather than consumers of information. Giftedness is defined as a combination of demonstrated above average ability, task commitment, and creativity. Renzulli addresses how students should be identified, suggests educational experiences, and offers practical materials and strategies to meet the needs of gifted children in the schoolwide setting.

Renzulli's work has encouraged educators to expand their conceptions of giftedness because gifted programs

based on the Enrichment Triad Model typically include the top 25% of students, who pass through a “revolving door” of identification, rather than the top 3% who are identified and served in many other programs. Also, Renzulli’s emphasis on information production led to the notion of curriculum compacting, which streamlines information acquisition to make room for curriculum enrichment activities (Renzulli, 1977).

Tannenbaum’s Psychosocial Model of Giftedness (1983, 1990) involves five factors that enable the gifted to become “critically acclaimed performers or exemplary producers of ideas in spheres of activity that enhance the moral, physical, emotional, social, intellectual, or aesthetic life of humanity” (1983, p. 86). These factors are: superior general intellectual ability, special abilities or aptitudes, nonintellective factors (personality variables such as task commitment, ego strength, need for achievement, and meta-learning abilities), environmental factors (nature of the family, peers, school, community, and culture) that nurture gifted development and determine which talents are valued, and finally chance factors (luck, opportunities). To become a producer of ideas requires different configurations and levels of each of these factors depending on the field of endeavor in which one becomes productive. Individuals with early promise are potentially gifted. A gifted child was not necessarily a gifted adult.

Taylor’s Multiple Talent Theory (1986) is based on the egalitarian notion that everyone has brain-based talents that need to be developed, and that the ability to accumulate knowledge is only one type of gift. Taylor developed a “multiple talent totem pole” for identifying and cultivating all human capacities through educational programs. Talents included in the totem pole are: academic, productive thinking, communicating, forecasting, decision making, planning (designing), implementing, human relations, and discerning opportunities. Each student is seen to have a unique pattern of strengths in one or more areas and a unique developmental curve in each talent area. It is beneficial to both self and society to systematically develop the whole person by searching for and developing these talents. This is best accomplished through a “double curriculum” in which knowledge acquisition and talent development occur simultaneously. Taylor’s model has been further developed for mainstream and gifted classrooms by Schlicter in her Talents Unlimited Program (Schlicter, 1986).

Others are in the process of developing models or theories. Emerging theories and models of narrow focus include: (a) the SMPY model for identifying, teaching, tutoring, and accelerating mathematically precocious youth (Benbow, 1986; Stanley, 1974); (b) Frasier’s (1992) theoretical framework for identifying the gifted in economically disadvantaged groups; and (c) Hollingsworth’s (1985) application of enaction theory, which uses mental simulations involving representational, procedural, and heuristic knowledge to

develop thinking skills. Emerging theories or models of broad scope include: (a) Betts’ (1985) Autonomous Learner Model which meets the emotional, social, and cognitive needs of the gifted through five dimensions (orientation, individual development, enrichment activities, seminars, and in-depth study); Feldhusen’s (1986) Purdue Models for Gifted Education—Primary (with Koloff), and Secondary (with Robinson); and (d) VanTassel-Baska’s comprehensive curriculum for the gifted (1988, 1989), an evolving model that embeds curriculum for the gifted within the regular classroom. Time will tell whether these approaches move beyond models to become theories.

Theories of Creativity

Theories of creativity are particularly valuable to the field. A chart listing selected, major theories of creativity, their proponents, and the basic tenets of each theory is found in the section “How Might the Various Theories be Unified?” (Tables 1 and 2). Therefore, only those theories relevant to education of the gifted, which are not discussed on the chart or require elaboration, will be considered here. Three of these theories described at the end of this section (quantum-idealistic, economic, and chaos) are rooted in bodies of knowledge outside the field. These theories may enrich education for the gifted because, as Piaget (1981) noted, reading around the field avoids parochialism and promotes creativity.

Wallas (1926) proposes four stages in the creative process: (a) preparation, (b) incubation, (c) illumination, and (d) verification. Preparation is the initial stage in which information about the problem is gathered. In the incubation phase, subconscious mental processes take place in which new information is associated with old concepts. During illumination, the creator suddenly becomes aware of a new idea, concept, or problem solution. In the verification phase, the new idea is tested for validity. These phases do not necessarily occur in sequence, nor do all of them occur in every instance. For example, a creative insight about a minor problem may occur without any perceptible preparation phase. Wallas’ model enables educators to recognize and encourage the creative process in the classroom.

Gowan’s (1972, 1979) Periodic Theory of Creative Development integrates Piaget’s cognitive developmental stages with Freud’s psycho-sexual stages and Erikson’s stages of ego development, producing a periodic version of developmental stage theory. He proposes three stages beyond Piaget’s formal operations (creativity, psychedelia, and illumination) to match the last three of Erikson’s eight stages. Stages 1, 4, and 7 are latency periods in which the individual focuses on the world. Stages 2, 5, and 8 are identity periods in which the focus is on the self. Creativity blooms in the third and sixth stages. Movement from one stage to another is discontinuous, caused by energy escalation. Dysplasias are malformations in development in which

one aspect of the psyche continues to escalate while another is arrested in a given stage. Students could benefit if educators diagnose dysplasias, and recognize the differential nature of Gowan's stages.

Urban's (1990) Components Model of Creativity is a holistic, gestalt-orientated approach to creativity, which emphasizes the interactional structure of the problem, process, product, personality, and environment that comes into play in a particular situation. All of these factors are intricately interwoven, and influence each other. For example, macro-environmental conditions, such as the political climate of the time, and micro-environmental conditions, such as the socioeconomic conditions of the family, determine the range and recognizability of possible problems that require creative action. In turn, the product of a creative act may affect the environment or reformulate problems. Urban also describes the interaction of three cognitive components (divergent thinking, general knowledge base, and specific knowledge base) and three personality components (focus or task commitment, motives, and openness/tolerance of ambiguity). The components all work together as a functional system and no single component may be sufficient or responsible for the whole creative process. Urban's model enables researchers and practitioners to focus on specific aspects of creativity without losing sight of the whole.

Goswami (1988, 1990) proposes a theory of creativity based on the idealistic interpretation of quantum physics. He suggests that the brain-mind system has a quantum, nonphysical mechanism as well as classical, physical neuronal machinery. The quantum mechanism enables the creative mind to leap out of a system of persistent self-reference, enabling it to access transcendent archetypes that provide the inspiration for creative thought. Other physicists have also conceptualized connections between the underlying principles of quantum physics and creative consciousness (Bohm & Peat, 1987; Capra, 1975). Quantum physics theories highlight the importance of intuitive processes in creative thought, and explore the possibility that underlying, holistic interconnections influence those processes beyond the scope of sense perception.

Rubenson's Psychoeconomic Model (Rubenson & Runco, 1992) is rooted in the field of economics, yet it addresses many of the issues of concern to psychologists. It encompasses notions pertaining to personality traits and intrinsic motivation drawn from the psychological literature. Rubenson portrays creative activity as the product of an interaction between the individual, the field (which determines market demand for creative activity), and a particular domain (the market itself). Creative potential is viewed as a product of initial endowments, societal and family influences, and active investments the individual may make in that potential. The rate of investment in creative endeavors varies from one individual to the next in response to a number of extrinsic and intrinsic factors including the cost of producing innovations (time costs and psychic costs),

both intrinsic and extrinsic benefits, and discount rates (the ability to defer gratification). If the development of creativity over time is an objective in programs for the gifted, this theoretic perspective can inform the field because it highlights motivational elements that influence the willingness of a person to invest time and effort in creative work.

Sternberg (1992) proposes another economic theory of creativity he calls an "Investment Theory". Creators need to be able to recognize areas or ideas that are undervalued and to invest themselves in these ideas, using aspects of their intelligence, intellectual style, knowledge, personality, motivation, and environmental context to produce creative ideas.

Sterling (1992, in press) applies concepts from chaos theory to creativity, portraying the human brain as a nonlinear dynamic system. The content and behavior of a dynamic system constantly change in response to environmental conditions, and in a nonlinear system, cause and effect are interrelated in complicated ways. The whole is greater than the sum of its parts so analysis of the system is not possible through analyses of the component parts. In the creative act, a problem moves the brain system from a state of equilibrium into disequilibrium. As the system moves further from equilibrium it becomes highly sensitive to tiny changes in variables such as external events or thoughts, and minute changes can have enormous, unpredictable effects. Under such conditions, the system can move into a chaotic state in which it reaches a new level of cognitive or creative organization. The chaos view of creativity highlights the importance of unpredictability and the necessity of ambiguity in creative development, providing a useful perspective on curriculum development.

In reviewing these various theories, it becomes evident that the boundaries are no longer so clear between theories of intelligence, giftedness, and creativity. The three groups of theories are beginning to move toward each other. The intricacies of this overlap are discussed later in the section "Should a Theory for Gifted Education Focus on Giftedness, Intelligence or Creativity?"

What are the Key Questions or Issues that Theories for the Gifted Must Answer?

Although written some 2000 years ago, Aristotle's conception of a complete explanation is useful in determining what the golden links might be for framing a theory for gifted education. Aristotle reasoned that complete explanations are based on four distinct causes:

(1) Material causes—causes attributable to the substance of which the object is composed, such as the physiological, neurological or genetic features affecting the organism.

A theory for gifted education should, therefore, include explanations of the role of genetics, neurological differences, motivation and personality variables, physi-

cal growth and maturation, extraordinary bodily-kinesthetic abilities, and discussion of the very nature of the gifted individual. Such explanations must deal with what underlies the characteristics that typically describe the gifted child: great curiosity; ease and speed of learning and memory retrieval; intrinsic motivation and immersion in an interest or task; heightened sensitivity; the ability to abstract, to make relationships, to generalize, and so forth. Works by Amabile (1983), Clark (1986, 1992), Eysenck (1988), Gardner (1983), Piechowski (1979, 1986) and Storfer (1990) focus particularly on this category of causes.

(2) Efficient causes—causes due to an external agent, antecedent condition, or independent variable that move the object—the stimulus of environmental effects.

A theory for gifted education must include explanations of the effects of the physical, social, and cultural environments (including educational practices) on the development of giftedness. Theories and/or research on environmental effects by Albert and Runco (1986), Simonton (1984) and Tannenbaum (1983, 1990) and the environmental component of Sternberg's theory (1985); psychoeconomic theories of Rubenson (1992) and Sternberg (1990); and educational theories of Jellen and Verquin (1986), Milgram (1989), Renzulli (1977, 1985), Urban (1990), and Ward (1961, 1986) focus on efficient causes.

(3) Formal causes—causes arising from the pattern, organization, or form of an object—the underlying structure or rules that can explain temporary stability or organization.

A theory for gifted education must explain how the individual structures and organizes thought and metacognition; the ensemble of structures or systems within and outside of the individual that support or limit optimal development; and the patterns underlying both the characteristics of the child and the types of educational experiences provided. Works by Cohen (1985, 1988, 1992), Feldman (1980, 1982, 1989), Feuerstein (1979, 1980, 1988), Gruber (1981, 1988b), and Horowitz (1992) focus on formal explanations. Others who look at patterns in thought and metacognition are Shore and Dover (1987) and Sternberg (1985).

(4) Final causes—causes focusing on the end toward which an object develops that explain the organization and direction of change (teleological causes).

A theory for gifted education must explain the development of giftedness over the life span. The bridge between childhood giftedness and the productive creative giftedness of adulthood must be understood. Creative beings purposefully direct themselves toward creating (Gruber, 1981; Perkins, 1981). Purpose can be considered a final cause notion, in that it directs efforts toward an end point. The vision of possibilities that creators have in developing their efforts is also a final cause notion. Works by Cohen (1985, 1988, 1992), Horowitz and O'Brien (1985), Gowan (1972, 1974, 1979) and Gruber (1981) focus on final causes.

According to Aristotle, a complete explanation

involves all four causes: material, efficient, formal, and final; therefore, the most complete theory for education of the gifted will involve all four causes. In addition to the four causal explanations, certain structural and definitional aspects must also be included in a theory. In sum, the golden links in a theory will involve the following: (a) a definition of giftedness and related terms (talent, intelligence, creativity, genius, prodigiousness); (b) the biological base for giftedness (genetic factors; physical, perceptual, and maturational factors; neurological differences); (c) the nature of the gifted child (personality, motivational, and learning style factors; moral development; development of conation/purpose; vulnerability factors); (d) differences in thinking and learning (cognition, metacognition, intuition); (e) the environmental context that supports gifted development (physical, social, and cultural environments; interactions of the individual with the environment; social development; adaptation; chance factors); (f) educational practice (identification, including identification of the underserved; curriculum; provision of programs and services; teaching and teacher preparation; counseling; program and student evaluation); (g) metatheoretical considerations (philosophical orientation and conceptual lens; historical antecedents of the theory; relationship to other theories; mechanisms or principles that link one part of the theory to another; degree to which theory accounts for research and practice in a field; consideration of theories, research, and practice from outside the field; the scope and scale of the theory); and (h) how giftedness develops and evolves over the lifespan.

What Criteria Might be Used to Analyze or Develop a Theory for Education of the Gifted?

Most theories applicable to education of the gifted are pieces of the whole picture. Some focus more on personality variables, some on neurobiological explanations, others on social and cultural factors, and still others on pedagogical issues. Criteria are needed to analyze and judge the value and breadth of existing efforts, to weed out theories from program applications, and to give direction in furthering or developing theory.

A theory must apply to a wide array of behaviors, yet be guided by parsimony, internal coherence, and esthetics (Overton & Newman, 1982). It should describe and explain, predict and control, and be testable (Kuhn, 1970). According to Ary, Jacobs, and Rasavieh (1990), a sound theory is characterized by the following criteria:

(1) It explains the "why" of the observed facts in the simplest possible form, observing "the principle of parsimony" (p. 18).

(2) It efficiently accounts for, and is consistent with, observed facts as well as the accumulated body of knowledge.

(3) It provides a means for its own verification

through deductive hypotheses that state anticipated consequences if the theory is true. Rather than truth or falsity, however, a theory is accepted based on its utility in efficiently predicting events.

(4) It suggests areas in need of investigation and stimulates new discoveries.

Cohen (1988) presents four broad categories of criteria related to theory: the nature of the gifted child, education and identification, the framework of the theory, and criteria for the theory. Cohen further suggests that theories applicable to education of the gifted could be analyzed and rated for each criterion on a scale of 0 to 4. This type of analysis could show where a theory needs to be modified or expanded, and permit comparisons of theories. It could also provide a basis for combining the strongest aspects of a variety of theories into a metatheory for gifted education.

What is the Relationship of Theory to Research and Practice?

The pearls of practice and gems of research are crafted together by the golden links of theory. Ideally, the pearls, gems, and links should inform one another in a reciprocal manner. Research informs theory development just as theory provides a heuristic for new research. A theory must be able to account for extant research findings and organize these into a cogent whole. Although there may be gaps in what is known, a theory should help to locate where these gaps occur, as well as point out directions for new research aimed at finding the missing information.

Likewise, practice should inform theory and vice versa. A theory of giftedness should provide guidelines for application to educational practices. In addition, what works successfully for gifted children in educational settings should provide information for theory-building. Research and practice also have the same relationship.

Historically, the reciprocal relationship between research and practice probably is the most evident. Shore, Cornell, Robinson, and Ward (1991) describe the importance of such mutual relationships. Their study of whether research efforts support what experts have called for in practice suggests that more research is needed to justify certain practices and that some recommended practices are unsubstantiated. The relationship between theory and research or theory and practice also needs exploration. Unfortunately, the theory aspect is too often ignored by researchers and practitioners alike. But research without theory is banal and practice without theory has no foundation. Theorists should work together with expert researchers and practitioners in gifted education to build theories, plan research, and improve practice. By acknowledging and integrating the necessary and reciprocal relationships of theory, research, and practice, the field will gain a stronger foundation.

What Should Be the Scope and Scale of a Theory for Gifted Education?

The scope of a theory delineates its breadth—what it chooses to describe and not describe. Related to gifted education, each theorist appears to have a different vision of what the scope should be. Gruber (1981, 1988a, 1989) believes that the scope should involve constructing a theory of an individual, particularly highly creative, unique individuals. Others, like Feldman (1980, 1989) or Stanley and colleagues (1974), advocate the development of theory for a particular domain or field of endeavor. Some focus on a theory of intelligence (Gardner, 1983; Sternberg, 1985), others advocate a very broad theory that attempts to unite the parts and pieces characteristic of giftedness with pertinent theories from other cultures and different disciplines (Ambrose, 1992). The narrower the theory, the more specific and the more accurate the control and predictive capacity. The broader the theory, the greater the descriptive and explanatory potential. What may be needed is an integration of narrower theories into broader theories within compatible frameworks in order to strengthen the power of description, explanation, prediction, and control.

The scale of each theorist's work relates to the level of complexity from which theory development is viewed. At the macrolevel is a group of theorists focused on how a framework for a theory might be built. Works by Cohen (1985, 1992) and Overton (1984, 1990) are concerned with this level of framing. Next is a group concerned with overarching theories that could be applied to optimal development: general systems theory, developmental theories, chaos theory, psychoeconomic theories, and perhaps quantum theory. Theories of Feldman (1980), Goswami (1988), Rubenson (1992), and Sterling (1992) seem to fit well at this level. The next two levels deal with the person. Within this frame, the third level focuses on the thinking/creating processes: the metacomponents, cognition, intuition, and imagination as epitomized in works by Gardner (1983), Gruber (1981), Meeker (1969), and Sternberg (1985). A fourth considers factors that influence gifted development—environmental influences, chance factors, neurological aspects, inherent talents and abilities, personality variables, particularly in theories by Milgram (1989), Piechowski (1979, 1986), Runco (1990), Tannenbaum (1983) and Urban (1990). The final two levels emphasize applications. Level five focuses on educational frameworks seen in works by Clark (1992), Jellen and Verduin (1986), Renzulli (1977, 1985), and Ward (1961, 1986). Level six considers specific learning processes, seen in works by theorists such as Feuerstein (1980), Hollingsworth (1985), Presseisen (1987), and Shore and Dover (1987) (see Figure 1).

The difference between scope and scale is that scope accounts for the breadth of explanation offered, while scale describes the viewing point or level of focus in a theory. For example, both Ward and Clark focus

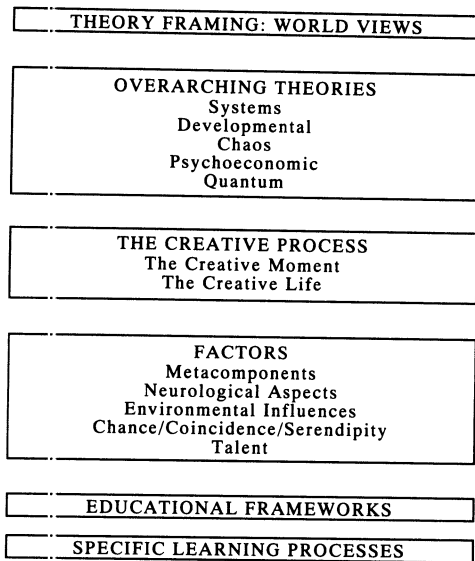


FIGURE 1. Theory building levels for optimal development of mind.

on educational applications as their level of scale. However, Clark's scope is broader, as it involves parenting, the evolution of giftedness, a focus on creativity, and biological explanations related to pedagogical considerations.

Theorists need to identify where their own theories fit in terms of scope and scale. To recognize where a theory fits is to understand the questions and issues being addressed by that theory, as well as the theory's limitations. Some theories deal with more than one level of complexity. All the levels, however, must be addressed to create a complete understanding of giftedness: from the macro-big picture world views to the microviews of specific learning processes and strategies.

Should a Theory of Gifted Education Focus on Giftedness, Intelligence, or Creativity?

It appears obvious that a theory of gifted education should focus on giftedness. But such is not the case. In reality, both theories of giftedness and theories of intelligence need to focus on creativity, for the following reasons.

Theories of intelligence essentially look at how successfully the individual adapts to the environment. An issue is whether theories of intelligence should require the individual to adapt to the world or whether the world should adapt somewhat to the individual. In theories of creativity, the adaptation is mutual. As Gruber (1988a, p. 41) stated, "It is safe to say that no case of early achievement occurs without a long apprenticeship [in order to master a field]". This is adaptation to the

world. But when the creative individual extends or transforms the domain in which he or she functions, that world of endeavor adapts to him or her (Cohen, 1989). For example, when Freud described the workings of the unconscious mind, he changed the way new learners learned the field of psychology (Feldman, 1980). The creator also transforms the self, constructing a framework for looking at, and organizing data and events from the outside (Gruber, 1981). The most recent theories of intelligence acknowledge this shaping of the world aspect, thus incorporating creativity, but they do not address the transformation of self.

Any theory of intelligence or cognitive development should be able to explain giftedness. Giftedness can be viewed as simply the optimal state or level within that framework, for example, two standard deviations above the mean on a scale of intelligence. But most theories of intelligence and cognitive development do little to explain why some individuals develop more fully and how to support that development, nor do they explain the difference between what is considered gifted development in children and gifted development in adults. These are issues of primary concern to educators and psychologists working with the gifted.

Most definitions of childhood giftedness focus on specific traits, factors, or abilities (usually as determined by tests of academic or mental ability) that in some way distinguish such children from others (Siegler & Kotovsky, 1986). Most definitions of giftedness in adults, however, involve creative productivity. But it does not seem that adult creative productivity can be predicted from childhood academic or intellectual abilities. For example, a brilliant secondary student selected as a presidential scholar for his or her outstanding academic performance may fail to accomplish much of anything in adulthood (Kaufman, 1981). Even Terman's longitudinal study of genius that looked at almost 1500 high IQ children and followed them over their life spans turned up many high achieving adults, but few creative producers or geniuses. If a theory should allow prediction, perhaps the field has been looking at the wrong dimensions.

A bridge between "schoolhouse giftedness" (Renzulli, 1986) and adult productive creativity must be found. Theories of creativity offer greater possibilities for understanding the end state toward which giftedness can lead—the creation of new and useful ideas, products, or performances that extend or even transform a field, hence, gifted → creative development (Cohen, 1985, 1989). To limit gifted education to concerns only for the current needs of extraordinary children may deny the development of their creative potential. In addition, the possibility for creative productivity may be overlooked in a child whose gifts are not obvious. Efforts should focus on creativity, working to understand how to support its development in children, so that they can become creative, productive adults.

Creativity in mature individuals is most often defined as the production of something new or rare, of value (Rothenberg & Hausman, 1976). In creativity, both

the self and the field of endeavor are extended or even transformed. There is a discontinuity with what was before—a change in context (Bateson, 1979; Cohen, 1992; Feldman, 1982; Goswami, 1988). The greatest difficulty in theory development comes in explaining novelty, how something new enters a system, a discontinuity. Also difficult to explain in current theories of giftedness are change processes (Feldman, 1989). A theory for gifted education must address not only how something new is created but also the change processes—how the self and a field of endeavor are transformed. Theories of creativity do so, while most theories of giftedness or intelligence do not.

Creativity is universal. Every human invents the world for him or herself, and all acts of real learning are creative acts (Piaget, 1981). Creativity, therefore, must be a brain-based function characteristic of the species. Giftedness, however, is not characteristic of everyone, but is a “best example” in any given theory. Giftedness is also context-specific: only the specific traits valued by a culture are acknowledged and encouraged. By focusing theory development on the universal human characteristic of creativity and explaining its optimization, the field of gifted education can be better related to general education, thus avoiding its relegation to a peripheral, dispensable frill in the schools. More must be learned about this basic function of mind and what allows some individuals to reach mature levels of creativity—or adult giftedness (Cohen, 1989).

What Are the Contextual Influences on Theory Development?

Lakoff and Johnson (1980) claim that our thoughts are implicitly shaped by metaphor, and that cultural and philosophical biases can permeate our thought below the level of awareness. Similarly, critical theorists suggest that the particular structure of communication in a group tacitly carries with it ideological predispositions that can reinforce the power of dominant groups within a culture or society, and undermine the opportunities for advancement among the weak (Hodge & Kress, 1988). Bohm and Peat (1987) illustrate how scientific inquiry can be influenced by the tacit infrastructure of commonly accepted beliefs and values that pervade a particular culture.

In essence, a particular brand of ideology can permeate the communications and ideas of theorists and researchers in a field, particularly if the leaders in that field are predominantly the products of a dominant culture. Bohm (1987) claims that a fish cannot see the water in which it swims. Theorists, researchers, and practitioners face a similar problem, swimming through the conceptual familiarity of an ideology that limits their focus to a narrow band of the human potential spectrum. Most of the leaders in the field of gifted education are predominantly the products of Western-industrial culture and, as such, may be prone to ideological

insularity. Eastern Asian, Native American, African American, Hispanic, and other cultural viewpoints may be underrepresented in the field.

Fortunately, many leaders in the field are at least aware of the need for theory, research, and practice that addresses cultural diversity, and some are actively advocating for a greater emphasis on theoretical frameworks related to underrepresented populations, most notably Frasier (1992). Nevertheless, it appears that theorists must be careful to ensure that their conceptual frameworks are not being tainted or warped by insular perceptions and biases. Theorists need to recognize such biases in their work, and to consider a broad spectrum of abilities in their deliberations concerning gifted education.

The same concerns apply to the breadth of disciplines represented in the theories being considered. Most of these theories are rooted in the behavioral sciences. A comprehensive theory for the field should be truly interdisciplinary in nature, encompassing disciplines such as philosophy and the arts, as well as the behavioral sciences. Ideally, the context from which a unified theory might draw will include as much of human experience as possible.

How Might the Various Theories be Unified?

The field of education for the gifted needs a unified theory that combines theories of giftedness with theories of intelligence and creativity in order to fully explain the development of gifted and creative individuals and how they should be identified and served. This might be thought of as somewhat akin to Stephen Hawking’s “Big Bang” theory of the universe wherein he combined theories of relativity, gravity, and quantum physics. Sternberg and Davidson (1986) state that we are at the brink of such a possibility, that the many, diverse conceptions of giftedness are on the verge of coming together, and that there is a need to combine theoretical methodologies and perspectives. Theories from different fields—the various psychologies, biology and neurobiology, genetics, anthropology, physics, philosophy, education—should be brought to bear on optimal development. To construct a unified theory will allow the field to move ahead, putting research and practice on a sound footing.

What is Currently Being Done to Unify Theory?

Some individual theorists are attempting to integrate the theoretical work of others in the field. For instance, Sterling (1992) is using chaos theory as a framework for spanning the gaps between theories of creativity. Meininger (1992) is using grounded theory methodologies to find common threads of meaning among some of the theories outlined in this chapter.

There have also been collaborative attempts at theory

unification, spearheaded by Cohen, her colleagues, and students. Cohen has encouraged theorists to organize symposia at major gifted education conferences to accomplish the following:

(1) Consider the definitions, needs, and purposes of a theory for the field, list possible theories to consider, and develop criteria through a panel or group discussion.

(2) Have a presentation by each theorist of his or her theory, perhaps with a scoring on each criterion by participants.

(3) Meet in a symposium or discussion group to illuminate where the strengths of various theories lie and to explore how to work together to "get ahead by getting a theory". An attempt would be made to reach the best possible explanation to link together definitions, identification, and educational practices for gifted and creative individuals from the participants' combined efforts. Such a synergistic product, a metatheory for gifted education, should allow the field to make some great leaps forward (Cohen, 1988).

In response to this encouragement, the National Association for Gifted Children in the United States established a new Conceptual Foundations Division in 1991 as a forum for the development of conceptual frameworks that will serve as a basis for appropriate research, curriculum development, and identification. The mission of the Division is to consider definitions, conceptions, and theories of giftedness; trends, issues, and future directions; historical perspectives; ideas from outside the field; and philosophical and ethical issues.

Another collaborative effort emerged through the founding of the Institute for Creative Intelligence in 1990. Theory Summit Conferences on Optimal Development of Mind were held at Mt Hood, Oregon in the fall of 1990 and 1991. The Summit group, which includes some of the seminal minds in a number of different disciplines, is attempting to provide the foundation for a unified theory of creative intelligence. With development of a consistent funding base, Summits can be planned for the next several years.

In order to streamline these efforts, particularly those involving collaborative groups, it is important to understand some of the obstacles that make the construction of a metatheory problematic.

Obstacles to Theory Unification

Efforts to unify theory involve complex, multidimensional processes that encompass a broad range of perspectives on the rather nebulous concepts of creativity, giftedness, and intelligence. Among the many problems that can confound attempts to unify theory are differing philosophical beliefs, a lack of shared language about the phenomena in question, and the tendency of participants to prefer different levels of discourse (see Figure 1). There are also a large number of difficult logistical problems that can hinder progress when theorists and researchers assemble to carry

out collaborative, interdisciplinary, theoretical work (Ambrose, 1992).

Perhaps the most fundamental difficulties faced by interdisciplinary researchers attempting to grapple with ill-defined theoretical problems are related to philosophical positions and world views. A world view is the conceptual lens or filter through which an individual perceives reality (Overton, 1984). In the scientific realm, it colors perceptions, shaping theory and ultimately, the practice that theory informs.

Overton suggests that there are two competing world views that currently underlie and influence scientific investigation. The mechanistic view considers reality as regular, stable, and fixed, predisposing researchers to reductive analysis and the search for causal explanations of phenomena. The central metaphor is a machine. The organismic lens portrays reality as dynamic, holistic, and evolving, encouraging the researcher to look for patterns in the whole and to infer the underlying organization or structure. The central metaphor is a living thing.

Organismic theories deal with universal structures and help in understanding both the direction and organization of gifted → creative development. They accept formal and final causes as central, and limit the value of material and efficient causes to explaining rate and terminal level of development (Overton, 1984; Overton & Newman, 1982). Because organismic theories accept qualitative, discontinuous changes, creative leaps or insights do not have to be explained by antecedent, contingent causes. Creativity, however, involves variation, non-universal systems, non-linear pathways, and an incredible coincidence of confluent factors to reach extremely high levels (Feldman, 1982). Organismic theories do not deal with these aspects successfully. Because mechanistic theories focus on environmental (efficient) and hereditary (contingent) factors, they are needed to explain the conditions necessary for creative development, individual variation, and the small steps in the creative process. But mechanistic theories do not accept organization (formal) and direction (final) explanations as natural or necessary.

Without an explicit awareness of these fundamental philosophical differences, a domain of inquiry can become fragmented, with different theoretical camps aligning themselves under the banners of incommensurate world views or paradigms. Such entrenchment and fragmentation inhibits communication across disciplinary boundaries, as well as within disciplines where the world views differ. At the same time, integration of these conceptual frameworks is needed to address all four of Aristotle's causes needed for a complete explanation. The field of creativity is a perfect focal point for an attempt at theoretic integration because its extreme breadth of scope will illuminate the completeness of explanation provided by each of the major world views.

In addition to different world views, lack of shared language increases the difficulty of collaborative attempts to unify theories. The same term can have subtle differences in meaning from one discipline to the next

and theorists can find themselves talking or even reading past one another (Anbar, 1986; MacDonald, 1986). Even within the same field, theorists have quite different definitions for the most commonly used terms: giftedness, creativity, talent, genius, prodigiousness, and intelligence.

Further communication problems arise from the tendency of researchers and theorists to prefer different levels of discourse (see Figure 1), a problem of scale. Participants in theory unification efforts can expend their energies attempting to convince peers to participate in dialogue at their preferred levels, and this detracts from the interdisciplinary conceptual bridging they are attempting to achieve (Ambrose, 1992).

Interdisciplinary research in theories of intelligence, giftedness, and creativity can be highly complex and problematic. It encompasses an enormous body of knowledge and several levels of inquiry. It also demands the resolution of seemingly incompatible theoretical perspectives that are rooted in competing world views. Time is an obstacle, as opportunities to work with other theorists are limited. Lack of criteria for such a metatheory also confounds theorists' attempts to "get a handle" on the issue. It will take a great deal of patience, time, and insight from the best minds in the field to overcome such obstacles.

Recommendations for Unifying Theories

The following are some strategies for unifying theories. Other suggestions may be found in Cohen (1992).

WORLD VIEWS: UNIFICATION BY "FAMILIES OF THEORIES"

The two major world views, mechanistic and organismic, can be used as a heuristic for the initial stages of theory unification. Theories within each world view can be thought of as a "family of theories" (Overton, 1984; Overton & Reese, 1973), each having common central notions and metaphors, as well as preferred research techniques.

The mechanistic family of theories related to creativity is included in Table 1. In the mechanistic world view, creativity is considered to be comprised of traits, factors, specific behaviors, or chains of associations that can be explained by antecedent causes. The view of the gifted→creative individual is present-focused, a cross-sectional slice in time, a being (as opposed to a becoming) view.

In the organismic conceptual lens or world view, creativity is portrayed as a process of necessary restructuring of systems or structures, usually in the direction of ever higher levels or goals (formal or final causes). The view of the gifted→creative individual is future-focused, a longitudinal or becoming view. The organismic family of theories is outlined in Table 2. More extensive explanations of these theories, and references for the work of the theorists included in Tables 1 and 2 can be found in Rothenburg and Hausman (1976) and in Cohen (1985, 1988).

Theories can be related to each other first within each family, because they share the same core notions and research heuristics. Theories within each of the two world view families should first be analyzed along criteria proposed for theory selection and development (Cohen, 1988). One approach would be for individual

TABLE 1
Mechanistic Family of Theories

Description	Proponents	Applications
Associationist Theories Creativity emerges from the number and unusualness of associations. Caused by bringing together two remote ideas.	<i>Mednick</i> — remote associations <i>Koestler</i> — bisociation theory (subconscious relating of matrices or frames of reference).	Highly influential basis for: Guilford's factors of ideational fluency, associational fluency, & originality; Torrance's verbal & figural test based on divergent thinking; Osborn's brainstorming & checklist of verbs; Eberle's scamper; Parnes' idea stimulating techniques; Feldhusen & Treffinger's forced relationships; Gordon & Prince's synectics.
Psychometric Theories Measurable, stable traits or factors differentiate gifted & creative from others. High IQ & creativity not synonymous.	<i>Galton</i> — hereditary traits <i>Terman</i> — longitudinal study of high IQ individuals age 10 onwards <i>Guilford</i> — factor theory of intelligence, structure of the intellect (SOI) <i>Meeker</i> — application of SOI to classroom.	Very influential, most identification procedures rely on IQ & achievement tests, some include creativity tests. Program evaluation sometimes based on standardized achievement tests or tests of creativity. SOI-LA programs (Guilford, Meeker) increasingly applied in TAG classes

TABLE 1 Continued

Description	Proponents	Applications
<p>Behaviorist Theories Creativity based on links between stimulus and response. Reward for creative behavior, or appearance of novel response stimulates additional novel behavior.</p>	<p><i>Skinner</i> — operant conditioning <i>Staats</i> — cumulative hierarchical learning <i>Berliner; Boles</i> — catastrophe theory accounts for creative leaps</p>	<p>Little applied in TAG classes except in positive teacher reinforcement as stimulus behavior.</p>
<p>Personality Traits & Cognitive Style Theories Relatively fixed or stable personality characteristics differentiate creative individuals from non-creatives, such as self-confidence, independence, risk-taking, preference for complexity, humor, task commitment, imagination, cross-sex identification, self-acceptance, intuition, sensitivity, and field independence.</p>	<p><i>Roe</i> — creative scientists <i>MacKinnon</i> — architects & others <i>Gough</i> — research scientists <i>Barron</i> — Air Force officers, creative writers, & other groups <i>Walberg</i> — eminent men <i>Cattell</i> — factor analysis of several groups</p>	<p>Use of personality inventories to help teacher learn about student and student learn about self (Khatena's SAM, Rimm & Davis' GIFT, Torrance's "What kind of Person Are You", Williams' "How Do You Feel About Yourself"). Emphasis on match of learning styles to appropriate teaching styles.</p>
<p>Environmental Factors Theories Identifiable environmental factors may cause creativity (special family position, parental encouragement, consistent discipline, lack of parental pressure, early exposure to many adults & eminent individuals; historical factors; availability of cultural stimuli, materials in field of eminence; & mentors early in life.</p>	<p><i>Roe</i> — male creative scientists <i>MacKinnon</i> — architects <i>Albert</i> — American presidents, British prime ministers, nobel laureates, eminent scientists <i>Walberg</i> — sociocultural events influencing creative development <i>Feldman</i> — coincidence of environmental factors <i>Amabile</i> — motivational aspects of social climate <i>Simonton</i> — political, social, cultural conditions</p>	<p>Much applied. Belief that students will be creative if teachers provide the right environment.</p>
<p>Experimental & Training Approaches Creativity can be increased through teaching or training of specific steps or techniques.</p>	<p><i>Covington, Crutchfield, & Davies</i> — productive thinking program <i>Feldhouse, Speedie, & Treffinger</i> — Purdue creative thinking program <i>Parnes</i> — creative problem solving program <i>Meyer & Torrance</i> — Torrance-Myer workbooks <i>Khatena</i> — Training of imagination & imagery</p>	<p>Extensively used. Best for establishing supportive environment & developing problem-solving heuristics, & for influencing production at non-professional levels. Transfer of skills best to problems similar to those used in training.</p>
<p>Cognitive Science/Information Processing Theories Humans are manipulators of symbols which they put into patterns. Specific, higher-level cognitive processes or components differentiate the gifted from average (e.g., knowledge acquisition components, reconstructive memory, insight, metacognition). Use of computer analogies to explain workings of the mind. Preferred research method is isolating variables using large sample methods.</p>	<p><i>Borkowski & Peck</i> — metamemory <i>Davidson</i> — role of insight <i>Dehn</i> — reconstructive memory <i>Jackson & Butterfield</i> — giftedness as excellent performance <i>Sternberg</i> — triachic theory (with componential, contextual, & experiential subtheories)</p>	<p>Beginning to be used in research (Shore & Dover, Hollingsworth). Little classroom application in literature yet.</p>

TABLE 2
Organismic Family of Theories

Description	Proponents	Applications
<p>Psychoanalytic Theories Unconscious or preconscious is source of creativity. Process involves bringing content to surface through imagery & imagination, & consciously acting on it.</p>	<p><i>Freud</i> — sublimation of sexual interests via unconscious <i>Kris</i> — stems from the preconscious caused by regression in service of the ego <i>Kubie</i> — source is playful preconscious <i>Arietti</i> — “magic synthesis” of unconscious & logical processes <i>Jung</i> — primordial archetypes surface from collective unconscious through dreams rather than free will <i>Rank</i> — focus on consciousness, will, & separation. Three types of personality development (adapted, conflicted, ideal-the artist)</p>	<p>Extensively used in gifted education, mainly in two ways: the notion of insight as meeting place for subconscious thought & conscious awareness (e.g., Osborn-Parnes creative problem solving includes subconscious access techniques; Prince’s work attends to censors of the unconscious); and the importance of imagery and imagination (Gowan, Khatena & Torrance; Gordon & Prince focus on metaphor through synectics).</p>
<p>Humanist Theories Creativity is a capacity in everyone, individual strives toward self-realization. Planning required for optimal development. Creativity is the ideal.</p>	<p><i>Maslow</i> — self-actualizing creativity is capacity in everyone <i>Rogers</i> — actualized person creatively lives & produces <i>Fromm</i> — comes from need for transcendence <i>Combs</i> — proposed a perceptual framework. Need classroom climate conducive to creativity <i>Erikson</i> — proposed eight stages of life cycle. Individual striving toward highest level as conscious choice.</p>	<p>TAG classroom applications seen in openness, goal of developing independent learners, call for creative climate. Torrance’s “checklist of creative positives,” Whitmore’s interventions with underachieving gifted, & Clark’s focus on early interactions that support becoming gifted.</p>
<p>Systems Theories General systems theory is an interdisciplinary model of organization that explores structural similarities across fields, serves as a vehicle for integrating, & generates more narrow theories. Distinct structures accepted as different, parts are distinguished from whole & may work differently, focus is on material & energy exchange with environment in the build-up of order & organization. Allows for “equifinality” — the same goal may be reached under different conditions & by different paths. A need to destructure in order to reintegrate is recognized.</p>	<p><i>Bertalanffy</i> — father of general systems theory <i>Land and Kenneally</i> — stage of the growth cycle; destructuring for creative transformation</p>	<p>Little application of systems theory to gifted education except in the works of Bruch, Langham and Torrance, Gowan and Dodd, & Khatena. Dabrowski’s theory of positive disintegration also ties in with the destructuring aspects of systems theory.</p>
<p>Gestalt Theories “Gestalt” means an organized whole, a set of structured configurations or patterns which must be understood as a totality rather than a collection of parts. Learner develops insights through a sense or feeling for patterns. Individual is purposive & striving, directed toward goals, & motivated by barriers to self-set goals. Productive thinking & psychological growth are gained through restructuring problems.</p>	<p><i>Wertheimer</i> — proposed way to impose order on disorganized field through Laws of Perception <i>Kohler</i> — demonstrated that insight was used by apes to solve simple problems <i>Koffka</i> — popularized gestalt psychology <i>Lewin</i> — used topology & vector analysis to represent the cognitive field <i>Schachtel</i> — focused on perception in productive thought</p>	<p>Outside the work of DeBono, who uses a lateral thinking approach & developed lessons (CoRT program) to force individuals to perceive structures in different ways, gestalt psychology has been relatively little used in TAG classrooms. Morphological analysis & field-dependent/field-independent concerns could fit into this theoretical camp.</p>

TABLE 2 Continued

Description	Proponents	Applications
<p>Developmental Theories Focus on the changing way the child understand the world as she or he develops. Growth of intelligence as a form of biological adaptation. As child grows cognitively through periods of relative stability in the way the world is viewed, he or she becomes better adapted because of a growing ability to anticipate, predict, or consider possibilities. This occurs through a process of equilibrating or balancing; changing the self to deal with discrepancies.</p>	<p><i>Piaget</i> — father of developmental theories. Reflective abstraction as mechanism for creating and learning <i>Feldman</i> — nonuniversals in cognitive development are base of creativity <i>Gruber</i> — evolving systems of cognition, purpose & affect. Network enterprises mark creative individual <i>Gowan</i> — periodic stage theory of creative development <i>Heller</i> — differential equilibrations in creative individuals <i>Roberts</i> — rapid & flexible equilibrations are characteristic</p>	<p>In spite of the research on developmental theories and giftedness, little (beyond the child as active and stage-material matching) is applied in the classroom. Developmentally appropriate practices are being applied in some classrooms.</p>
<p>Transcendental Theories Focus on explanations outside the organism, such as God, the Muses, or universal consciousness. Jung's collective unconscious might fit in this group of theories, as the individual is the instrument through which the collective unconscious emerges in creative acts.</p>	<p><i>Plato; Maritain</i> — creativity is a divine gift coming from outside the individual <i>Gowan</i> — creativity comes via drugs, trance or spiritual revelation <i>Goswami</i> — creativity analogous to quantum leap</p>	<p>Clark's respect for intuitive knowing, philosophical implications of quantum physics, & Eastern philosophies have been incorporated in suggestions for the classroom. Little else has been applied. Perhaps because of the association of some transcendental approaches with drugs or metaphysics, these theories have been generally avoided.</p>
<p>Biological Theories Two major groups of biological theories: (1) Mechanistic — focuses on the microlevel of neurological functioning, & seeks to understand specific neuronal connections or triggering of chemicals in the solution of a specific problem. A specific connection might be understood, but not creativity. (2) Organismic — looks at change through brain development over time & in relationship to environmental interactions.</p>	<p><i>Witrock</i> — generative brain which develops through use <i>Epstein</i> — brain weight changes over development, & relationship to Piagetian stages <i>Miller-Jones</i> — aspects of differential neural development <i>Gardner</i> — seven biological competencies <i>Clark</i> — giftedness is optimal neurological development <i>Pieckowski</i> — gifted display "overexcitability", a visceral reaction to experiences expressed in five modes</p>	<p>Clark's work on integrative education is the best known example. A few other brain-based classroom applications.</p>

theorists to determine what is missing in their theories and to seek other theories within the same conceptual framework to complement and enhance their own. A group attempting to unify theory might select only a few theories as a focus for analysis of phenomena. The common threads among these theories may become more explicit through in-depth work on case studies of creative people, products, or processes. By studying only a few theories at a time, the group might make real progress toward integration while sparing itself the overwhelming complexity of a large number of perspectives in aggregate (Ambrose, 1992). Clusters of

theories could then be brought together into a whole family theory, a common synthesis that focuses either on systems within and outside of the individual or on specific conditions, short term problem-solving steps, and influences of heredity. Ways to integrate these two giant frameworks, now containing a synthesis of organismic and mechanistic theories related to giftedness, intelligence, and creativity, can then be attempted (Cohen, 1992).

Overton (1990) recommends that researchers establish a "recursive cycle of knowing" by alternating between the two perspectives. Cycling between the

TABLE 3

Luminous Elements in Theories of Intelligence, Giftedness, and Creativity

		Definitions					Biological Base				Nature of Child					Think Diffs					
		giftedness	talent	intelligence	creativity	genius	prodigiousness	genetics	neurological diffs	physical factors	perceptual factors	maturaton factors	personality	motivation	emotion	learning style	moral development	conation/purpose	vulnerability	cognition	metacognition
Theories of Intelligence	Trait: Galton/Binet/Terman	•		•																•	
	Crystallized/Fluid - Cattell			•																	
	Factor - Guiford, Meeker			*	•				•					•							*
	Componential - Sternberg	•		*	•								•		•						*
	Biological - Gardner	•		*	•			•	*					•							•
	-Eysenck			*				•	*												•
	Developmental - Piaget			*	•			•		•	•			*							*
	- Feuerstein			*						•				*							*
Theories of Giftedness	Social/Motivation											•	*	*				*		•	
	DEG - Ward	•		•																	
	Dev Poten - Piechowski	•		•	•			•					*	*		*					
	Tax DEG - Jellen	•		•									•	•			*				
	Integ Ed - Clark	•			•			*	•	•	•			•							•
	4 x 4 Struc - Milgram	*			•																*
	Schoolwide Enr - Renzulli	•		•	•								•		*		•				
	Psychosoc - Tannenbaum	•	*	*	•								•	•		•					
Theories of Creativity	Mult Tals - Taylor	•	*	•																	
	Associationist				•																•
	Psychometric		•	*	•			•													•
	Behaviorist				•																
	Personality, Cog Style				•								*	•	•	*					
	Enviromental Factors				•																
	Experimental/Training				•																
	Information Processing			•	•									•							•
Other	Psychoanalytic				•							*	•	*						•	
	Humanist				•							•	*			*					
	Systems				•							•				•					
	Gestalt				•				*				*			•					
	Developmental (Other)			*	•		*		•		•		•	•		•				*	•
	Transcendental				•																*
	Biological			•	•																
	Stages - Wallas				*																•

two vantage points would enable theorists to incorporate the work of many different theorists within a single macroframework.

During the first Theory Summit, Meeker and Ward suggested that the group might find a common language by developing a compendium of commonly used terms in each of the disciplines represented in the theory-building group. Each theorist could provide operational or constitutive definitions for the various terms for this "dictionary". The definitions could then be categorized and commonalities and differences discussed.

Theorists who recognize their own preferred level of scale could initially choose to work with others who share that level. At the same time, they need to extend into other levels of scale for a complete explanation. Chaos theory might be usefully applied to scale because of its notion of repeated patterns at different levels of scaling. For example, the pattern of a tree trunk with branches is repeated in looking at a given branch with still smaller branches, or a branchlet with twigs. Using this notion, theorists could look for the patterns that occur across each level of a theory.

The following suggestions are particularly applicable to group efforts. If each participant who joins a theory-building group has a basic understanding of his or her colleagues' viewpoints, the group will be better prepared to share and integrate diverse perspectives. Coherence conditions, simplifications that enable a researcher to grasp the essence of a large mass of complex information (Hesse, in Lincoln & Guba, 1985), can contribute to this understanding. Coherence conditions for theory-building could include abstracts, charts, graphs, mind maps, visual metaphors, and comprehensive lists of concepts and terminology from represented disciplines (Ambrose, 1992).

Individual synthesizers could extend the work of a theory-building group. For instance, one synthesizer could filter the dialogue of the group through the lens of a single theory, using that theory to provide a framework for understanding disparate notions from different disciplines. Another synthesizer could carry out a thematic analysis of the content in the group's dialogue, finding common threads of meaning that may bridge interdisciplinary gaps (Ambrose, 1992).

A theory-building group could approximate Overton's recursive cycling by breaking into subgroups by process preference. One subgroup could make explicit connections among the concepts and phenomena that are encompassed by the nebulous notion of creative intelligence. The other could attempt to integrate perspectives through metaphorical analysis and synthesis. Ideally, the emerging syntheses represented by the work of these groups would contribute to each other during plenary sessions. Such a parallel agenda may establish a productive dynamic tension between incongruous processes, while providing methodological triangulation to the group's work. It may also capitalize on the diverse learning and thinking style preferences of the participants (Ambrose, 1992).

Finally, theorists might look for the gaps and strengths across a variety of theories. Table 3 below represents the authors' attempts to use the "necklace" criteria to highlight the breadth and strengths of various theories of intelligence, giftedness, and creativity germane to education of the gifted. As with any analysis of extreme breadth and complexity, the authors' world views and values likely permeate the table; thus, the reader is advised to consider how he or she might apply the criteria to each theory. Such an analysis could be a starting point for looking at how theories might be combined. For example, the blank spaces indicate elements not emphasized by a theory, the plus signs indicate particular strengths. Cohen (1992) calls these strengths "luminous elements", as they have an esthetic rightness and light-shedding quality. By looking for the plus signs, the best features of given theories could be related to theories within similar conceptual frameworks first, and then across world views. Then the gaps on the chart can be addressed by theorists, researchers, and practitioners alike.

Theory Into Practice: Conclusion

Early approaches to education of the gifted focused on identifying and labelling children who demonstrated special abilities, or were characterized by specific traits. Often, educational provisions were offered in the form of pull-out programs or special classes that separated the gifted from their less-able peers. Such an approach may be a necessary first step in program provision as educators become aware of these children and try to serve them, often in climates hostile toward their needs. All too often, such programs are ad hoc or add-on affairs, such as a telescope-making day, or a competition in problem solving. Although such programs may benefit some gifted children, they cannot be justified as suitable for the gifted alone, nor do they provide the type of comprehensive, articulated, and sequential programming needed. Such programs lack a theoretical base. In addition, because there is little relationship to the total educational program and only a few children are served, such practices are often viewed as elitist, making them politically vulnerable.

More recently, a shift toward a focus on identifying needs has become evident in practice and is reflected in a variety of theories. Programs and services in schools are identified or developed and students are assigned to classes based on assessed need. For example, a student may be assigned to an independent study social studies project, accelerated math, or a counseling group for underachieving gifted students. A continuum of abilities is considered, the more exceptionally gifted, the greater the need for extended services. This approach represents a paradigm shift toward a special education view. Because the focus is on the current needs of the child, this view is generally beneficial, but without national mandates for the gifted (typically provided for other

exceptionalities), this approach also becomes vulnerable in periods of tight budgets.

A new shift is occurring toward linkages with regular education. Because the field has insulated itself and ignored a relationship to regular education for so long it is vulnerable to being eliminated (VanTassel-Baska, 1992). In the current economic recession worldwide, gifted education is seen as an isolated specialization that helps only a few, often the elite. Until theory and practice put gifted education squarely within the mainstream of education, the field will be vulnerable. This does not mean that gifted education must adapt to regular education programs; rather, gifted education could creatively transform the education system itself. In terms of educational reform, educators of the gifted long ago incorporated many salutatory practices. With a sound theory based on the universal human phenomenon of creativity, educators of the gifted could take a leadership role in bringing about changes in regular education by providing all children the opportunities needed to optimize development.

In addition to theories already discussed, political theories are needed that can explain the relationship of the gifted child movement to the rest of the world. Gallagher's (1986, 1988) political theory of the pendulum swings of love and hate for the gifted could be useful. According to Gallagher, when a nation is in a period of crisis, especially if threatened by outside forces, the gifted are supported and excellence is rewarded, with the look to escaping the difficulties. In periods of national calm, equity is supreme. Although the United States and the world have been in great turmoil in recent years, gifted programs are being axed. Gallagher's political theory may need to take into account economic theories, but it is a starting point. How to help nations recognize the need to support excellence and creativity for their very survival must be considered.

Theory unification should include political issues, perhaps considering various levels of systems in interaction. A metatheory that brings together the various luminous aspects of individual theories and identifies missing elements within the political context would be a giant step toward strengthening education for the gifted. This new theory necklace could then be tried on by researchers and practitioners until a better set of golden links is constructed.

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Theory and Research on Curriculum Development for the Gifted

JOYCE VANTASSEL-BASKA

College of William and Mary, Williamsburg, Virginia, U.S.A.

Introduction

How can educators help a gifted student to excel? The answer to this question is a complicated one because much of our research on what impacts the lives of gifted individuals relates more to the roles of parents (Feldman, 1985; Bloom, 1985), of internal factors and significant others (VanTassel-Baska & Olszewski-Kubilius, 1989), of crystallizing experiences (Gardner, 1985), or of chance (Tannenbaum, 1983). Yet what happens to a child in school should have a significant positive effect on the processes of learning. The quality and character of a school's curriculum is a vital ingredient to the eventual realization of a child's capacity. Gifted and talented students, like all students, have the right to a continuity of educational experience that meets their present and future academic needs. When an organized, thoughtful curriculum plan is in place and when that curriculum is supported by an articulate, informed educational leadership, the probability of capturing the interest and energy of our ablest young thinkers is markedly enhanced. Certainly an organized curriculum is a key ingredient in this complex blending of circumstance so central to the transformation of a gifted learner's initial capacity for intellectual activity into a mature competence for academic and professional accomplishment.

Key beliefs and assumptions have guided the thinking of most recent curriculum theory in gifted education (Passow, 1982; Gallagher, 1985; Maker, 1982; VanTassel-Baska et al., 1988). These include the following:

- (1) All learners should be provided curriculum opportunities that allow them to attain optimum levels of learning.
- (2) Gifted learners have different learning needs compared with typical learners. Therefore, curriculum must be adapted or designed to accommodate these needs.
- (3) The needs of gifted learners cut across cognitive, affective, social, and esthetic areas of curriculum experiences.
- (4) Gifted learners are best served by a confluent approach that allows for accelerated and advanced learning, and enriched and extended experiences.

(5) Curriculum experiences for gifted learners need to be carefully planned, written down, and implemented in order to maximize potential effect.

(6) Curriculum development for gifted learners is an ongoing process that uses evaluation as a central tool for future planning and revision of curriculum documents.

Over twenty years ago, national reports ushered in a new era for educational and curricular change, predominantly in science and mathematics. Today American educators again are faced with a barrage of reports that describe deficiencies in current instruction in mathematics and science and in other content disciplines as well. *A Nation at Risk* (National Commission on Excellence in Education, 1983) reported on the failure of public education in exposing students to full secondary programs in science and mathematics. A Carnegie task force report (1986) further documented the need for more advanced course-taking in these subjects by larger numbers of the secondary school population. The College Board's Project Equality (1983) outlined maximum competency skills in academic areas that require mastery in today's technologically advanced world. The most stringent recommendations on curriculum were reported by the National Science Commission (1983) which prescribed four full years of science and mathematics for the majority of students in American schools.

In the early 1990s, the reform movement has moved to a global arena. All countries are focused on the importance of education. All countries see their future economic hopes linked to an educated citizenry, skilled in the world technologies. Moreover, the demographic make-up of many developed countries is pluralistic, thus globalizing the issues. The reform issues as they are played out in the United States represent an important case in point.

Some of the preeminent educational thinkers in the United States have published treatises on the nature of ideal schooling. Adler's *Paedaeia Proposal* (1984) advocated a basic liberal arts education for all, with a focus on traditional content and the objectives of knowledge acquisition, thinking skill development, and esthetic appreciation. This view has been reinforced by Hirsch (1989). From an administrative perspective, Goodlad's

A Place Called School (1983) explored fundamental deficiencies in how schools are organized to carry out instructional tasks. Subsequent work further explicated our structural problems, especially at secondary levels (Sizer, 1984; Boyer, 1983). The instructional focus of Bloom's (1980) work on mastery learning provided a model for the systematic and progressive development of skills in various domains of knowledge. Yet newer work in curriculum and instructional processes would favor deeper, more conceptual understanding over mere mastery of skills (Resnick, 1984). Moreover, studies of gifted students support the need for differentiated strategies based on cognitive differences (Rogers, 1986).

Based on the proliferation of reports on problems and remedies, it is clear that education has and is experiencing significant pressure for reform and curricular change. In particular, there is a strong interest in focusing efforts on raising the level of performance for all learners and a belief that the successful approaches to the achievements of the gifted can also enhance the educational enterprise for those who are less able.

Although many local school efforts have not been responsive to the perceived needs of a modern technological society, curriculum for the gifted and talented provides a starting point to upgrade these efforts, particularly in areas that reports have cited as most deficient: mathematics, science, technology, and foreign language. Practitioners of theoretical ideas about curriculum for the gifted must be sensitive to the organizational structure of the schools, contemporary K-12 curriculum needs, and the recommendations for change being advocated by the major studies.

The Forces That Drive Curriculum

Based on the calls for reform at steady rates over the last decade, one would expect a commensurate interest in curriculum development projects. Yet very few large-scale curriculum projects have been funded since the splurge of the 1960s. However, curriculum development in math and science is now in the forefront of educational reform. Examples include the Amoco Foundation's \$50 million grant to the University of Chicago to change the shape of American mathematics education at the elementary and secondary levels; new National Science Foundation-funded projects in science and mathematics with a heavy focus on technological application; and American Association for the Advancement of Science science projects that capitalize on new science concepts. Within gifted education, two major curriculum development projects have been funded by the United States Department of Education under the Javits Gifted and Talented Act. These projects presage a renewed interest in serious curriculum work for gifted learners.

What has caused this resurgence of interest in curriculum? One of the social forces at work is our concern as a nation for meeting future workforce needs. Wirsup

(1986) reported on the dismal status of America's students in math and science when compared to their Russian, Japanese, and West German counterparts. Numerous reports over the last few years continue to document similar deficiencies in performance (Darling-Hammond, 1990; Stevenson & Stigler, 1992). At the national level there has been a pronounced shift in focus from issues like discipline and community involvement to hard questions about the content and sequence of curriculum. The egalitarian philosophy that dominated the last twenty years of educational policy altered curriculum standards, reduced requirements, and created an elective system that spawned low test scores and gaps in traditional knowledge. A concomitant focus on the education of the handicapped sparked an examination of our educational priorities. The billions of dollars allocated to tailoring educational programs to the special needs of handicapped children as a result of the passage of the Education of All Handicapped Americans Act (PL 94-142) raised consciousness about the cost of responding to individual needs of learners at appropriate levels. The current concerns about changing demographics, work force, competency issues, and negative international education comparisons further exacerbate the need for reform.

Juxtaposed with these social, political, and economic forces within educational systems is new research that affects thinking about the nature of curriculum change desired. New studies about intelligence (Gardner, 1983; Sternberg, 1985) and how children learn are available to shape the curriculum process.

While limited research has been conducted on curriculum for the gifted *per se*, current research in teaching and learning appears important to our conceptual framework for understanding appropriate curriculum for the gifted. For example, curriculum planners for the gifted have long advocated the optimal match between learner capacity and level of experiences provided; new evidence for this principle has emerged from studies of human development that found that when both personal skill level and challenge level are correspondingly high, adolescents experience a state of "flow" which allows for optimal learning (Csikszentmihalyi, 1987).

Current learning research is also deeply rooted in the basic disciplines of reading, writing, mathematics, and science. Much on-going research is attempting to explain how children master complex knowledge structures and procedures (Brown & Campione, 1986). In both reading and mathematics, current research has supported a meaning-based approach that provides appropriate drill and practice in key activities (Anderson, Herbert, Scott, & Wilkinson, 1985; Resnick, 1984).

Studies of thinking also contribute to understanding curriculum directions for the gifted. Expert-novice comparisons in various fields (Berliner, 1985; Sommers, 1980) have yielded differences favoring experts in metacognitive acts like planning and revising. A collection of research on expertise has revealed that the successful utilization of these skills may be

content-specific. Rabinowitz and Glaser (1985) found that expert performance entailed a large knowledge base of domain-specific patterns, rapid recognition of situations in which these patterns apply, and the use of forward reasoning based on pattern manipulation to reach solutions.

Further support for such domain-specific research comes out of studies which use general content-independent cognitive strategies and which find no clear benefits outside the specific domains in which they are taught (Pressley, Snyder, & Carigha-Bull, 1987). Thus, research on transfer suggests that "thinking at its most effective [level] depends on specific context-bound skills and units of knowledge that have little application to other domains" (Perkins & Saloman, 1989, p. 119).

Curriculum is also being affected by larger social and political contexts. Computer technology has found its way into the curriculum as a "basic" subject rather than as a peripheral. Global interdependence has become a major organizational theme of special programs in all content areas, not just social studies. On the other side of the ledger, "moral majority" advocates have brought about the dissolution of values education, and other educational foci that encouraged free and open inquiry by students.

Goodlad (1979) posited that curriculum decision-making is done at two levels, each in isolation from the other. School boards effect curriculum policy, and teachers implement classroom curriculum. Little curriculum leadership is provided at a middle level by building principals or central office staff. Consequently, curriculum implementation as a standardized process does not occur in most public school settings. Even skeptical parents are not likely to challenge teachers in an area heavily loaded with issues of expertise and academic freedom.

But curriculum is still mostly driven by the inertia of the status quo, a system of skill-based areas of inquiry that proceeds on a continuum from first grade to twelfth grade, buttressed by basal texts and little examination of the "why" of a curriculum offering at a particular point in the sequence. For example, algebra was not in the school curriculum sixty years ago, and now the debate rages as to its appropriateness at the ninth-grade level where it was initiated and has tended to stay. Reading continues to follow a similar illogical path of development based on a curriculum model that ignores individual readiness issues.

Since curriculum is at a point of potential change, the opportunity for educators of the gifted to take a strong role in defining what it should be for the most able, the process by which it is formulated, and the diversity of products or outcomes to be anticipated is at hand. It is through appropriate curriculum design and delivery for the top 5% of the population that the whole of curriculum can be upgraded and enhanced. The curricular work for the gifted can spearhead higher standards and more rigorous methodologies in addressing the needs of the rest of the student body.

A Curriculum Philosophy for the Gifted

Eisner and Vallance (1974) presented five conceptions of curriculum that have shaped the thinking of gifted educators. The roots of each of these conceptions can also be found in extant curriculum for the gifted, and represent strong philosophical orientations for what a view of curriculum for the gifted might be. A sixth orientation related to career preparation is also considered.

(1) *Curriculum as the development of cognitive process.* This orientation in the education of the gifted has focused on process skill development and has led to the adoption of curriculum materials organized around higher level thinking skills. Having its roots in faculty psychology, it has fostered a content-independent model of curriculum that uses cognitive skills as the centerpiece of all learning activities. Implicit in this view is the assumption that learning cognitive skills will translate across, apply to, and enhance any field of inquiry a student may encounter. Many pull-out programs for the gifted, which reflect this orientation, have emphasized critical thinking, creative thinking, and problem solving as the substance of their curricula, treating these process skills as content dimensions in their own right. Recent research would support this orientation if there are also ample opportunities for applying cognitive skills directly to content (Perkins & Saloman, 1989).

(2) *Curriculum as technology.* This approach to curriculum is also process-oriented, but focuses on the organization of curriculum into student inputs and outputs. This view of curriculum relies heavily on stated behavioral or performance objectives with measurable outcomes that can be tested in order to determine educational progress or achievement. Learner outcomes developed in individual states and by three national groups attest to the current centrality of this curriculum orientation. It assumes that curriculum standards must be explicit, taught to, and tested for. This view of curriculum sees curricular effectiveness and efficiency as realizable if a learning system is adopted by schools rather than piecemeal changes (Spady & Marshall, 1991).

(3) *Curriculum as personal relevance.* This orientation promotes a child-centered model that values curriculum experiences which are tailored to individual student needs. The interest of students in specific areas guides the curriculum. The goal of such a curriculum is to be personally engaging and to offer consummatory experiences that will provide growth at each student's level of understanding. Several curriculum models in gifted education employ this orientation. Renzulli (1977), Feldhusen and Kolloff (1978), Betts (1991), and Treffinger (1986) favor this orientation because of its emphasis on self-directed learning. Gifted students become responsible for their own curriculum through contracts with a facilitator who assesses interest and ability. The interaction of student and facilitator in mutually agreed upon work form the central core of curriculum experiences.

(4) *Curriculum as a social reconstruction.* This view of curriculum holds that the purpose of educational institutions is to be agents for social change and that the content of curriculum should be viewed within the larger social and cultural realm. Topics to be studied are chosen to promote community action programs needed in a student's immediate environment and to promote individual and collective social responsibility. Engaging students in social action such as drafting a piece of legislation, taking a poll of neighborhood opinions regarding nuclear energy, or organizing a school anti-pollution campaign typify the curricular experience as part of social reform. Work in the education of the gifted that best exemplifies this orientation is the curriculum for global futures and the theme of global interdependence developed at sites like the Center for Global Futures in Muncie, Indiana. Whole school districts also organize curriculum this way to serve the high-school gifted student, such as at Glenbrook Academy in Northbrook, Illinois, and Morgan Park High School in Chicago. Multicultural trends in curriculum also have their philosophical roots in this orientation (Hernandez, 1989).

(5) *Curriculum as academic rationalism.* This curriculum orientation has its roots in the Western tradition of rational humanism. Specifically, it adheres to an ideal of education as a way of providing students with an understanding of great ideas and an ability to analyze and synthesize past achievements. It recognizes a core of work as central to our evolution as a culture (Hirsch, 1989). It further espouses a belief in the structure of knowledge as embodied in the organization of academic and artistic fields of inquiry, and seeks to instruct students within those content disciplines. Most of the "durable" curriculum that is used in gifted programs flows from this general orientation. The special National Science Foundation curriculum projects in mathematics, science, English, and social studies (MACOS) which were developed in the 1960s were all rooted in this orientation. Packaged curricula like *Junior Great Books* and *Philosophy for Children* also adhere to this view.

(6) *Curriculum as a precursor to career/professional life.* This view of curriculum has its roots in both the professional school and vocational school models that have influenced curriculum offerings over the last 20 years. A strong focus on the practical and the utilitarian has been a preoccupation at secondary and post secondary levels. In the field of the gifted, this orientation may best be seen through the career education models (see Hoyt & Hebel, 1974) that have appeared to help students view curriculum as a preparation for their future. The work experience programs for the gifted, loosely termed mentorships and internships, also have a utilitarian "real-world" focus. In these programs, students relate to the practicing professional in his or her domain and come to understand and appreciate their own potential as future practitioners of a particular craft. New conceptions of curriculum include a strong emphasis on developing the skills, attitudes, and traits of professionals (VanTassel-Baska, 1992).

Although educators are free to choose among these curriculum philosophies, the most effective curricula incorporate all of them to some extent. Whereas the academic rationalist's view most closely accommodates the current curricular organization of schools and has guided most long-term curriculum efforts, it currently is being seriously challenged by the social reconstruction orientation. This view holds that curricular decisions reflect social and economic biases. Thus any attempt to differentiate curriculum for the gifted may be seen, according to this orientation, as an elitism fostered by the educational forces that would oppress the poor and the minority members of our school community (Oakes, Gamoran, & Page, 1991). This viewpoint has led many school personnel to flee from issues of curriculum differentiation for the gifted to a more moderate position of higher curriculum standards for all learners that include the best features of curriculum for the gifted.

The other major challenge to the traditional view has come from those favoring individual student-centered approaches (e.g., Renzulli, 1977; Treffinger, 1986). In all fairness, this viewpoint has dominated gifted child education worldwide, especially at the elementary level. Thus while a confluency of these orientations may be most desirable, clearly none exists at the present time.

Research on Curriculum for the Gifted

Although the field of gifted education is not prolific with intervention studies, the body of literature on acceleration in curriculum areas places it in the category of an effective approach for many gifted learners. Perhaps more has been written about the efficacy of accelerative practices with the gifted than about any other single educational intervention with any population. Reviews of the literature on acceleration have appeared with some regularity over the last 25 years (Benbow, 1991; Daurio, 1979; Gallagher, 1969; Kulik & Kulik, 1984; Reynolds, Birch, & Tuseth, 1962; VanTassel-Baska, 1986). Each review has carefully noted the overall positive impact of acceleration on gifted individuals at various stages in the life span. Successful programs of acceleration, most notably offshoots of the basic talent search model developed by Stanley and others in the 1970s, have demonstrated significant positive impact on the learning of students (Benbow & Stanley, 1983; Kulik & Kulik, 1992; Swiatek & Benbow, 1991a, 1991b). Moreover, a broad-based research agenda has emerged in the field of gifted education, dedicated to understanding the long-term effects of educational acceleration of the gifted (Brody, Assouline, & Stanley, 1990; Brody & Benbow, 1987; Brody & Stanley, 1991; Robinson & Janos, 1986; Swiatek & Benbow, 1991a,b). These recent studies continue to show positive results in cognitive development from acceleration and no negative effects on social emotional development.

Much descriptive literature has been written about enrichment experiences that broaden a student's view

of the world of knowledge (Gallagher, 1985; Kaplan, 1979; Renzulli, 1977; Feldhusen & Kolloff, 1978). In a review of research on enrichment, Treffinger et al. (1991) found mixed results for programs that described themselves with that term. Counseling has also been mentioned as important to the emotional and social growth of the gifted learner as well as an important underpinning to any devised academic program (Gowan, Demos, & Khatena, 1965; Colangelo & Zaffran, 1979; Piechowski, 1984). Although acceleration, enrichment, and counseling represent the major interventions used with the gifted over the last eighty years, it remains to be determined which approaches are most effective under what circumstances with which gifted learners.

Beyond these basic approaches, research into appropriate curriculum for the gifted child is rather meager. Until the Sputnik era of the late 1950s, which resulted in programs that addressed specific content areas, few ideas about differentiated curriculum for the gifted were systematically studied. Even though special classes had been in operation since at least 1919 in selected locations, usually large cities, the actual differences in instructional strategies, content, or materials were not examined. Grouping based on intelligence and achievement was the predominant strategy employed, although individual grade acceleration was practiced to some extent, and curriculum outlines and sometimes units were prepared for use with the identified gifted students (Hollingworth, 1926; Hall, 1956).

Over the past twenty years, however, educators in the field of the gifted have formulated some general principles about appropriate curriculum for gifted children. Ward (1961, 1981) developed a theory of differential education for the gifted that established specific principles about appropriate curriculum. Meeker (1969) used the Guilford Structure of Intellect (SOI) to arrive at student profiles that highlighted areas of strength and weakness so that curriculum planners could build a gifted program to improve weak areas. Curriculum workbooks were structured to address this need in the areas of memory, cognition, convergent thinking, divergent thinking, and evaluation. Renzulli (1977) focused on a model that moved the gifted child from enrichment exposure activities through training in thinking and research skills into a project-oriented program that dwelt on real problems to be solved. Gallagher (1985) stressed content modification in the core subject areas of language arts, social studies, mathematics, and science. Stanley, Keating, and Fox (1974) concentrated on a content acceleration approach to differentiate programs for the gifted. Feldhusen and Kolloff (1978), Kaplan (1979), and Maker (1982) have stressed a confluent approach to differentiation of curriculum for the gifted that includes both acceleration and enrichment strategies. Passow (1982) formulated several cardinal curriculum principles that reflect content, process, product, behavioral, and evaluative considerations. VanTassel-Baska (1988, 1992) synthesized existing approaches to gifted education curriculum and

translated them into each content area using a traditional curriculum design approach.

More current work in curriculum for the gifted has focused on a merger with the curriculum reform principles advocating world class standards in all traditional curricular areas (VanTassel-Baska, 1992). The major shift in thinking regarding this orientation is from one that looks only at the optimal match between characteristics of the learner and the curriculum to a model based on professional competence in various domains, thereby letting the curriculum standard determine who may become proficient in an area rather than a predetermined test. Thus differentiation for any population is grounded in differential standards of performance at a given period of time. Standards are constant; time is the variable. Such a model holds promise for gifted students in that the level and pace of curriculum can be adapted to their needs, and the stated standards imply the kind of focus that curriculum makers for gifted students have long advocated—higher level thinking, interdisciplinary approaches, and emphasis on student-centered learning.

The other current approach to curriculum for the gifted has been instituted as a result of newer conceptions of giftedness, notably Gardner's multiple intelligences (1983). This approach assumes that the majority of children have some talent area or intelligence which can be developed through focused curriculum attention. Similar in practice to the Talented Unlimited model developed in the 1970s by Calvin Taylor, the talent development model also eschews identification of children as gifted but rather favors the use of diagnostic information to determine strengths that can be used to develop an appropriate curriculum. Highly individualized, this approach has been implemented successfully in several school-based settings (Bolanos, 1991).

Some combination of both of these approaches is probably most productive. Gifted students need high but realizable expectations for learning at each stage of development. Other students can benefit also from working to attain such standards. By the same token, gifted students can also benefit from a more developmental perspective on fostering their abilities at a close-up level. Lingering questions over both approaches will remain until there is research evidence that supports gifted student growth in a context that has done away with formal identification.

Theoretical Curriculum Models for the Gifted

Although research on curriculum for the gifted provides limited evidence regarding effectiveness, three relatively distinct theoretical curriculum models have proven successful with gifted populations at various stages of development and in various domain-specific areas. They are: (1) the content mastery model; (2) the process/product research model and (3) the epistemological concept model.

The Content Model

The content model emphasizes the importance of learning skills and concepts within a predetermined domain of inquiry. Gifted students are encouraged to move as rapidly as possible through the content area; thus content acceleration dominates the application of this model in practice. When a diagnostic-prescriptive instructional approach (D-P) is utilized, students are pretested and then given appropriate materials to master the subject area segments prescribed.

The D-P instructional approach has proved effective in controlled settings, but has not been widely practiced in regular classrooms for the gifted. Several reasons account for this. Like any individualized model, it requires a highly competent classroom manager to implement it. When used appropriately, each student may be working on a different problem, chapter, or book at the same time. Regardless of the rhetoric surrounding individualization, very little is actively practiced in basic curriculum areas. A second reason is that most pull-out programs do not focus on core content areas and therefore negate the possible employment of the model. Third, the approach has not been particularly valued by many educators of the gifted because of its insistence on utilizing the same curriculum and merely altering the rate. The lecture-discussion approach to the content model is more widely practiced at the secondary level, but its effectiveness is highly dependent on teachers being well-versed in the structure as well as in the content of their discipline. Too frequently the content model disintegrates into learning the exact same skills and concepts as all learners are expected to do in the school context, only tediously doing more exercises and drills in a shorter period of time.

In the D-P approach, teachers and teaching assistants act as facilitators of instruction rather than as didactic lecturers, although many content-based programs for the gifted place a strong emphasis on lecture and discussion. The curriculum is organized by the intellectual content of the discipline and is highly sequential and cumulative in nature, making a proficiency-based model for measuring achievement very feasible.

The D-P approach to the content model has been utilized effectively by talent search programs across the world, particularly in mathematics (Keating, 1976; Benbow & Stanley, 1983). VanTassel-Baska (1982) has shown the effectiveness of the model in teaching Latin, and foreign language teachers have used the model for years to ensure English syntactic mastery in their students. Clearly, it represents the most individualized instructional approach to basic curriculum for the gifted, and it embodies a continuous progress philosophy that schools readily understand.

The more typical approach to content-based instruction, however, is one that presets an early mastery level for students, frequently requiring more advanced skills and concepts to be mastered one year earlier than normal. The content model uses existing school curriculum and textbooks, so it is not costly to implement.

Although it responds to the rate needs of groups of students, allowing the able to advance a little more quickly through the traditional curriculum, it may still leave the highly gifted unchallenged.

In fairness to the content-based model, teachers who use it successfully have made important alterations in the organization of the subject matter being taught. For example, in the fast-paced Latin program, the concepts that are spread out incrementally over the first three chapters of the book are synthesized into a matrix study sheet, presenting students with all five Latin cases, three genders, and two numbers in their various combinations all at once. Homework is assigned only from the third unit, where all the interactions of gender, number, and case may be practiced. Thus 30 hours of instructional time may be reduced to four or five at the most, and gifted students can master the important concepts governing Latin syntax in an economical fashion.

What appears as a simple process of moving more quickly through the same basic material becomes more sophisticated in actual practice. The effective teacher reorganizes the content area under study according to high level skills and concepts. The focus of student prescriptive work is in larger increments that carry with it a holistic picture of the topic under study.

The content mastery model for curriculum and instruction also has the capacity to cover the regular skill-based curriculum in reading and mathematics in approximately one-third the time currently expended. This condensation process occurs as a result of two curriculum modifications. Students move through skill areas at a rate commensurate with their capacity. By testing for proficiency, by assigning work based on documented increased levels of development, and by reorganizing basic skill areas into high level skill clusters, mastery learning time is conserved, and more efficient and challenging learning experiences are promoted.

The Process/Product Model

The process/product model places heavy emphasis on learning investigatory skills, both scientific and social, that allow students to develop a high-quality product. It is a highly collaborative model that involves teacher-practitioner-student as an interactive team in exploring specific topics. Consultation and independent work dominate the instructional pattern, culminating in student understanding of the scientific process as it is reflected in selective exploration of key topics.

Reported in the literature under the rubric of the Enrichment Triad and the Purdue model (Renzulli, 1977; Feldhusen & Kolloff, 1978), this approach to curriculum for the gifted has also enjoyed success. At the secondary level, special science programs for the gifted have used the model (VanTassel-Baska & Kulieke, 1987; VanTassel-Baska, Gallagher, Sher, & Bailey, 1992), and institutions like Walnut Hills High School in Cincinnati, Bronx High School of Science

in New York, and the North Carolina School of Math and Science have practiced the model as a part of their high-powered science programs for years.

One manifestation of the model engages the student in problem finding and problem solving and puts the student in contact with adult practitioners. In the field of science, for example, scientists from national science laboratories work with academically talented junior-high students during the summer to help them develop research proposals for project work during the following academic year. Students are actively involved in generating a research topic, conducting a literature search, selecting an experimental design, and describing their plan of work in a proposal. The proposal is then critiqued not only by the instructor but also the scientist. In this way, then, students focus on process skill development in scientific inquiry and strive to develop a high-quality product. Another manifestation of the model emphasizes problem-based learning, an approach that allows the student to generate learning tasks based on a paradigm of the known, the need to know, and the process by which needed knowledge can be acquired (Barrows, 1985).

The process/product model for gifted curriculum differs from the content-based model in that content is incidental. Student interest is the mainspring for what "content" will be studied. The nature of the evaluation effort is product-based rather than proficiency-oriented, and the focus is on studying selected topics in-depth rather than moving through a given domain of inquiry in a fast-paced manner.

This curriculum and instructional model most closely parallels the recommendations of national curriculum groups in both science and mathematics who tend to favor a student-directed, hands-on, inquiry-based process of problem solving, where students are engaged in the act of constructing knowledge for themselves.

The Epistemological Model

The epistemological concept model focuses on talented students' understanding and appreciating systems of knowledge rather than the individual elements of those systems. It reflects a concern for exposing students to key ideas, themes, and principles within and across domains of knowledge so that schemata are internalized, synthesized, and amplified by further examples. The role of the teacher in this model is as questioner, raising interpretive issues for discussion and debate. Students focus their energies on reading, reflecting, and writing. Esthetic appreciation of powerful ideas in various representational forms is viewed as an important outcome of this model.

This model has been used with gifted learners for several reasons. First, the intellectually gifted child has unusually keen powers to see and understand inter-relationships. The whole structure of conceptual curriculum is based on constantly interrelating form

and content. Conceptual curriculum is an enrichment tool in the highest sense, for it provides the gifted with an intellectual framework not available in studying only one content area, but exposes them to many ideas not provided for in traditional curricula. Furthermore, it provides a basis for students' understanding the creative as well as the intellectual process through critically analyzing creative products and being actively engaged in the creative process itself. It also provides a context for integrating cognitive and affective objectives into the curriculum. A discussion of ideas evokes feelings; a response to the arts involves esthetic appreciation; and the study of literary archetypes creates a structure for self-identity.

Many writers in the field of gifted education have lauded the epistemological approach to curriculum (Ward, 1961, 1981; Hayes-Jacobs, 1981; Maker, 1982; Tannenbaum, 1983). Some extant curriculum has been organized around the model at both elementary and secondary levels. The College Board Advanced Placement Program relies heavily on this curriculum approach in its history (both American and European) and literature and composition programs. The *Junior Great Books* program, *Philosophy for Children*, and *Man: A Course of Study (MACOS)* are elementary programs that promote the approach. Each of these programs stresses the use of Socratic questions to stimulate an intellectual discussion among students on an issue or theme. Creating analogies across a field of inquiry is encouraged, and interdisciplinary thinking is highly valued. Recent curriculum development efforts for the gifted have also attempted to utilize the epistemological framework (VanTassel-Baska & Feldhusen, 1981; Gallagher et al., 1984), and larger curriculum projects in the past, such as CEMREL's mathematics program at the secondary level and the Unified Mathematics program at the middle school level, have utilized a holistic approach to the organization of content.

The concept-based model for curriculum and instruction differs considerably from the nature of the previous two models described (see Table 1 for an overview of key characteristics of each model).

The concept-based model is organized by ideas and themes, not subject matter or process skills. It is highly interactive in its instructional context, which contrasts with the more independent modes of instruction used in the other two models. Concern for the nature and structure of knowledge itself is a major underlying tenet. The evaluation of students engaged in this model typically requires evidence of high-level esthetic perceptions and insight rather than content proficiency. The nature of culminating products tend to be well-crafted essays that show evidence of synthesizing form and meaning across areas of study. Artistic products also demonstrate this synthesis of form and meaning (Eisner, 1990).

Effective curriculum and instruction for the gifted has reached a stage of evolution where existing theoretical and research-based models need to be systematically translated into practice at the local level. Competition

TABLE 1
 Contrasting Curriculum/Instructional Models for the Gifted

A. Content	B. Process/Product	C. Concept
<ul style="list-style-type: none"> ● Fast-paced ● Proficiency-based ● D---P approach ● Organized by intellectual content ● Teacher as facilitator 	<ul style="list-style-type: none"> ● In-depth on selected topics ● Product-based ● Resource-orientated ● Organized around scientific of other process model ● Collaborative 	<ul style="list-style-type: none"> ● Epistemological ● Aesthetics-based ● Discussion approach ● Organized by themes and ideas ● Socratic method

among these models has dissipated the effect of building a strong differentiated program for the gifted that addresses all of their intellectual needs within the core curriculum as well as at all levels outside it. The synthesis of the content, process/product, and concept models has provided a clear direction for new curriculum work.

This synthesis approach has been the dominant one employed in two recent national curriculum projects. These projects have attempted to look specifically at the content areas of science and language arts in order to integrate the three curriculum models in providing appropriately for the gifted. A brief review of the curriculum foundations of each project follows.

Mathematics and Science

Mathematics and science education are currently experiencing several major and interrelated problems in the United States. Current national reports recommend a major shift in the organization of science curriculum from a content emphasis to a focus on key concepts and scientific principles taught through hands-on, real-world problem-solving approaches (AAAS, 1989, 1990; Bennett, 1986; Hilton et al., 1989; National Science Board Commission, 1983; NAEP, 1988). Major curriculum reform efforts emanating from several disciplines have highlighted the need for curriculum change that moves away from the teaching of discrete facts toward the organization of significant content by concepts, away from content coverage toward selective examples to support principles, and away from passive learning towards hands-on inquiry-based learning experiences (Association for Supervision and Curriculum Development, 1990).

Current curriculum and instructional problems combined with the need to develop a literate scientific citizenry create a special kind of dilemma for science education. On the one hand, school organizational structure at all grade levels is too inflexible to accommodate serious science study. Laboratory time and hands-on classroom experiments require longer time periods than are typically allocated (National Assessment of Education Progress, 1988). Moreover, science instructional time is significantly less than amounts allocated to reading and math. Combined with the instructional time issue is the lack of training of teachers to do

science with children in an appropriate way (American Association for the Advancement of Science, 1989; Bennett, 1986; National Science Board Commission, 1983). Most elementary and middle school teachers rely heavily on textbook worksheets and canned experiments for conveying what science is. Because science is poorly and infrequently taught at the elementary level, it has failed to sustain the involvement of all but the most science-prone students, those who may also have extra curricular resources to spark their continued interest in science. The most tragic loss of continued involvement in science is among girls and minorities as well as other high ability learners lacking opportunity (Hilton et al., 1989).

An interrelated part of the problem is the failure to treat science as active inquiry and students as real investigators in the process of making meaning of their world. In order for science to be viewed as real inquiry, it must be taught in a way that demonstrates a strong emphasis on science concepts, on investigation of real problems, and on the integration of science with other disciplines.

The needs of science education may be perceived as complex, requiring solutions on several fronts simultaneously. These areas may be delineated as:

- (a) the development of model curricula that reflect the elements of the new science and standards appropriate to high ability learners;
- (b) changes in the selection of curriculum materials and how they are used;
- (c) instructional strategies that complement the new science and demonstrate effectiveness with a variety of learners;
- (d) teacher attitudes and behaviors that accept the importance of curriculum and instructional change and are capable of executing it; and
- (e) systemic change models that allow these dynamics to work together.

These general concerns about the state of science curriculum in schools are felt keenly by educators of high ability learners. The data clearly indicate that our top students are not ready to compete at world class levels (ASCD, 1990; Stevenson & Stigler, 1992). It is critical that high ability students have a functional knowledge of science, even if they do not enter careers directly related to scientific research or teaching. In a complex society, with the increasing involvement of science in matters of

health, the economy, and national security, the general population needs to have a better understanding and appreciation of science, mathematics, and technology. Many high ability students do not experience an appropriately accelerated and enriched science curriculum during their elementary and middle school experiences; often science is not even taught systematically at the elementary level. Yet high ability learners, including the intellectually gifted and the science prone, exhibit an unusual readiness to engage in inquiry and exhibit intense curiosity about the world around them, eager to participate in more concept-based work in science. It is also at elementary and middle grade levels that independent investigations involving science can most easily be initiated and scientific processes explored in an interdisciplinary framework. However, in the majority of school districts in America, the textbook approach is the major delivery system for science curriculum, used primarily as a passive learning tool where children read and answer factual questions (Lockwood, 1992). Consequently, many gifted learners face boredom and demotivation in this critical field of inquiry.

Gifted learners in science then need a curriculum that is sufficiently advanced and challenging, offering a sequence of tasks that extend their knowledge base. They also need a curriculum that provides opportunities for original investigations in science, using real world problems as a point of departure. Lastly, they need to study important scientific concepts that allow for making connections within science areas and across to other areas of study.

By overlaying the concerns of general science education with the special learning needs of gifted learners, common issues emerge: how to infuse the curriculum with appropriate content and methodology; how to impact positively upon science and technology literacy, especially among high ability students; and how to motivate students to see the joy of engaging in science inquiry. This complementation of science education and gifted education leads to the consideration of six key components necessary to curriculum development work that seeks to wed principles of the new science to curriculum principles for gifted learners.

(1) *Developing an understanding of scientific concepts.* In a world of fragmented information and knowledge explosion, there is a need to organize subject matter more effectively. One of the most powerful ideas that emerged from a study of 120 scholars conducted by Shane (1981) was a recognition among leading scientists that students need to understand key concepts in science more than specific facts and that scientists could agree on what these concepts were. Judson (1980) also used key science concepts to develop his powerful curriculum *Search for Solutions*, and concluded his text material with a set of unanswered scientific questions. Focusing on scientific concepts is also a cornerstone of new work in science curriculum, most notably *Science for All Americans* (Rutherford & Ahlgren, 1979).

(2) *Developing scientific inquiry skills in collaborative settings.* Just as one considers a shift in the organization of science curriculum toward key concepts, so too there needs to be a shift toward the student as investigator. Sternberg (1982) has outlined this major focus for gifted learners as the importance of engaging in problem finding, problem solving, problem evaluation, and scientific reporting.

An appropriate science curriculum should reflect an emphasis on more independent laboratory work, more extensive reading, more authentic library skills, and more true experimental work (Brandwein & Passow, 1988). Cothron, Giese, and Rezba (1989) suggest the use of a four-question strategy to help students internalize experimental design procedures, asking what materials are available for conducting experiments on a particular phenomenon, how a phenomenon acts, how one changes the set of materials to affect an action, and how one measures or describes the response to the change.

Closely related to an understanding of doing real world science is the ability to work collaboratively in a research team. Given the nature of the knowledge explosion, no one is capable of grasping all content knowledge for purposes of generating new knowledge. Consequently, an important model of science for the high ability learner to understand is that of collaboration. In the world of scientific research, many breakthroughs are made by scientific teams made up of individuals with specialized backgrounds, but with a scheme for working together on current scientific problems that requires combinational knowledge from several areas. Work in biochemistry is a good example of this, for biologists and chemists routinely address key research questions together. Even the recent practice of awarding the prestigious Nobel Prizes in the sciences is toward a joint award to a team that has made a major contribution. Mentorships and internships both offer structured program options for gifted students to appreciate the nature of collaborative work in the sciences.

(3) *Developing a knowledge base in science areas.* Another key component to an appropriate science curriculum for high ability learners is the opportunity to learn significant content in science areas. Emphasis on equal exposure of students to content in the biological, physical, and geological sciences is also necessary to ensure that intradisciplinary understandings are developed. In an analysis of the effects of curriculum materials, it was found that students generally learned the specific content areas of science (biology, chemistry, etc.) to which they were exposed. However, in the case of selected National Science Foundation curriculum materials, which are strongly content-oriented and include BSCS Biology, Chemistry study, IPS Science, and PSSC Physics, students improved more in the areas of process skills, analytical skills, and creativity when compared to students using other curricula (Welch et al., 1981). It appears that the science curriculum that has a significant content base organized conceptually

can enhance the development of skills critical for doing science. Where high ability students are exposed to a heavy content emphasis, as is still the case with some basal text materials, it is critical that opportunities for testing out of content already mastered are provided along with opportunities for advanced work in science topics. Rutherford and Ahlgren (1989) integrate scientific knowledge requirements into a set of scientific views of the world. These include:

- (a) the structure and evolution of the universe;
- (b) the general features of the planet earth;
- (c) the basic concepts related to matter, energy, force, and motion;
- (d) the human organism as a biological, social, and technological species;
- (e) the human life cycle through all stages of development and maturation; and
- (f) the basic structure and functioning of the human body.

The emphasis on learning an appropriate knowledge base in the sciences is then shaped by these views that guide the teaching of more discrete content.

(4) *Developing interdisciplinary connections.* In the last half of this century, the world has begun to recognize the awesome connection between scientific discovery, technological development, and direct impact on society (Kuhn, 1970; Bronowski, 1973). Perhaps the development of the atom bomb was the first time this connection was truly etched on people's collective consciousness. Since that time, however, the connections have been repeated over and over again. Consequently, to teach science as a totally objective set of processes is to misrepresent the role of science in today's world. High ability students need to be exposed to the social issues surrounding the scientific enterprise and to develop a philosophy of science and a code of ethics that includes concerns for the moral and ethical dimensions of doing science.

Infusion of technological advances into the curriculum should be a two-pronged approach: making use of technological tools that aid learning (e.g., computer simulations, video-discs, CD-ROMS) and inclusion in the curriculum content of the technological advances that affect society (e.g., telephone, laser, or medical technology). In each case, it is important for students to see the application of these advances and not just know of their existence.

Making the connection between science concepts and other areas of inquiry such as the social sciences, mathematics, and language is also crucial to meaningful science learning. As students study the concept of scientific systems, for example, it is helpful to link that study to systems of government, systems of economics, and various communication systems. This forging of deliberate connections to other disciplines of study provides a richer and more complex curriculum for high ability learners.

(5) *Developing investigations of real problems.* Integral to considerations in developing an appropriate

science curriculum framework is the role of the learner and her sense of connectedness to the enterprise of doing science as scientists themselves do. Traditional curriculum structure has a well-established order of instruction: information comes first, followed by questioning to determine student understanding, and ending with some sort of problem-solving activity. While this approach is very systematic and easy for teachers to manage, it does not reflect the kind of learning which takes place in the "real world", and especially in the science professions. The goal of problem-based learning, one technique to engage learners in real problem-solving, is to make learning in school more closely parallel the life-long learning which occurs in adulthood (Barrows, 1985).

With laboratory experiences carefully structured within the investigation of the problem, problem-based curriculum becomes an encapsulation of the entire process of scientific thought, investigation and impact. Moreover, problem-based curriculum has the advantage of easily incorporating study and discussion of the inter-relationship between science and social structures such as government and economics.

(6) *Developing scientific habits of mind.* Welch (1984) has noted the importance of understanding the activities, beliefs, and personal traits of scientists in order to make appropriate inferences about an appropriate science curriculum. Most scientists share a common set of fundamental beliefs about the natural world. These include such ideas as the existence of universal physical laws, the Copernican theory, and the belief of living things evolved over a long time period from simple to more complex forms. Such shared beliefs, unlike religious beliefs, are subject to question and can radically change if experiment or observation of the world indicates that they do not accurately reflect the true nature of things. Thus science is uniquely dependent on experiment and inquiry. It is therefore important to convey both the fundamental ideas of science and the methods by which they are tested and refined to learners.

Welch (1984) also notes that certain personality traits seem to characterize the more successful scientists, and this research provides us with important guidance on the appropriate way to structure a science program for high ability learners. The particularly important characteristics that scientists exhibit have been identified by Brandwein (1955) and Klemm (1977) to be curiosity, creativeness, and commitment.

Language Arts

Recent national reports in the language arts also have called for a reconsideration of language arts curricula that is sensitive to using high powered material and inquiry-based approaches (Marzano, 1992). As with mathematics and science, such reports also stress the importance of using such approaches throughout elementary and junior high school. Close and active reading of various genre is also encouraged even at

the expense of broad coverage (National Assessment Governing Board, 1992). Constructivist theory in the language arts has focused on the complex tasks of student as meaning maker (Spivey, 1990). Other theorists view the province of teaching language arts as promoting the classical canon and teaching traditional forms of writing (Flirsch, 1989; Thompson, 1990). Accompanying modes of assessment are also being advocated to reflect this intensive involvement with literary works, focusing more on the processes of reading, the thought patterns of students engaged in it, and the power of thought brought to bear in connecting one work to another (National Assessment Governing Board, 1992). There exists, however, a significant gap between theory and practice. Researchers in literary development generally have deplored the lack of curriculum research in testing what works in schools (Langer & Allington, 1992). One of the challenges, then, is to find ways to incorporate what is known about literacy development and the schooling process and put it into "testable" practice.

Glatthorn (1992) emphasizes learning as an interactive process that brings together the learner, an activity or task, and the situation that surrounds them. Thus there is concern for ensuring a "holistic view" in a language arts curriculum. A literate environment provides rewarding experiences where meaning is constructed in real situations. Students work collaboratively and use the teacher as a model. Learners engage in risk-taking and revising their work as a regular part of their school experience. An integrated curriculum uses communication skills as inter-related processes which support each other and as enabling skills across all subject areas. In the integrated language arts, learners employ three cueing systems: semantic (meaning), syntactic (word order or grammar), and graphophonics (sound/symbol). Outcome-based curriculum goals focus on whole-thinking processes (rather than sub-skills) that are at a sufficiently challenging conceptual level. A "thinking" curriculum requires awareness of one's own thinking, and the awareness includes attitudes, habits, and dispositions, as well as the critical and creative thinking processes about ideas. Such a language arts curriculum encourages student responsibility for learning as well as supports student choice, collaboration, and active participation. Finally, a key curriculum feature relates to an aligned curriculum where what is written is also taught and tested so that instruction and assessment become interrelated areas.

Tschudi (1991) reviewed the materials on K-12 language arts curriculum and suggested several key ideas for successful language arts programs. These ideas focused on the need to integrate the language arts with all content areas, the need to recognize and honor cultural differences in children through involving parents and community in the schools, an emphasis on open-ended activities that are judged through authentic assessment procedures, and the integrated teaching of all the language arts together.

Research on the effectiveness of the whole language

approach compared to the traditional, skill based approach to language learning suggests that they are approximately equal in their effects with several exceptions (McKenna, Robinson, & Miller, 1990). Whole language approaches seem to be more effective in kindergarten than first grade, may produce stronger scores on word recognition than reading comprehension, and produce weaker effects with populations labeled specifically as disadvantaged than with those not so labeled. More recent studies, however, show a trend toward stronger effects for basal reading programs relative to whole language programs (Stahl & Miller, 1989). Reading literacy, however, has been depicted as a multi-purpose, multi-level set of experiences (NAEP, 1992).

While arguments for a high quality liberal program of study in the language arts have been consistent over the past ten years (Adler, 1984), the current state of language arts curriculum may be characterized as fragmented by both philosophical orientation and areas of emphasis. The whole language movement has attempted to integrate language arts areas, to provide opportunities for interdisciplinary work, and to encourage "meaning-making" on the part of the learner. The cultural literacy movement has attempted to stress the importance of students developing a rich knowledge base in established works of literature and developing expository writing skills. A third movement to emphasize multicultural literature and a global perspective is also a primary orientation within the field.

Major Emphases within Language Arts Curricula for High Ability Learners

Based on the current language arts issues, and an examination of the major areas of the language arts curriculum that might be emphasized, the National Curriculum Project in the Language Arts has chosen to emphasize the following areas in curriculum development:

Address the Intellectual Needs of High Ability Students Through Selecting Rich and Rigorous Reading Materials

High ability students, as all students, need to learn and master the content and the skills deemed by society as essential in order to be a good "participant" in the society. However, it is also true that basal reading materials are inadequate to guide high ability students in the development of their potential. Language arts programs for identified high ability students should provide rigorous opportunities for the development of their academic and intellectual potential in all major areas of the discipline. Thus enhancing reading and literature programs through choice of substantive texts is a crucial component of appropriate curriculum (Baskin & Harris, 1980; Polette & Hamlin, 1980; Polette, 1982; Halsted, 1988).

Foster Critical and Creative Thinking

While gifted students should have opportunities to understand the importance of performing the tasks and mastering the structures of traditional K-12 language arts curricula, they should also understand that mastery of a structure frees them to push beyond the boundaries and constraints of that form, to diverge into more creative patterns of thinking. Gifted students should not see mastery of standardized skills as an end, but as a means to more innovative thinking. Even the very youngest student should be given repeated opportunities to try out traditional and non-traditional modes of inquiry. The classroom must provide repeated opportunities for gifted students to engage in critical and creative thinking and inquiry that integrates the language arts.

Incorporate “Whole Language” Literature-Based Materials Which Emphasize the Critical Connection Between Reading and Writing

Most students can profit from language arts programs which expose them to whole, meaningful works of literature. Since gifted students typically learn to read early and develop “holistic” reading strategies, early use of whole language approaches seems particularly appropriate for them. Gifted students also can benefit from exposure to literature which demands their thoughtful interaction and which challenges their attitudes and beliefs. Recent research has demonstrated that the most fruitful type of interaction with texts occurs both receptively through reading and productively through writing. Students must be encouraged to see themselves as engaged in a continuing dialogue with exciting works of literature and great writers, and through thoughtful reading of and writing about those texts.

Enhance the Growth of Metacognitive Awareness and Control

Among the special talents that high ability students possess is the ability to think about their own thinking, or metacognitive awareness. Along with encouraging the students to interact thoughtfully with works of literature, language arts programs for high ability learners should enhance the ability to examine critically their cognitive activities. In addition, then, to solving the problems involved in deriving meaning from a text or producing meaning through a text, gifted students should be encouraged to reflect on the ways that they plan, assess, evaluate, and revise their cognitive activities through meaningful research activities. Data on good readers indicate a high degree of metacognitive control already over the basic skills of reading. Good readers possess positive habits and attitudes about reading; read with enough fluency so that they can focus on the meaning of what they read; use what they already know

to understand what they read; form an understanding of what they read and extend, elaborate, and critically judge its meaning; use a variety of effective strategies to aid their understanding and to plan, manage, check the progress of their reading; can read a wide variety of texts and can read for different purposes (NAEP, 1992).

Encourage Active Learning

Discourse is made; it is not just passively received. Too often students merely react passively to what they hear or read. High ability students should be aware that they are active meaning makers not only in the stories that they create out of their own experience but also in their reading of literature. They need to be encouraged to see themselves as active readers and shapers of language. They must be made aware of the processes that they use to speak, read, and write, and the role of their communities in those processes of producing discourse. We must make them aware of the various discourses that they use in several contexts.

Heighten Students’ Awareness and Appreciation of Cultural Diversity

It is critical that high ability learners become especially sensitive to differences among and between cultures. Cultural diversity is a valuable resource and exposure to such diversity can provide genuine opportunities for personal growth. While not all materials in a language arts program will necessarily or explicitly explore cultural diversity as a central theme, a special effort should be made to incorporate these materials. Given the importance of attitudinal factors in cognitive development, limited English proficiency students and students from minority groups within the dominant culture can be expected to benefit from the inclusion of materials which provide positive depictions of their cultural traditions. Moreover, students from the majority culture need a strong background in other cultures as well. Thus the inclusion and focus on multi-cultural materials is critical to a strong language arts program for high ability learners.

Use Collaborative Learning Techniques

Students are a valuable resource to each other and should be used through incorporating collaborative activities. Some of the most rewarding, unpredictable, and exciting learning occurs when peers collaborate on projects. Gifted students should be given opportunities to work on group projects where one student’s ideas supplement, challenge, redirect a classmate’s work. In particular, students should be given opportunities to

receive oral and written responses from their intellectual peers. They should come to regard themselves as members of a learning community, and they should come to consider their classmates as valuable sources of feedback and as co-learners. Use of discussion groups, workshopping techniques for the writing process, panels, and debates are all strategies that can enhance collaborative learning.

Explore Interdisciplinary Applications by Connecting Literature to Art, Music, Social Studies, and Other Relevant Areas of Study

High ability students need exposure to material that helps them overcome narrow disciplinary constraints and that allows them to explore ideas in a number of areas. They should be exposed to the similarities as well as the differences among artistic media. They should explore the literacies of the written, visual, and performing arts and engage in the excitement of discovering the ways that one artistic medium defines the limits of or merges with another. How does an illustrator portray fantastic characters from a fairy tale? How might one go about setting a poem to music? How does gesture depict a description of an action in a short story? Gifted students should be encouraged to cross artistic boundaries and to apply the visual, musical, or dramatic to reading and writing. Beyond these applications, high ability students can make interdisciplinary connections to an understanding of the cultural context within which a work of literature developed and to areas of study that use a common theme such as change.

Foster Independence

By being both an innovative mentor and someone who knows when to let go, the ideal teacher provides the gifted student with a nurturing classroom of intellectual support as well as with the confidence to work on his or her own. The gifted student is thus encouraged to test out classroom instruction and to strike out, with the instructor's guidance, on her own. The instructor, then, often functions as a metacognitive coach who encourages students to take charge of what they have learned and to use their learning in independent ways.

Encourage the Exploration of Issues of Significance, Using a Variety of Research Techniques

Students need to develop literary habits of mind that encourage them in using resources appropriately and well. Researching relevant issues of significance can be one avenue to develop such skills. By exploring

an issue of real world relevance and interest to the learner, students can learn how to organize data to support an argument, how to develop an argument, how to evaluate various perspectives on an issue, and how to present their findings in oral and written forms.

Develop Authentic Assessment Strategies

If students are to believe that thinking and reflection are valued in the language arts program, then teachers must develop assessment techniques that honor that approach. Use of essays that challenge learners to explore new ideas and connections between ideas, journals that record thinking about reading, and other activity-based assessments are critical to the new language arts curriculum.

Major Curriculum Strands in Language Arts for High Ability Learners

The language arts is not a unified field of study; rather it has evolved historically from a set of separate traditions and strands of learning. Therefore, it is important to see curriculum development in the language arts as progressing on parallel tracks that have to merge. Important strands include reading and literature, writing, language study, and oral communication (speaking and listening).

Studies of reading which have proliferated in the last 20 years have tended to focus on one of three areas: (1) the social world of reading with particular emphasis on the student as reader and teacher-child interactions (e.g., Cazden, 1988); (2) the basic mental processes of reading and textual features that address them (e.g., Palinscar & Brown, 1984); and (3) classroom-based research that advocates more time on task among other recommendations (e.g., Cazden, 1988). These three areas have not been addressed in a confluent way at the level of practice although the studies are not contradictory but rather center on different issues and priorities. However, the world of practice has embraced certain features of these studies. The Reading Commission of the National Council of Teachers of English (1988) recommended a de-emphasis on the role of basal readers and standardized tests and a reconsideration of mandated curriculum. The State of California Framework (1987) and the NAEP report on reading (1992) both stress the need for student-centered reading curriculum that centers on shared inquiry discussion techniques of authentic and worthy texts. Such recommendations line up well with issues of teaching reading to the gifted learner.

Current National Assessment of Education Progress (NAEP) data in writing (1992) demonstrate limited emphasis on expository writing and greater emphasis

on more creative forms, with the result being that writing samples of students' "best work" at grades 4 and 8 evidence mediocre control of the writing process and very limited competency in developing argument. Such a result might have been predicted from recent earlier studies. Applebee (1984) analyzed three popular high school writing texts and found that writing assignments were predominantly evaluative, seeking right answers rather than reflection from students and calling for limited responses. In a comprehensive survey of writing in high school, Applebee (1981) also found only 10% of writing time being spent in composing more than a paragraph. More recently, Cooper and Brennen (1988) recommended more direct instruction in teaching writing and requisite thinking in order to master various forms, wide reading and analysis of texts, and sustained literacy programs for all. Thus a critical issue to consider in the language arts is how to integrate a comprehensive writing program that provides extensive experiences in expository writing.

Moreover, the language arts program for the gifted should offer opportunities to study language directly. VanTassel-Baska et al. (1988) suggested that the goals for an English language program should be to understand the syntactic structure of English (grammar) and its concomitant uses (usage); to promote vocabulary development; to foster an understanding of word relationships (analogies) and origins (etymology); and to develop an appreciation for semantics, linguistics, and the history of language. Thompson (1992) argues for a strong integration of grammar and vocabulary into the language arts curriculum as these constitute the structure within which all language functions.

Oral mastery and use of language are critical parts of the language arts program. The thinking process involved in experiencing literature and in writing is linked intimately to and can be enhanced by oral language experience. Through planned experiences in discussion, debate, oral reading and interpretation, oral reports, dramatics and panel presentations, gifted youth can learn to think effectively in and through the language, and they can learn to write more effectively. Chaney (1992) emphasized the importance of developing critical listening skills as fundamental to teaching students traditional speech.

The United States-Supported National Curriculum Projects in Science and Language Arts: A Prototype for Educational Reform

Coherent curriculum evolves from a strong rationale and goal structure. The conceptual framework for developing both the science and language arts curriculum was grounded in understanding the state of the discipline under study, key curricular reform forces at work in the world community, and the core facets of an effective curriculum for gifted learners. The major challenge of the curriculum projects was to find consistent ways to

translate all of the desirable components into usable products in schools and classrooms. Given the dynamic nature of the disciplines and the concurrent information explosion, it was recognized that any proposed curriculum would need to be adaptable and responsive to change.

The purpose of each project was to develop recommendations for high ability learners K-8 that responded to both the needs of such learners and the reconfiguration of education in the respective discipline. Specifically, the projects accomplished the following objectives.

(1) *To develop criteria for assessing appropriate curriculum materials for high ability learners.* Promising curriculum materials for high ability learners were reviewed according to a curriculum evaluation system that developed criteria for judging exemplary curriculum in both science and language arts. By delineating a set of curriculum standards, this evaluation system provided schools with a template for reviewing any new curriculum materials that are teacher-made or commercially developed according to general curriculum design features, exemplary discipline-specific features, and tailoring for high ability learners.

Specifically, evaluation criteria for the review of curriculum materials included an assessment of the general curriculum design features (rationale and purpose, content, and responsiveness to developmental needs); classroom design features (instructional objectives, activities, instructional strategies, assessment procedures, materials resources, and extension ideas); and technology features at Phase I. A second review addressed issues of exemplary discipline-specific inquiry (for example, in science it included both science content and science process features at Phase II). The last phase (Phase III) of the review process focused on differentiation for high ability learners. This segment of the review process also examined more specifically issues of curriculum responsiveness to intellectually gifted learners, girls, minorities, and disabled students. These criteria have been coalesced into rating forms, described and presented in products entitled *Curriculum assessment guides* (CAG).

(2) *To review existing curriculum materials.* Initially an annotated bibliography of 62 science materials were compiled using a variety of data sources to locate the most promising ones. From this list, ultimately 26 sets of curriculum materials were reviewed, culminating in a product entitled *A Consumer's Guide to Science Curriculum for High Ability Learners*. The language arts project focused on extensive reviews of basal and supplementary materials, culminating in a comparable guide.

Three reviewers with different expertise and perspectives evaluated each curriculum by using the CAG. A rating scale was developed and used to highlight strengths and weaknesses in the three phases of each curriculum: curriculum design indicators, science or language arts indicators, and differentiation for high ability indicators. The scores of the three reviewers

were averaged and the resulting scores were used to assess the curriculum as "recommended," "adequate," or "not recommended" in each of the rated areas.

Finally, a narrative review was written that provided: (i) a thorough description of the curriculum material, (ii) an analysis of its strengths and weaknesses, and (iii) a conclusion that pinpointed recommended use.

(3) *To develop a set of science and language arts concept papers.* A series of concept papers that describe a number of broad, overarching, concepts common to many branches of science were developed by the scientist working with the project. They were chosen with reference to the concepts selected by Rutherford and Ahlgren in *Science for all Americans* (1989), those adopted by the California State Board of Education (1990), and those selected by Judson for his book *Search for Solutions* (1980). Additional criteria applied to selecting the concepts in this project were: (1) ease of applicability to all science areas, (2) numerous valid connections to non-science domains of inquiry, and (3) concepts found highly workable to demonstrate content manifestations at the unit level of analysis.

Of all the concepts referred to in other works, six were chosen for explication in the project: scale, models, change, systems, evolution, and reductionism. In addition, during the course of the project, a general description of the scientific process that would be useful for teachers to follow was developed along with a description of useful ways to incorporate laboratory work for high ability learners. Finally, an applications paper containing implementation suggestions was developed for teacher use in teaching the specific scientific concepts.

In language arts, the papers developed focused on key strands, specifically: (a) language, (b) writing, (c) oral communication, (d) literacy, and (e) a general paper on developing curriculum in the language arts.

The overall purpose of the concept papers was to aid teachers in understanding the key components and generalizations that are critical to specific concepts as well as to see ways these concepts can be applied to high ability students' learning in the classroom. Moreover, by providing a rich bibliography of further readings on each concept, teachers were encouraged to engage in the first step of the curricular and instructional process: learning as much as possible about what they are expected to teach.

(4) *To develop a scope and sequence model for K-8 curriculum.* A scope and sequence model for K-8 curriculum was developed that selected a particular concept and developed it systematically from generalizations to learner outcomes to content applications to interdisciplinary applications at the specific grade levels of K-2, 3-5, and 6-8. The scope and sequence model provided an organizing structure for the development of teacher units around the concept. In science, the concept was "systems" in language arts the organizing concept was "change" with teacher units developed around each of these concepts.

(5) *To develop exemplary curriculum units.* A set of exemplary curriculum units were developed for primary, intermediate, and middle school levels. These units were generated from the projects' selected concepts of "systems" and "change," followed the scope and sequence guidelines, and were evaluated according to the project criteria for exemplary science curriculum materials.

A summer institute in teaching science and language arts to gifted learners was held during the summers of 1991 and 1992 respectively to prepare preselected teachers to develop exemplary curriculum units for high ability learners at K-8 levels. The participants examined the issues and criteria relevant to developing quality curriculum for advanced elementary and middle school learners in the specific disciplines.

Field testing of newly developed curriculum units was accomplished in the classrooms of teachers attending the institute the following fall. The field testing provided an operational evaluation mechanism for determining the applicability of the written curriculum to classroom practice. Following the field testing, project staff revised the unit products, based on teacher log data and observational data collected during the field testing.

Implications of the Projects

These 18-month curriculum development projects have yielded important data on several issues related to curriculum development for high ability learners. Their findings may be characterized as follows:

(1) The similarities between curriculum development efforts in general education and the principles of gifted education curriculum development are very complementary. While the translation of these principles into practice will still require greater flexibility and latitude when dealing with the range of high ability learners, it is important to note the commonalities of general approaches to curriculum reform with those principles of good gifted education. Because of the complementarity of discipline-specific reform efforts and gifted education tenets, educators of the gifted should align their efforts in curriculum with the work currently going on in all the content disciplines. As a field, gifted education has much to contribute to the debate on national and international standards in all of the core domains of inquiry.

(2) While there is considerable overlap in the proposed exemplary content-based curriculum for all learners and curriculum differentiation issues for the gifted, there still remain two issues that must be accounted for in working with the gifted. The differentiation for these learners in such a model must still emanate from a clear understanding of the capacity of such learners at a given grade level to engage in a faster pace of learning at an advanced level. Moreover, high ability learners require access to more sophisticated curriculum treatment at earlier stages of development. Consequently, curriculum expectations for these students need to reflect such

adaptations, at advanced and even world class levels. Curriculum grounded in intra and interdisciplinary concepts, however, provides enormous opportunities to enhance more advanced and sophisticated learning for gifted students.

(3) Based on the thorough review of existing science and language arts materials, it appears appropriate to underscore the extent to which cost effective exemplary curriculum materials are readily available for use in classrooms. One problem uncovered, however, was the very limited use those materials were receiving, even in schools and districts that have purchased them. Some of the best materials may be characterized as unleveled in respect to grade, interdisciplinary in orientation, and comprised of multiple modes of learning, usually including video or computer technology as a key feature. It is paradoxical that the very curricular components valued for their appropriateness with high ability learners are overlooked when they are "packaged" into ready-made curriculum materials. The lesson to be learned may be that there already are excellent curricula for high ability and other learning groups; the problem rests with (a) continuing the development process through extending and refining that which is already available using existing frameworks and (b) removing barriers (such as lack of experimental materials and/or equipment and lack of human resource assistance in implementing classroom procedures) to getting the new curriculum institutionalized in classroom practice.

(4) Major publishing companies need to be aware of the extent to which their existing materials are inadequate for the task of curriculum reform, especially for high ability learners. No basal text reached the level of being recommended for use with high ability learners with the exception of the BSCS Biology program originally developed in the 1960s. Clearly there is a need, if the use of basals continues to be school practice, to convince textbook publishers of the need to restructure their materials based on the more powerful current curricula models.

(5) The projects have demonstrated that it is possible to create a set of curriculum materials that are coherent in their treatment of important and desirable features in a curriculum tailored to the needs of high ability learners. The concept papers, scope and sequence model, and the curriculum framework all represent organizing structures that facilitated project staff in being able to implement faithfully the progression of the project phases, from the broad framing of concepts to the specific application of classroom activities and/or questions. These projects produced curriculum that represents various levels of use from a concept framework, to a scope and sequence based on one concept, to classroom units, to lesson plans, to student work sheets. At each level, a careful articulation of content, process, and product considerations were made.

(6) Developmental and ability levels of students appear to impact on the use of new curriculum materials. However, many primary age learners were capable of

engaging in sophisticated concepts and inquiry. The curriculum units were pilot tested in various classroom settings: gifted self-contained, resource rooms, high ability classes, and heterogeneous classrooms. Teachers who worked with gifted students daily reported greater success with the curriculum than did those who saw students only once or twice a week. Based on teacher log data, it was found that high ability learners were more receptive to the curriculum than other learners; however, some students not identified as gifted displayed aptitude and interest through the use of the materials, and teachers felt that most learners benefited more from the approaches embedded in this curriculum than from traditional text models. This finding tends to support the premise that more high-powered curriculum in regular classrooms would enhance the learning for all.

(7) Clearly the major thrust in curriculum reform in science and language arts education for high ability learners must be in the arena of teacher training. The need for specific subject matter training is great if the findings of these projects regarding the convergent areas of discipline-specific reform and curriculum efforts for the gifted are to be understood and implemented in all classrooms at the K-8 levels. In science, for example, all teachers are teachers of the high ability learner, except in special schools or self-contained classes. Thus the need to engage with general science educators in their staff development efforts to reform science education for all learners is a crucial part of our role as educators of the gifted.

Teacher training for gifted learners needs to target the following areas over the next several years. In respect to curriculum in general, preservice and inservice work needs to focus on how to implement discipline-specific models of curriculum and instruction that are responsive to the underlying needs of gifted learners, how to engage learners as investigators providing the tools and processes used by real world problem solvers, and how to raise standards and expectations for gifted learners in regular classrooms.

Curriculum Issues for Special Populations of Gifted Learners

Whether one is talking about low income, minority, or handicapped gifted students, each group shares a common factor: they reside outside the mainstream networks that provide access to educational advantage. This knowledge is crucial to converting high aspirations into creative productive achievement at various stages of development. Thus the role of key interventions is critical to this conversion process.

At their best, in-school programs have provided rigorous coursework comparable to what advantaged learners in the best school settings would receive. At the same time, other school programs have focused on remediating skill deficits or offering programs in nonacademic areas, such as the performing arts. A

recent national survey of existing programs for disadvantaged gifted students at the local level identified over 100 districts thought to be providing service (VanTassel-Baska, Patton, & Prillaman, 1991). The majority of these programs were not differentiating service delivery for disadvantaged gifted students, even though they were careful to include them in programs for gifted students.

Yet there is evidence from the general literature on disadvantaged populations of the importance of key differential interventions with these learners based on the variables that separate them from their more advantaged peers in the first place. These key interventions include early intervention school variables, classroom environment, curriculum, and counseling.

Historically, the Upward Bound program, which assists high school students in preparing for college, emphasized language-based skills such as reading, composition, ethnic literature, and creative writing (Koe, 1980). Yet recent curriculum concerns have centered on the paucity of minority students pursuing advanced programming in math and science. Anick, Carpenter, and Smith (1981) noted that serious inequities exist in math education of African American and Hispanic students and that their achievement levels were not only well below the national average, but that differences from the larger population increased for each consecutive age group. Their study showed though, that while African Americans appear to take less math than other groups, they reported positive feelings about the subject. The authors concluded that motivation may not be a major problem and that general approaches used for all students would be appropriate for minorities.

In a review of 24 studies of participation and performance of minorities in math done since 1975, Mathews (1984) found that parents desire but often do not know how to help their children, that minority role models appear to have a positive effect on enrollment in math courses, and that math may be seen as lacking utility by lower SES children.

Several researchers have focused on group rather than individual models of learning as more facilitative for minority group students. Slavin and Oickle (1981) found a greater increase in African American students' academic performance when cooperative learning groups were used. Hale-Benson (1986) advocated peer tutoring, while Holliday (1985) emphasized enhanced teacher-student interactions.

The literature has suggested several differentiated approaches for working with gifted learning disabled children, including separate class grouping (Daniels, 1983), counseling and adaptive behavior programs (Wolf & Gyi, 1981), the use of technological aids (Tobin & Schiffman, 1983), after-school structured timetables (Sah & Borland, 1989), and the teaching of compensation strategies (Suter & Wolf, 1987). Moreover, most writers also urge the use of strategies appropriate for all gifted learners. A list of adaptations

for use at school and home to enhance learning for gifted learning disabled students include: use visuals and hands-on experiences; provide a quiet place for work; use a sight approach to reading rather than phonics; use a word processor with a spell correct program; practice visualization as a memory aid; tape record lectures instead of taking notes; and concentrate on the child's strengths, especially in order to compensate for weaknesses (Hansford et al., 1987; Silverman, 1989; Suter & Wolf, 1987).

Much of the past research emphasis for these populations has been on identification measures, particularly finding the right test to use in locating special populations. It appears that we have spent too much time already attempting to reinvent the testing wheel and would be better served by supplementing our best testing models available, namely the individual intelligence test and Scholastic Aptitude Test, with other data sources that would enhance our understanding of a particular child in a particular social context for the specific purpose of intervention. Culturally normed checklists; behavioral characteristics in specific domains; and parent, peer, and teacher nominations might serve us well if they were used for diagnostic information in planning a program of study. Thus the emphasis in assessment needs to shift from testing in its narrow function of labeling to its more useful role in providing instructional information for curriculum intervention and to be seen as a part of the information bank necessary to work with special populations of gifted learners in programs.

As effective curricular interventions are examined, there are several directions that appear promising:

(1) Separate instructional opportunities for students with the same developmental profile. Data across special populations suggest the importance for within-group instructional time that allows for interaction based on similar conditions whether it be gender, social background, or handicapping conditions.

(2) The use of technology, especially microcomputers, to aid in the transmission of learning for many special population learners. While it has been used most predominantly with handicapped gifted learners, it holds promise for targeted use with other learners who evidence discrepant learning patterns and can profit from compensatory intervention.

(3) The use of small group and individual counseling, mentorships, and internships for special population learners appears promising since these interventions all constitute individual attention to affective as well as cognitive issues of development.

(4) A focus on the arts as a therapeutic intervention as well as a creative and expressive outlet appears important to consider for all of these special populations. Through the arts, the dysynchronies of one's experience can be reduced and absorbed into a higher pattern of integration. Thus it serves as an enhancement to higher level functioning for such individuals.

(5) Use of materials rich in ideas and imagination coupled with a focus on higher level skills appears to be an important intervention approach for special populations. Both self-concept and motivation are in jeopardy if prolonged use of compensatory strategies and basic level materials are used in the educational process of these learners. Challenging content with a focus on ideas and creative opportunities is essential to combat further discrepant performance.

Conclusion: The Challenge for the Future

Where is curriculum and instruction for the gifted headed and where should it be headed over the next several years? It is clear that the field of gifted education is changing: conceptions of intelligence and therefore of giftedness have changed, conceptions of the delivery context for serving the gifted have changed, and the population focus has changed as well. This shift in focus is both a dilemma and a challenge that provides us with new opportunities to grow and develop as a field, hopefully more responsive to the individual needs of children than to preordained labels; to the social context of schools and the networks that hold them together than to the categorical approach to gifted education as a separate enterprise; and more responsive to change in general that requires us to compromise hard positions and join forces with all educators who care about students with special needs.

Curriculum planners for the gifted need to be cognizant of the importance of maintaining a balanced perspective toward key issues if gifted education is to be meaningful for the students to be served. The theme for approaching and dealing with these issues is that of balance—a balance that must be effected between alliances with general and special education models without diffusing efforts to maintain a distinguishable set of curriculum principles that are appropriate only for gifted learners. One of the dangers of stretching to reach out to the more entrenched curriculum models of general education or the specialized administrative models of special education is a loss of identity in what gifted education itself represents. If it is shown by current research efforts that the degree of exceptionality is not sufficiently great enough to warrant a special administrative structure and special settings for gifted learners, then claims for a field to separate program considerations becomes weakened. If at the same time, it is sufficiently demonstrated that exemplary approaches to curriculum in general education are in fact both necessary and sufficient for gifted learners, then claims to a qualitatively different set of educational experiences for the gifted are weakened. While the field of gifted education may have made too much of its distinctiveness and specialness, by the same token it must guard against too quickly abandoning the very principles on which the field has been grounded for the last 70 years—the basic principles of the gifted student's unique needs that call

for acceleration, grouping, and enrichment in school settings in order to receive an appropriate education.

Balance is also important in considering the needs of learners who are gifted in all cognitive areas in comparison to those gifted only in one. How are appropriate curricular experiences for specialized talents to be provided as well as comprehensive services to more broad-based ones? This issue is particularly worthy of reflection at the level of developing a curriculum scope and sequence. Should the outcome expectations of secondary school for the science-prone, for example, differ from the expectations for the intellectually gifted student whose interests and aptitudes are more broad-ranging? If so, how might these differential expectations be articulated K-12? Or should specialized talent development even be a function of the public school arena? Certainly Bloom's work on talent development (1985) would support the contention that it has not been traditionally a part of what public schools have taken on as their responsibility. Perhaps it is in the specialized areas of talent—art, music, mathematics, chess—where the school's major role may be that of broker and facilitator of talent development for students who show early promise. It is for these learners that tutorials, mentorships, and internships in the larger community are reserved since their aptitudes and interests are more finely attuned to the need for individualized adult expert instruction.

Balance is also a theme in our consideration of the domains of study to be valued in a comprehensive curriculum for gifted learners. In an earlier text, this author has argued for giving the affective, esthetic, and social domains of study as much attention as the cognitive in the overall development of the gifted learner (VanTassel-Baska et al., 1988). This balanced perspective on curriculum development is needed lest the recognition of the integrated needs of the gifted learner be limited with a resulting narrowing of available educational options. Inclusion of the arts, for example, in a curriculum for the intellectually gifted is significant because it provides a vehicle for the development of aesthetic appreciation and an expressive outlet that enhances the creative impulse. Scientists often foreshadow discoveries in metaphors and visual symbols. Mathematicians strive for elegance in form. Philosophers value the symmetry of an argument. In most professional fields at high levels of creative work, the esthetic artistic aspects of the work come strongly into focus. Thus, to ensure that curriculum for gifted learners is heavily infused with such an emphasis throughout their schooling years seems vital.

Honoring the affective development of the gifted also is an important aspect of a comprehensive balanced curriculum view. These students need to understand their own exceptionality, their intensity and sensitivity of feelings, their need for coping strategies to help them deal with their own perfectionism and vulnerability, all of which dictates the necessity of a strong affective orientation to the curriculum to

be delivered by teachers sensitive to the nature of gifted students. Such needs also demand a set of counseling services that can respond to psychosocial, academic planning, and career planning needs at requisite periods during schooling.

Another facet to a balanced view of curriculum for the gifted is the area of social development, undertaken with the long view toward adult leadership. While much of the work in leadership curriculum for the gifted has focused on political leadership (e.g., Gallagher, 1984), there is a need to expand the thinking in this area to embrace a concept of leadership that recognizes the other forms of leadership that gifted individuals in a society provide including intellectual leadership in various areas and for many gifted women, social service leadership. The skills of understanding group dynamics, the organization of complex tasks, and how to motivate others, however, are fundamental to all forms of leadership and thus must underlie a curriculum in this area.

Another issue related to a balanced perspective in curriculum planning for the gifted rests with a need to review the purposes in constructing specialized curriculum for gifted learners. It has often been argued that differentiating curriculum for the gifted was important to meet individual needs, yet the potential contribution of the gifted to society is viewed as an equally important purpose. The metaphor of the gifted as national resource has been exploited more than once in our history as a field. In the policy arena, at least, it seems important to be able to keep these purposes in a healthy tension that allows for both views to be made explicit. At a fundamental level, the gifted develop as individuals in a reciprocal relationship with their society; thus their creative work carries meaning beyond themselves whether it is fully intended to or not. By the same token, a society is enriched by having individuals actively engaging in self-chosen creative endeavors.

The translation of this paradox of individual and societal needs at the classroom level can be seen in the issue of cooperative learning and the gifted. To what extent does the use of the gifted learner as a tutor/teacher model to others in group settings become exploitation and costly to their own individual development? To what extent does prolonged independent or homogeneous group work carried out in isolation contribute to a rejection by the gifted of their natural connection to other learners in the classroom? Again a healthy balance must be struck between independent and homogeneously grouped pursuits and heterogeneous group opportunities in order to ensure the full development of the gifted learner in a social context. Can we tolerate individual excellence within a social framework that honors the integrity of everyone and is hospitable to all learners? This is a fundamental question in school classrooms today.

As curriculum planners reflect on these somewhat traditional issues, they must not reject their importance in favor of the more "trendy questions" that

may be asked. If curriculum planning is to have merit, then the need for a balanced perspective in the areas of general and specialized talent development, equal valuing of cognitive, affective, esthetic, and social development of the gifted, and a concern for both individual and social contributions must all be satisfied. For groups of typical gifted learners as well as individual-need gifted learners, such as those from special populations, attention to these issues at the planning stage will be most beneficial. School districts must remember that the curriculum for the gifted, its goals and purposes, as well as its delivery systems speaks loudly as to how talent and its development is honored and nurtured in a community.

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Acceleration and Enrichment: The Context and Development of Program Options

W. THOMAS SOUTHERN

Bowling Green State University, Bowling Green, Ohio, U.S.A.

ERIC D. JONES

Bowling Green State University, Bowling Green, Ohio, U.S.A.

JULIAN C. STANLEY

Johns Hopkins University, Baltimore, Maryland, U.S.A.

Introduction

Acceleration and enrichment may be regarded as legs that support the same chair. Casual consideration of the definitions of the two approaches will reveal apparent similarities. Whatever the appearances, the rationales for acceleration and enrichment are based on different assumptions about four basic issues: the nature of intellectual giftedness, affective characteristics of giftedness, the goals of regular and gifted education, and the adequacy of regular education curricula. Cultural and societal factors and historical events have also influenced the assumptions of educators and the public about all factors associated with acceleration and enrichment. Differences in basic assumptions and shifts in values and goals have had a profound influence on initiatives to provide programs to gifted students.

This chapter is divided into four principal sections. First, it begins with a discussion of definitions of acceleration and enrichment. Implications of the definitions for program development and implementation will accompany those discussions. The second section of the chapter describes the historical context of the debate over the relative merits of acceleration and enrichment. In the third section, factors that fuel the debate are delineated. The final section of the chapter describe attributes of national educational systems that affect the development of acceleration and enrichment options and presents descriptions of the options that are employed.

Acceleration: Definition and Programming Issues

Pressey (1949, p. 2) defined acceleration as "progress through an educational program at rates faster or at

ages younger than conventional". Several assumptions can be identified in his definition. First, it presupposes an educational program in which content, tasks, and skills are defined for each level of instruction. Second, the definition assumes that there is a pace of instruction that may at least be inferred to be suitable for most students. Third, it assumes that some children are capable of mastering the standard curriculum faster, and, thus, are capable of more rapid progress. Pressey's definition sets two criteria for accelerated advancement: higher than average achievement and the ability to master the material at more rapid rates compared to age level classmates.

Although the term acceleration is frequently associated with grade skipping, a number of variations fit Pressey's criteria. In the early 1920s, acceleration was mainly a form of advancement in grade status (Stedman, 1924). Passow, Goldberg, Tannenbaum, and French (1955) noted eight different options: grade skipping, double promotion, early admission to first grade, extra course work, single subject acceleration, concurrent enrollment, and extracurricular course work. Kitano and Kirby (1986) listed no less than thirteen methods, while Benbow (1979) compiled fourteen. Table 1 provides a compilation of options identified as accelerative in various textbooks and articles about the education of gifted children.

These programmatic options vary along two dimensions. The first involves the degree to which the student is treated differently from his or her age peers. Some of the options do not require extensive amounts of time away from age mates. For example, extracurricular options and credit by examination do not necessarily entail separation from the normal age/grade placement

TABLE 1
Range and Types of Acceleration

(1) Early entrance to kindergarten or first grade	The student is admitted to school prior to the age specified by the district for normal entry to first grade.
(2) Grade skipping	The student is moved ahead of normal grade placement. This may be done during an academic year (e.g., placing a third grader directly into fourth grade, skipping the last 2 years of high school to enter college), or at year end (e.g., promoting a third grader to fifth grade).
(3) Continuous progress	The student is given material deemed appropriate for current achievement as the student becomes ready.
(4) Self-paced instruction	The student is presented with materials that allow him or her to proceed at a self-selected pace. Responsibility for selection of pacing is the student's.
(5) Subject-matter acceleration	The student is placed for a part of a day with students at more advanced grade levels for one or more subjects without being assigned to a higher grade (e.g., a fifth grader going to sixth grade for science instruction).
(6) Combined classes	The student is placed in classes where two or more grade levels are combined (e.g., third and fourth grade split rooms). The arrangement can be used to allow younger children to interact with older ones academically and socially.
(7) Curriculum compacting	The student is given reduced amounts of introductory activities, drill, review, and so on. The time saved may be used to move faster through the curriculum.
(8) Telescoping curriculum	The student spends less time than normal in a course of study (e.g., completing a 1-year course in 1 semester, or finishing junior high school in 2 years rather than 3).
(9) Mentorships	The student is exposed to a mentor who provides advanced training, experiences, and pacing in a content area.
(10) Extracurricular programs	The student is enrolled in course work or summer programs that confer advanced instruction and/or credit for study (e.g., fast-paced language or math courses offered by universities).
(11) Concurrent enrollment	The student is taking a course at one level and receiving credit for successful completion of a parallel course at a higher level (e.g., taking algebra at the junior high level and receiving credit for high school algebra as well as junior high math credits upon successful completion or taking a college physics course in lieu of high school physics).
(12) Early graduation	Graduate from high school or college in 3-1/2 years or less.
(13) Advanced placement	The student takes a course in high school that prepares him or her for taking an examination that can confer college credit for satisfactory performances.
(14) Credit by examination	The student receives credit (at high school or college level) upon successful completion of an examination.
(15) Correspondence courses	The student takes high school or college courses by mail (or, in more recent incarnations, through video and audio course presentation).
(16) Acceleration in College	The student is admitted with full standing to an advanced level of instruction at least 1 year early.
(17) Early entrance into junior high, high school, or college	The student completes two or more majors in a total of four years and/or earns a Master's degree along with the Bachelor's.

Material compiled from: Southern, W.T., & Jones, E.D. (1991). Academic acceleration: Background and issues. In W.T. Southern, & E.D. Jones (Eds.), *The academic acceleration of gifted children* (pp. 1-29) New York: Teachers College Press and Benbow, C.P. (1979). The components of SMPY's smorgasbord of accelerative options. *Intellectually Talented Youth Bulletin*, 5, 21-23.

at all. On the other hand, early entrance or grade skipping place students outside of the normal age/grade placement completely. In between are options such as subject matter acceleration, combined classes, and telescoping curriculum. Subject matter acceleration would require only part-time placement outside of the regular class. Combined classes and telescoped curricula allow the student to remain with at least a few other age peers in an accelerated setting. The discrepancies between (a) the student's age and the accelerated placement, (b) the amount of increase in the pacing, and (c) the student's maturity all contribute to the salience of the intervention. Students who skip more than two grades, or enter higher levels of schooling more than two or three years early, or experience extremely rapid pacing of instruction (e.g., completing algebra in three intensive weeks), are said to be radically accelerated (Stanley, 1977, 1989; Brody & Stanley, 1991). Radical acceleration can be quite conspicuous, but may be less noticeable for students who are socially mature as well as academically precocious.

The second dimension along which these interventions vary is the extent to which they represent administrative recognition of prior achievement. Implicit in Pressey's (1949) definition are the dual criteria of the student's prior achievement and the pace at which the student acquires new knowledge and skills. Some of the options represented in Table 1 seem designed to recognize the extent to which a student has already mastered the curriculum. Early admission to any school level, grade skipping, or subject matter acceleration are applied when a student has clearly exceeded the expectations and demands for achievement at the current grade placement. On the other hand, options such as self-paced instruction, telescoped curriculum, and compacting are ostensibly more concerned with varying the pace of instruction to accommodate the faster acquisition rate of a gifted student. In effect, this dimension represents two purposes for acceleration. First, it involves giving a student credit for what has already been learned. Second, it involves adapting the instruction to provide a better fit with the student's rapid rate of achievement.

Although the issues of salience and purpose for acceleration are rarely discussed in the popular press or in the professional literature, it is clear that forms of acceleration vary on those dimensions. Considerations of both salience and purpose suggest very different potential outcomes for students and educators. Certainly, a few summer courses at a university where little or no communication or articulation with regular school offerings occurs are apt to be less fraught with potential peril than skipping whole years of school. On the other hand, recognition of a student's prior achievement may be less difficult than seeking out a cohort of students to place in a rapid-paced math class or a telescoped middle school. Yet, very few studies define these variables when looking at the effects of acceleration. A student who enters school a few months early may have entirely different sets of experiences than one who enters two

years early. Some researchers have, however, noted that skepticism toward accelerative options is frequently based on assumptions about the desirability of grade skipping alone or equation of grade skipping with other options. Pressey (1954, p. 59), for example, rebutted an article critical of acceleration and complained that the critic had discussed only grade skipping, "the least desirable form of acceleration." DeHaan and Havighurst (1957) referred to grade skipping as gross acceleration and averred that it was a potentially harmful process. While the bulk of research does not clearly demonstrate that there is no risk with acceleration (Cornell, Callahan, Basin, & Ramsay, 1991), critics fail to cite research studies that clearly demonstrate any type of harm.

A third variable, not explicit in Table 1, involves the age at which a student undergoes accelerative programs. Intuitively, one might expect that interventions applied at early ages might have very different effects from those applied when a student is more mature. Some distinctions are drawn in the literature between school entrance and later options. Though some researchers have addressed the issue of the age at which the student receives an accelerated program (e.g., Feldhusen, Proctor, & Black, 1986), with the exception of early entrance, this variable is also virtually ignored in the research literature. Concerns about early admission arise from fears that taking students who are not in school and placing them into instruction with the potential for doing so before the child is developmentally ready may cause harm. Many of the researchers who have conducted studies have used school readiness as a concept that applies to virtually all cases of early entrance, regardless of the mental capacity or achievement of the child (e.g., Baer, 1958; Bigelow, 1934; Carroll, 1963; Carter, 1956; DiPasquale, Moule, & Flewelling, 1980; Forester, 1955; Hall, 1963). The justification of these concerns remains problematic (Jones & Southern, 1991) and will be addressed specifically later.

On the surface, the level of the intervention and the purpose for which the intervention is used may have strikingly different effects. The apparently contradictory claims about the potential harm from accelerative options may even be partially explained by the confusion that results from ignoring what may be important variations between different types of acceleration. Certainly, if grade skipping were used only for purposes of recognition of student achievement, then concerns about gaps in instruction and undue pressures and expectations for achievement would prove groundless. Since there is a tendency for educators not to make distinctions between either the processes or potential effects of different forms of acceleration (Southern & Jones, 1991), attempts to make assessments to guide the selection of the most appropriate acceleration alternatives have been rare. Such assessments would also be difficult if attempted. By the time acceleration options are considered, it is already apparent that the student has learned considerably more than age peers in the same grade. It will appear that the student may benefit

from a more rapidly paced curriculum, but the actual rate of learning is not directly observable. Thus, the decision whether to offer options that emphasize either more rapid formal instruction or grade advancement will generally have to be made on the basis of the same predictor—prior achievement. Given the conservatism with which many practitioners view acceleration, for all practical purposes only students achieving far higher than their current placement are considered for these options (Southern & Jones, 1991). It is unlikely that students who are only moderately advanced will be considered for any option. When options that amount to administrative recognition of prior achievements are used, concerns for the social and emotional adjustment of children who are younger than their classmates may remain, but it is unlikely that academic problems will ensue.

On the other hand, attempts to predict the potential value of more rapidly paced instruction will encounter different assessment problems. If a class is being identified to embark on a telescoped high school curriculum, then chances for assessment error are higher. The search for prospective candidates will involve increased numbers of students, some of whom may fall into the margins of error of the instruments used. The smaller the population screened, the greater the likelihood that students will be selected who cannot succeed in their acceleration options. If the demand on the students is extremely high, some of the potential concerns about achievement and the pressure of expectations might prove justified, at least in theory. In practice, even these options have generally been employed only among large populations in urban areas (e.g., Havighurst, Stivers, & DeHaan, 1955), and cut-off scores for selection have been set so high that the problem of false positives is virtually nonexistent. The Talent Search model is a case in point. Students selected for fast-paced instruction at age 12 or 13 take the Scholastic Aptitude Test (SAT) and achieve a threshold score that is about the average for college-bound male high school seniors. While such high criteria for entrance may screen some capable students out of a fast-paced instructional program, Stanley and his colleagues have clearly demonstrated that high acceptance criteria can eliminate the dangers of over-expectation (e.g., Stanley & Stanley, 1986; Stanley & Benbow, 1986).

Researchers have rarely addressed the issue of the potential advantages for gifted students associated with each accelerative option or the problems of assessing students and matching them with the most appropriate forms of acceleration. Though Study of Mathematically Precocious Youth (SMPY) has attempted to develop and design a variety of program options that meet the needs of individual students, documentation of the benefits derived from these programs have not translated to practitioners. When deciding to accelerate instructional placements or pace, practitioners have been influenced most by their assumptions about the nature and effects of acceleration. Southern, Jones, and Fiscus (1989a,b)

found that practitioners did not differentiate either among the type of option employed, the age of the accelerant, the salience of the intervention, or its purpose. This may result from a general tendency for educators and parents to over-generalize research on accelerative options. Thus, information about early entrance to grade school may be applied equally to early entrance to college. Research about telescoping college curricula may be applied to middle school programs. Evidence about the effectiveness of extracurricular programs may be applied to school interventions.

Decisions to use acceleration options seem to be based on three general assumptions. The first is that gifted students differ from their peers primarily in the rate at which they can acquire knowledge (though this does not preclude belief that their cognitive abilities are qualitatively different). Second, there is a strong belief that adapting the pace of instruction or advancing grade placement will answer many of the needs of gifted students. The third assumption, while rarely stated, is implied by the first two: the content of the curriculum across all levels of school is generally appropriate and challenging for gifted students, but they are denied access to it because of artificial and inappropriate age/grade barriers.

Enrichment: Definition and Programming Issues

While acceleration is defined as more rapid than typical advancement within a given curriculum, enrichment has been regarded as a process that extends instruction beyond the bounds of that curriculum. Over the years, authors have varied on the specific aspects of their conceptualizations of enrichment programs. Early descriptions used terms like addition to and expansion of the regular curriculum (e.g., Freeman, 1920). Hollingworth (1926) suggested that enrichment should assist gifted students to develop initiative and originality. Osburn and Rohan (1931) asserted that the goals of gifted-child education should include a curriculum that is rich and varied to relieve gifted students of monotony and to allow for active exploration. Passow (1958) identified four guidelines for the development of enrichment programs. He suggested that the curriculum could be modified to enrich the programming for gifted students in three ways: (a) in the breadth or depth with which it was approached, (b) in the tempo or pace with which it was presented, and (c) the kind or content of material that was presented. Passow's fourth suggestion was that the development of process skills was an essential part of the curriculum for gifted students and that efforts should be made to tie enrichment to the unique nature of gifted learners in general and to the interests of individual students. His four guidelines for enrichment are the themes most consistently expressed in discussions of enrichment programs.

Breadth, Passow's first theme, tends to be described as increased opportunities for applications of knowledge

and skills (e.g., Kaplan, 1979). By depth, writers and theorists imply learning more about topics than is typically presented in the curriculum. One example given by Norris (1958) was a unit on the Indian mound builders developed for the Cleveland Major Work Program, a topic that was mentioned only casually in the regular curriculum. Kaplan (1979) refers to this element as horizontal enrichment.

Passow's second guideline about enrichment programs was the tempo and pace of instruction. Since gifted students can, in the same amount of time, learn more than their less capable age mates, their educations may be enriched by study of novel content not normally presented in the regular curriculum. The assumption is made that the curriculum usually taught in school omits large amounts of content, materials, and skills that would be valuable to learn. Enrichment through the inclusion of additional or novel content would allow students to explore and develop deeper and more meaningful understandings of given academic areas. For example, electronics, historiography, and ecology, along with a myriad of other potential topics, could be presented for study by gifted students. Because of the nearly infinite number of possibilities for introduction of novel content, authors have often used student interest as the major factor for selecting additional content, determining appropriate emphasis, and devoting time to study. Kaplan calls this vertical enrichment. Renzulli (1977) defines enrichment as study of content "above and beyond" the curriculum, and asserts that student interest and learning styles should be used to determine the course of study in programs for the gifted.

The third theme struck in Passow's guidelines is that of making the curriculum responsive to the student. The nature of the gifted learner defines the type of content and the processes of instruction to be used. For many theorists, notably Renzulli (1979), enrichment differs from acceleration because of the efforts that are made to take advantage of the student's unique nature and needs. As early as 1926, Hollingworth suggested that good education for the gifted must take into account their interests and needs. Frequently expressed sentiments about the proper nature of enrichment programs for gifted and talented children are that education should be child-centered, and that the student's affective development is perhaps as important as academic achievement (of course, they are not mutually exclusive).

In practice, enrichment may fall short of the ideals Renzulli outlines for such interventions. While Renzulli has designed programs that have as a major component student interest, many programs in place identify students for enrichment programs that then proceed to ignore individual interests and abilities. For example, a student keenly interested in mathematics may be required, instead, to brain-storm about the energy crisis or the abortion debate solely because a teacher or enrichment committee believes he or she will be served better through such "enriched" social studies. This can be termed "irrelevant enrichment." No matter

how excellent it may seem to the teacher, it is largely irrelevant to the actual major interests and needs of that gifted child. This sort of enrichment is also often presented to groups of gifted children, perhaps somewhat homogeneous with regard to IQ but not with respect to their interests. The element of choice may be missing or limited to yearly projects ostensibly identified by the student, but which are frequently constrained by the program resources selected by a teacher for group instruction.

Passow's (1958) fourth theme is that of instruction in process skills. These include creative and critical thinking, heuristics and problem solving, and affective or social/personal skills. Gallagher (1981) pointed out that gifted students need heuristics that would help them manipulate the complex content in new situations and across interdisciplinary applications. Tannenbaum (1983) echoed Hollingworth's (1926) call for development of initiative and originality. He noted that gifted students should learn to be producers rather than simply consumers of knowledge. These assertions fit well into the learning structures posited by Bruner (1973), who claimed that effective learning was best accomplished by instruction in the processes of different disciplines at the expense of facts and simple skills. They also fit into a recurring concern about the explosion of knowledge and the potential inefficiency of current instructional methods to assist students to master some contents.

The call for process training in gifted education, however, also included a potential pitfall. Differentiating education for the gifted by content alone is often problematic. At what point does presenting unique content become either a form of acceleration, or an exercise in finding arcane instructional subjects for gifted students that they are unlikely to encounter in the regular curriculum? On the horns of this potential dilemma, it is possible to de-emphasize content entirely. A major emphasis on training process skills could produce instruction for the gifted that would be virtually content-free. Creativity training exercises would need not be tied to school curricula at all. Problem-solving techniques could be practiced with problems that had no relation to various school subjects. Renzulli (1977) noted the proliferation of activities that bore little relation to academic content. This trend continued through the 1970s and early 1980s, with curriculum for the gifted increasingly dependent on process-training skills separate from the regular classroom curriculum.

Advocates of enrichment for the gifted argue that it differs from accelerative options in three basic ways. First, they assume that the regular school curriculum is limited and monotonous for gifted students. The curriculum ignores a large number of interesting and valuable subjects for study to concentrate on a relatively sparse set of knowledge and skills. Therefore, the curriculum must be modified by extending the opportunities for application and elaboration, studying topics at greater length and depth, and introducing novel topics and themes into the regular curriculum. Second, advocates

of enrichment suggest that a modification is required in the way gifted students study any content. They assume that the regular curriculum concentrates on rote learning of facts and skills at the expense of facilitating more complex cognitive abilities, creativity, and basic understanding of the major processes inherent in the content discipline. Third, arguments for enrichment assume that a central focus of curriculum modification should be the welfare of the student, and that social and emotional welfare can be insured through curriculum interventions that stress social and emotional development. This assumption also includes a basic belief that the regular school curriculum does not meet these needs for gifted students.

It is unlikely that any advocate of enrichment would deny that the pacing of instruction needs to be varied for gifted students. Passow (1958) suggested that enrichment provide for greater breadth and depth of study than regular education, and that the tempo and pace of instruction be varied to recognize the capacity of gifted students to learn more than their age mates in less time. Kaplan's (1979) description of vertical enrichment is hard to distinguish from acceleration (cf. Khatena, 1991, p. 389, who claims that "Acceleration can be viewed as horizontal and vertical enrichment"). Advocates of acceleration proceed on the assumption that the curriculum is in very general ways acceptable, or at least they consider that the education system will hold both precocious children and children of more average ability accountable for demonstrating achievement of common knowledge and skills. They are certainly not apt to defend every curriculum practice and theme. In fact, a common rationale for acceleration has been that gifted students can accomplish their requirements faster and have time for deeper or more divergent studies. Common ground in the assumptions of proponents of acceleration and enrichment are that the gifted students can learn faster than other students of the same age and there is a great deal they can learn. Their progress should not be stifled or thwarted by simplistic and unchallenging curricula. The basic debate over acceleration "versus" enrichment, however, involves the extent to which varying the pace of instruction will meet the needs of gifted students. Renzulli (1979) questioned whether progressing through the general curriculum rapidly really met any important needs of gifted students. His concerns were shared by those who argue for enrichment as a primary means to address the needs of gifted students. This implies that acceleration options are regarded solely as a speeding up of pace. Daurio (1979), on the other hand, described horizontal enrichment as unsystematic. He argued that attempts to provide enrichment would be apt to hold students back from other important learning experiences (and implicitly that accelerants would receive such experiences). For most programs and practices, it is unlikely that either extreme characterization will be completely accurate.

Development of the Acceleration and Enrichment Debate

During the last 70 years the value of academic acceleration has been debated often, but a century ago there would have been scant interest in a chapter that described the processes of enrichment or acceleration in the education of the gifted and talented. Then, many bright youths were taught mainly individually by tutors or attended essentially ungraded one-room schools, as both Hollingworth and Terman did. However, conceptualizations of talent and ability have changed over time and they differ across cultures. They are influenced by prevailing economic conditions, societal sentiments on the role and value of education, the availability of educational programming, and status of the students who have access to these opportunities. Indeed, in many parts of the world where access to education is limited by the extreme paucity of national resources the questions dealt with in this chapter are probably moot. Until recently, concern about the benefits and risks of acceleration has been limited primarily to the United States.

In the United States, a commitment to universal education for all youths, a strong commitment to egalitarian values, and the play of historical forces have all combined to produce a professional literature that is at once vast and contentious. The aspirations for universal access to basic educational opportunities are no longer unique to the United States. In many other nations, older notions about the limitations of educational access now lack general acceptance. While few other countries can match the percentage of students in the United States who attend colleges and universities, many exceed the percentage of students who successfully complete secondary schools (Faraj, 1988; Snyder & Hoffman, 1990). European and East Asian countries have not only widened access to educational options, but also many of these countries have adopted a number of the assumptions inherent in the educational structures of the United States. Echoes of some of the same debates concerning initial school entry age and appropriate pacing have been heard in Western Europe and in Asian nations with advanced educational systems (Gredler, 1980). In some countries educators have generally assumed that children of similar ages need to be served in the same settings. As awareness of the need to develop educational talent increases, these assumptions will come in conflict with the fact that many students can learn at a pace much more rapid than their age peers. Despite different national educational systems, some of the resistance experienced in the United States to accelerative options may be repeated. The field of gifted-child education is a comparatively young one in much of the world. The body of theoretical treatises and research literature deals predominantly with the American context of schooling, but increasing interest in the gifted and talented is likely to raise similar concerns and objections. Certainly, few issues in the education of

the gifted have been debated as long or as fiercely as those surrounding enrichment and acceleration.

The Historical Context

It was not until the middle of the nineteenth century with the publications of Francis Galton (1869) that any real notice of differential educational needs for the gifted were noted. Galton's early research interests were into the nature of the genius and the extent to which genius was hereditary. He argued that genius was a trait observable in families of eminence and transmitted through inheritance. His writings were concerned with the traits men of genius possessed that allowed them to succeed in a wide field of human endeavors. He did not comment extensively on their educational needs, but did feel that every effort should be made to propagate genius through scientific selection of parents. Galton's position was characterized by an essential belief that hereditary genius was a highly desirable trait because it ensured attainment of eminence and relatively strong mental health. This position dominated the early history of research on the gifted and talented and would be adopted most wholeheartedly by Galton's intellectual heir, Lewis Madison Terman.

Terman's (1925) longitudinal study of students with high IQs involved many of the attempts to identify and provide for gifted children in the first third of the twentieth century. Terman believed strongly in the heritability of intelligence and the inherent stability of those who showed remarkable ability. He was strongly influenced by Galton's work, including his perspective on the positive relationship between genius and mental health. He reacted quite strongly (see Terman, 1954) to the claims of Lombroso (1891), a physiognomist, that geniuses were extraordinarily subject to diseases of madness. Terman's five-volume *Genetic Studies of Genius* functioned at one level as an apologia for the Galtonian characterization of genius. These studies defined genius as a particular, statistical occurrence (an IQ of 140 on the first, 1916, version of the Stanford-Binet Intelligence Test, attained by less than 1% of the population), and they also served to assert that these children were not only high achievers, but they were also more ethical, more stable, and healthier than the general population. It was Terman's strong belief that these students represented the future's most productive citizenry.

Although Terman's (1925) findings seemed to contradict Lombroso (1891), they provided no obvious basis for educational intervention with the gifted. Terman was aware that his assertion of extraordinary ability and exceptional adjustment might lead to a conclusion that no special provisions were required for the gifted. He was able to point to data which indicated that intervention of rapidly paced instruction would be ineffective. Among the students he studied, Terman found that the median age at which these students

completed high school and college was approximately one year ahead of their chronological peers. He also examined two sub-samples of the entire study whom he identified as school accelerants and who had been graduated from high school at mean ages of 14.9 and 16.0 years, respectively (Terman and Oden, 1947, pp. 264-281). In the third and fourth volume of the *Genetic Studies of Genius*, Terman and colleagues (Burks, Jensen, & Terman, 1930; Terman & Oden, 1947) commented at length on the effects of moving gifted students at a pace faster than normal or placement in classes ahead of schedule. They cited a number of benefits from the practice, including allowing students to (a) enter careers at earlier ages, (b) engage in mandatory military service, (c) improve motivation and avoid slovenly work habits, and (d) save financial resources for themselves and the taxpayer. In both studies (Burks et al., 1930; Terman & Oden, 1947) it is clear that the authors expected that their argument would be met with some skepticism. Indeed, by that time, acceleration had become a fairly controversial issue, and would not be acceptable as the sole programming response for gifted students. Ironically, the debate began to heat up almost at the same time that Terman published his initial study in 1925. (For concise updating of the studies, see Oden, 1968.)

Kett (1974) pointed out that the notion that students should remain with their age peers is very recent. It was not widely held in the nineteenth century, and appeared only with the arrival of an educational bureaucracy after 1920. During the 1920s several changes occurred in general education that in turn brought accelerative options under closer scrutiny. Those events included (a) mandatory attendance for all children, (b) increased educational expectation, (c) huge increases in the numbers of students being educated, and (d) the increasing prevalence of progressive education and developmental theories in child psychology. The public began to perceive the need to provide all children with a basic education. That sentiment was also fueled by public concerns about the abuses in child labor and the need to assimilate massive numbers of immigrants arriving during the early twentieth century. Mandatory attendance was finally accomplished during the United States' economic collapse in the Great Depression of the 1930s. Acceleration began to fall into disfavor as it became increasingly important to hold these students out of the labor market longer than had frequently been accepted in the past. Attempts to prevent abuse of child labor and protect the sometimes tenuous job security of adults contributed to greater numbers of American youths' completing higher levels of schooling. Secondary schooling became an institution for all children, not just those who lived in moderate to large communities. Those factors, combined with the rapid population growth of the 1940s and 1950s, dramatically increased the numbers of students in schools. A bureaucratic response soon followed and began to accentuate the institutional character of schools. Kindergarten plus

12 years became the conventional period for schooling. Students were sorted by age rather than ability or attainment. Standard curricula were adopted, and general uniformity increased with the growth of an emerging textbook industry. Chronological age became the standard attribute for educational placement. Along with sex, age is the most easily obtainable characteristic of a child entering and progressing through schools. Its value as the basis for grouping squared with popular wisdom about child development.

The fourth factor that contributed to the disfavor of acceleration was the application of the emerging developmental perspective on child psychology to education. Dewey (1962) advocated emphasis on the education of the whole child and found strong support in the educational community. In American schools, social and emotional health of the child became as important to the development of school programs as academics. The perspective readily permitted the needs and interests of various constituents of the educational process to be met. Teachers, for example, have a strong need for "psychic rewards of knowing and understanding their students." Administrators are concerned about good public relations, staff support, and harmony. Parents want their children to experience good classroom atmosphere and positive interactions with other children. The community values educational efforts that build community harmony (Lortie, 1969). These values soon became the basis for school structuring and, ultimately became the source of much of the theoretical underpinnings of enrichment activities for gifted children.

The influence of developmental psychology was strengthened with the publication of developmental theories of intelligence and learning. Piaget (1952), for example, posited stages of development that were relatively fixed and unresponsive to direct intervention. From this, educators incorrectly interpreted chronological age as the major indicator of a child's psychological development and, thus, his or her ability and potential for success in learning.

It is not surprising to find that acceleration was coming increasingly under attack. Daurio (1979) notes that the debate about acceleration began in earnest in the late 1920s, only to fall moot during the Depression era. Enrichment programming began to take its place as a principal option for dealing with the needs of gifted and talented children. Enrichment was firmly grounded in the progressive education movement and capitalized on concerns about social and emotional needs of students. The movement toward enrichment had, of course, to deal with the findings of Burks et al. (1930), which had seemed to indicate strongly that the gifted were not subject to hazard in these areas.

Grinder (1985) has written that the views of Terman (1925) were increasingly contradicted by the growing assumption that gifted children were at risk in the areas of social and emotional development, and that the primary purpose of programming lay in insuring

the emotional health and happiness of gifted students. Those assumptions certainly were at the heart of many of the programs that grew in the 1920s.

Hollingworth founded the Speyer School, dedicated to providing enrichment for gifted students. She claimed that signs of maladjustment and unhappiness were not unusual among both moderately and highly gifted children (Hollingworth, 1924, 1942). She emphasized the need to provide psychological support for their integration into a less gifted society.

Prominent examples of accelerants who experienced difficulties were widely cited and seemed to buttress critics' concerns about the process of acceleration. For example, William J. Sidis had entered Harvard at an extremely early age, but thereafter experienced severe problems in personal and social adjustment (Montour, 1977; Wallace, 1986; Wiener, 1953). Hollingworth cited the case of John Stuart Mill, who complained in his autobiographical writings about the tyranny and unsuitability of his father's educational regimen but, nevertheless, became a renowned political economist (Mill, 1908; Packe, 1954). Textbooks and articles (e.g., Davis, 1924; Hollingworth, 1926; Rugg, 1924; Stedman, 1924) in the field began to describe options for the gifted that included enrichment rather than accelerative options.

Freeman (1920) provided early descriptions of two potential approaches to meeting the needs of gifted children. The first was speeding up the pacing of instruction (acceleration) or adding to the curriculum (enrichment). He reported that rapid pacing (a process referred to as flexible promotion) had been employed since 1868. In this process, the curriculum was divided into smaller units, such as nine weeks in length rather than the traditional year. Students were tested frequently and passed on to the next higher unit as needed. He also noted that no teacher or administrator in a national survey had reported any harm accruing from the process. However, in that same survey, he reported rather wide use of enrichment among the schools surveyed.

Stedman (1924, p. 8) described the development of a program for gifted junior high students as a response to avoiding high school subject matter. "[The parents] were unwilling to make 'high school babies' and so the problem was to provide a post-8th grade course which would make suitable demands . . . without introducing them to high school subjects." Hollingworth (1926, p. 312) stated that, "The subjects taught in high school can be learned by very gifted children when they are 9 or 10. . . . But what profit is found in having done so?" Davis (1924) claimed that attitude development was vital for gifted students. Additional courses offered to the gifted in many areas included typing, tennis, art, and music (Hildenbrand, 1981). The schools began to incorporate wider definitions and to decrease reliance on IQ for identification. Hildenbrand (1981) claimed that schools could not support the more stringent and limited view of giftedness promulgated by Terman because, for many middle class students, it reduced access to training for professional careers.

The enrichment model was congruent with the progressive education movement, and with the acceptance of progressive education, the rationale for special programs for gifted students shifted. The turn was away from Terman's (1925) position that special education for the gifted was necessary to develop the talents of these children as societal resources. Instead of moving students through school quickly, there was increasing emphasis on promoting the mental health and well-being of gifted students, and during periods of exceptional economic stress, to maintain them in school and out of the work force.

The Cleveland Major Work Program, one of the earliest and most fully documented program for gifted students, has been described by Hildenbrand (1985) as an archetype for progressive education. Goddard (1928) noted that each classroom contained a piano, tool benches, aquariums, and bookshelves. The activities frequently included field trips with reports rather than extensive emphasis on content instruction. He reported that the teacher "can teach what she wishes. She does not even have a daily time schedule" (Goddard, 1928, p. 86). Hildenbrand (1985) stated that the dominance of this approach to enrichment arose from its obvious benefits for teachers, administrators, parents, and the community.

By the 1930s school personnel were generally reluctant to employ grade skipping (Pressey, 1954). Until the obvious exigencies of World War II, when vast amounts of manpower were needed in rapid fashion, assumptions about the dangers of grade skipping were rarely tested (Daurio, 1979). By contrast, a great deal of research was carried on during the 1940s. Pressey (1949) published extensive studies about the efficacy of early admission and telescoping of curriculum at the college level. Terman and Oden (1947, pp. 279-281) commented extensively and favorably about the impact of accelerative options. Yet by the end of the decade, the influx of veterans lessened the demand for rapid pacing through college, and the G.I. Bill guaranteed veterans economic access to a university education. The basic beliefs and attitudes of constituents of gifted programs, however, had probably not markedly changed during the war. Thorndike in 1947 wrote to Terman that the curriculum at the Hunter School for the Gifted was confined to art, music, and other "non-academics" and that teachers and administrative staff worried about making the course overly intellectual (cited in Hildenbrand, 1981).

In his Bingham Lecture, "The Discovery and Development of Exceptional Abilities and Capacities," Terman (1954) noted that lockstep (progress through the grades) was much more prevalent than it had been 30 years before. The availability of employment in a prosperous period and the beginnings of an increasing presence of women in the work force contributed to a demand for schools to take students at earlier and earlier ages. But efforts to employ early admission or grade skipping in the public schools were resisted by pressures of a skyrocketing population of

school-age children. Many districts undertook studies to determine the effects of early admission, and many of these "local studies" claimed to find evidence of major harm (e.g., Baer, 1958; Bigelow, 1934; Carroll, 1963; Carter, 1956; Forester, 1955; Hall, 1963; King, 1955; Mawhinney, 1964; Orbzut, Nelson, & Orbzut, 1984). Conversely, Worcester (1956) and Hobson (1946, 1963) found marked benefits. While resistance to early entrance remained high, other forces were at work and reintroduced a sense of urgency for school level acceleration.

During the early 1950s, calls for improving the quality of American high schools increased. Part of the impetus for those reform efforts was provided by a growing perception that the United States was falling behind the Soviet Union, and that American technological dominance was threatened. Conant (1959) and others called for the consolidation of small high schools into larger schools, with curricula that heavily stressed math, science, and technology. The launching of Sputnik by the Soviet Union in 1957 seemed to fuse fears that American students were receiving inadequate education.

During the 1960s there was a significant shift in educational values. Emphasis on the development of talent declined with the shift in attention to compensatory education. The dominant educational theories stressed themes similar to those of the progressive era of the 1920s. Personal relevance, enhanced self-concept, pride in one's racial or ethnic origins, and attainment of self-actualization became major criteria for effective schooling. Talent searches and attempts to channel talent into science and technical fields were frequently considered exploitative. Tannenbaum (1983) pointed out that intensified efforts to develop and use student talent as a national resource were associated with the subsequent dissatisfaction of many students with the sciences expressed in the decades that followed Sputnik.

Research into issues of acceleration were rare during this period. Enrichment was the dominant form of programming, where programs existed. In 1971, however, Stanley and his associates at Johns Hopkins (Stanley, 1991) began an examination of radical acceleration, looking at the effects on students of entering college two or more years earlier than normal. The first studies, concentrating on students with precocious mathematical ability, seemed clearly to indicate that these students achieved at high levels with no apparent harm to social and emotional well-being. Stanley's efforts began to gain adherents, and by the early 1980s a national network developed to discover and to develop boys and girls who reason exceptionally well mathematically and/or verbally.

Renewed interest in acceleration was concurrent with two factors that facilitated its dissemination. The first was growing perception nationally that American schools were inadequate. The curricular innovations of the 1960s and early 1970s were widely regarded as failing to instruct in the basic skills and competencies.

Reformers decried the lack of strict guidelines and specific curricula in the content areas. It was also claimed that too much emphasis was given to affective and emotional concerns, while academic content was slighted. The second factor that spurred interest in acceleration was fear that America was falling behind its principal economic rivals, especially Japan. During the 1980s widely cited national commission reports seemed to confirm the decline of the educational system (e.g., National Commission on Excellence in Education, 1983, 1985).

Factors that Fueled the Debate

Seven decades of discussion and dispute over the relative merits and risks of acceleration and enrichment illuminate both the factors that cause interest in the debate to wax and wane and the effect of political and social sentiment on the type of research that will be done and believed. Issues that have continued to influence the debate include beliefs about the intrinsic need to guarantee the welfare of children and to assimilate other cultures into the national value system, assumptions about the social and emotional vulnerability of gifted students, and availability of educational options and resources for gifted students.

First is the overly simplistic competition between societal intentions to develop talent vs desires to provide a nurturant and happy learning environment. There was concern over children in the labor market, where they were frequently exploited and/or hired at the expense of adults. During the 1920s the assimilation of immigrants and the protection of children from exploitation in the labor force became much more immediate issues than protecting "genius". Schools served as havens to protect children from exploitations of industrial labor. Mandatory and extended schooling also had the effect of protecting the jobs of adults. As noted above, the economic impact of the Great American Depression of the 1930s sealed the controversy until the exigencies of World War II required the development of talent. In the post war years, economic expansion and the rapidly increasing numbers of students assisted in the return to dominance of the enrichment paradigm. It was only during the heights of anxiety that accompanied the cold war public relations disasters of the Soviet explosion of the hydrogen bomb and Sputnik and the portents of an economic disaster in the 1980s that increased interest in accelerative programmatic options.

A second important element in the debate is that proponents of acceleration and enrichment seem to retain solidly opposed assumptions about the relationship between intellectual precocity and the social/emotional health of gifted students. These viewpoints are complemented by a view of school curriculum as either narrow and rigidly defined, stifling the needs of the gifted child, or as a relatively comprehensive

preparation of which mastery is essential for all children. The seeds of these viewpoints can be seen in the competing claims of Galton and Lombroso in the nineteenth century. Galton believed in the innate superiority of men of genius and averred that special schooling was neither required or even helpful. He pointed to numerous examples of men of eminence who were either uneducated during childhood or who experienced dreadful educational experiences. His view seemed to be that access to academic excellence might be necessary, but special provisions were not required. Lombroso, on the other hand, advanced theories of the innate instability of genius. For Lombroso, education was the source of a good deal of potential harm. Teachers could stifle and frustrate the delicate mind of the genius with devastating results. This debate is implicit in the works of Terman and Hollingworth. It can also be found implicitly in positions adopted by Stanley and Renzulli. If gifted students are of normal or superior adjustment, then special curricular interventions to insure emotional well-being are not required. For others, gifted children are at risk from threats that arise precisely from academic pressure applied to them because of their abilities. To the extent that one believes the latter, purely accelerative options are regarded as potentially harmful.

A crucial consideration is the extent to which the child is encouraged to take an active part in the educational decision-making process. For example, how eager is the child to skip a school grade, to work intensively in an accelerated mathematics class, to participate in academic summer programs etc.? Also, how effectively are the child's parents facilitating their offspring's social, emotional, athletic, and cultural development? Brody and Stanley (1991) assert that parents and the child must work on these four areas as much or more than on academic development. According to their views, each intellectually gifted child should strive to develop proficiency in at least one athletic sport and performing or fine art. This would provide the gifted youth several contrasting reference groups with whom to interact.

A third factor in the debate is the availability of options and resources for gifted children. In times of prosperity resources are relatively plentiful and the public has access to broader arrays of educational options. In times of economic or political crisis, alternatives are more constricted. The periods of interest in acceleration coincide with periods of political crisis and economic constraint (with the exception of the Great Depression of the 1930s). The availability of resources is always influenced by the political strength of the constituent groups that attempt to influence educational policies.

These three factors are pervasive in the United States, where there has been a consistent effort to provide public education to all students in a more or less equivalent form. There has been no history of long-standing or rigid class divisions that exist in other countries, although for most of the country's existence it discriminated severely against African Americans. The United States

has also experienced economic growth that has been accompanied by periods of attention to the welfare of individual children and extension of resources to meet the commitment to universal education. In countries where these conditions do not exist, efforts to define the needs of gifted students will progress differently.

Course of the Debate

During the last 70 years, a wide array of assertions have been made about the comparative benefits of acceleration and enrichment. The issues arise from basic differences in philosophy and beliefs and about the nature of schools and the nature of gifted learners. Supporters of acceleration from Terman to Stanley have contributed to a lengthy list of possible benefits for gifted students who are accelerated. These include:

- (1) Less emphasis on needless repetition and drill.
- (2) Achievement of closer match between the student's level of instruction and level of achievement.
- (3) Appropriate recognition of mastery so that students may receive credit for course work mastered regardless of their ages or grade level.
- (4) Increased opportunity for academic exploration as a result of having more time to investigate courses of study or even careers.
- (5) Increased productivity, especially in careers where early contributions seem most important (see Lehman, 1953).
- (6) Increased time for careers.
- (7) More exposure to intellectual peers.
- (8) Greater economy through reduced time spent in school, as well as diminished need for teachers in gifted education.
- (9) Lower probability of monotony and boredom.
- (10) Increased achievement motivation.
- (11) Reduced probability that capable students will drop out, because they will be more motivated to achieve in academics.

(12) Development of appropriate work habits and avoidance of poor study habits that might suffice, but not adequately challenge, highly capable students.

(13) Avoidance of or solution to underachievement.

(14) Avoidance of conflicts with age peers who do not share academic interests and abilities.

The claims of hazards from acceleration can be roughly categorized under four major headings: (a) academic achievement, (b) emotional maladjustment, (c) disruption of socialization, and (d) reduction in extracurricular opportunities. Each of these areas describes a wide variety of concerns and is summarized below.

Academic Outcomes

(1) Accelerants will fail in the new setting because they will not be able to comply with increased academic pressures.

(2) Developmentally precocious children who are accelerated will slowly lose their advantage and eventually fall behind their older classmates.

(3) Accelerated students will have gaps in their academic preparation that may become more pronounced and severe as they go through school.

(4) Accelerants will be physically or emotionally too immature to compete successfully with their older classmates.

(5) Precocity is more apparent than real. Accelerants may demonstrate knowledge, but lack appropriate experience, and thus will be unable to handle mature themes and concepts at higher grade levels.

(6) Acceleration within the regular curriculum will not provide needed experiences for gifted students (e.g., independent learning, creative problem solving).

(7) Increased academic demands will force children to concentrate on mastery of the basic skills and knowledge presented in the regular curriculum and therefore fail to develop creativity and productive divergent thinking.

Social Adjustment

(1) Accelerants will sacrifice time to develop and to learn through play and exploration.

(2) Students who are accelerated will miss age-appropriate social activities.

(3) The development of friendships will be threatened because accelerated students' time and opportunities to socialize with same-age peers will be reduced and older classmates will reject them.

(4) Acceleration will reduce opportunities to develop social skills.

Emotional Adjustment

(1) Frustration from increased academic and social demands will cause stress and burnout.

(2) Reduced opportunities to form friendships will lead to isolation and antisocial adulthood.

(3) Diminished opportunities to develop extracurricular interests and hobbies will contribute to emotional difficulties in later life.

(4) Acceleration will not allow for the introduction of valuable and potentially therapeutic integrative experiences that are present in enrichment.

Reduced Extracurricular Opportunities

(1) Accelerated students will have fewer opportunities to participate in age-related extracurricular activities.

(2) Because of relatively immature physical development, accelerants will not be able to participate in varsity athletics.

For critics of acceleration, these hypothesized risks seem unwarranted. If acceleration is used to address

a mismatch between demonstrated achievement and curriculum, it ignores the deficiencies inherent in the curriculum itself. Furthermore, it also does not address other needs that gifted students may have. Acceleration is an intervention that may address what is only a temporary developmental anomaly. Finally, acceleration does not address the unique nature of the gifted student and does not expand offerings that are based on traditional views of the more average student.

The nature of claims and counterclaims about acceleration have been consistent, but researchers have addressed them only periodically and spasmodically. A great number of studies have accumulated on the effects of acceleration on academic and affective development, but variables from both domains have been defined so broadly and measured so diversely that consistent generalizations have been difficult (Cornell et al., 1991). Recent studies and comprehensive reviews, however, have provided some strong evidence about some of the effects outlined above.

A broadly inclusive meta-analysis of the effects of grade skipping (Kulik and Kulik, 1984) documented that accelerants did not suffer academic harm from the process. The accelerated students remained highly productive and maintained their academic advantages even in the new, more demanding settings. Those findings were consistent with major reviews (Daurio, 1979; Pollins, 1983) and a best-practices analysis by Rogers (in press). Southern et al. (1989a,b) found that few parents, students, teachers, school psychologists, and coordinators of gifted programs cited academic harm as a potential outcome from acceleration. Fears of academic harm as a result of grade skipping may have been laid to rest, provided that parents of the accelerants wisely strive to help their child become well adjusted socially and emotionally.

When considering early admission to school, however, there is considerably more controversy. Some researchers have linked early admission to increased failure and retention rates and even to referral and placement in special education (e.g., DiPasquale et al., 1980; Maddux, 1983; Maddux, Stacy, & Scott, 1981; Orbzut et al., 1984; Uphoff & Gillmore, 1985, 1986). Jones and Southern (1991) and Robinson and Weimer (1991) have pointed out the limitations involved in the research supporting such conclusions. School readiness literature in general suffers from a variety of methodological and procedural errors that make conclusions about academic harm from early admission problematic. For systematic studies with favorable outcomes, see Worcester (1956) and Hobson (1963).

The evidence concerning social and emotional harm is less conclusive. Cornell et al. (1991) have pointed out that assertions of no harm from the process of acceleration have not been proven. Among other things, they point to (a) a lack of adequately designed studies, (b) failure to examine dropouts and students who did not succeed in accelerative programs, (c) frequent reliance on case study methods and self-report data, both of

which are susceptible to bias, and (d) the large proportion of studies based on questionnaires and surveys with low or unknown reliability and validity instead of more rigorous psychological instruments. Regardless of the methodological problems and unaddressed questions, advocates of acceleration are put in the unfortunate position of having to confirm the null hypothesis—that is, the absence of harm. That criterion is an unusual one and cannot really be met. The null can be rejected in individual studies when relationships are observed at given levels of probability. Alternatively, the researcher may fail to be able to reject the null hypothesis because a relationship could not be observed at a specific level of probability. The null hypothesis itself cannot, however, be proven to be true. It may be rejected, or it may fail to be rejected, but tests of the statistical probabilities of relationships will never provide valid proof that relationships do not exist. Furthermore, human beings are subject to so many different conditions and influences that no one variable such as educational acceleration is likely to triumph over them all. Inevitably, there will always be some failures.

There are few if any adequately designed studies that document social and emotional harm. Rogers (in press) calculated a negligible effect in the areas of social and emotional harm. Kulik and Kulik (1984) decided against any meta-analysis of social or emotional effects because of the dearth of well-designed studies on either side. It is clear, however, that those who are convinced of the negative impact of accelerative options hold their beliefs tenaciously. Southern et al. (1989b) found that concerns about accelerative options most frequently centered on social and emotional implications. Many respondents were able to cite assertions from critics of acceleration, while few were able to cite studies by proponents. They maintained their concerns about social and emotional adjustment despite any awareness of empirical support and frequently without any actual experience with academic acceleration of gifted students.

There are several possible explanations. First, social and emotional development are much more nebulous constructs than academic achievement. Instruments that measure academic achievement are widely available, are fairly well accepted, and have excellent psychometric features. The same is not true of instruments that attempt to measure social development or emotional health. The definitions of these constructs vary from setting to setting and researcher to researcher. Informal assessment by teachers and parents is also less definite than with academic achievement. Teachers are accustomed to making judgements about the level of learning individuals achieve in classrooms. It is, perhaps, their most familiar daily task. Determining if a student has suffered from social or emotional harm is a much less familiar one.

Second, because acceleration is a practice that most educators believe should be used conservatively, its impact may be overestimated. If a student experiences difficulties after acceleration, it is likely that parents,

teachers and age mates will ascribe the difficulties to the acceleration (in logic, the *post hoc, ergo propter hoc* fallacy—after this, therefore because of this). Gagné (1981) has pointed out that, in most of the cases he studied, the problems encountered by the accelerant would probably have occurred with or without acceleration. Yet, because of the weight given to acceleration decisions, problems are attributed to the educational intervention. It is unfortunate that students cannot serve as their own controls. It is impossible to determine what would have happened should a particular student not have been accelerated. This might be approximated by using identical twins as the experimental subjects. Yet, such a study would probably not be feasible because of social and ethical concerns.

Third, it seems clear that assumptions about the effects of one type of acceleration will be generalized to other types. Children who are young-in-grade also will be presumed to be affected similarly by the academic and social/emotional demands, regardless of whether or not they were placed in higher grades or entered school early because of demonstrated precocity and maturity or for other reasons. Southern et al. (1989b) observed that educators rarely considered a difference in the effects of early entrance and grade skipping or reasons for a student's being young-in-grade. They also observed that educators claim to base their assumptions about the effects of acceleration on their personal experiences, but very few have had much experience with gifted accelerants. Instead, it appears that educators' conjectures are based on over-generalizations of the school-readiness literature and on their experiences with students who were young-in-grade, but probably not academically precocious. The school-readiness literature is generally concerned with the effects of being relatively young-in-grade and does not concern itself with selected populations of the gifted. Some of the more sensational fears have been applied to practices specifically for gifted students, and to acceleration procedures that are apt to be quite different from early entrance (Southern & Jones, 1991).

Fourth, much of the concern expressed over social and emotional adjustments among accelerants arises from a basic confusion about the term itself. Acceleration brings to mind the speeding up of a student's learning tempo, an external manipulation of student learning. The common usage of the word means to hasten, quicken, or rush through—perhaps with the use of some force. Common images of the effects of "rushing" are tripping, crashing, overheating, burning out, and missing the time to enjoy the trip. In reality, however, students are rarely "sped along." Furthermore, there is no evidence that accelerants are likely to miss out and then fall behind as a result of acceleration. In the light of common school practice, most acceleration decisions are undertaken solely to apply some administrative recognition to a student's prior achievement.

Early admission and grade skipping do not usually result from broad screening efforts by the district to

determine which students could benefit from instruction at a more rapid than normal pace (for an exception, see Hobson, 1963). On the contrary, parents, administrators, or teachers recognize the extraordinary achievements of individual students and refer them for some form of intervention. Consideration of acceleration options generally occurs because of concerns that the student will not have access to any new learning opportunities in the current placement, or because the student may be showing signs of maladjustment in the current setting, which then is interpreted as a sign of boredom. Acceleration options are rarely used without extensive assessment of the student and the learning environments, or without consultation with the parents, teachers, and students. The result is a rather conservative use of acceleration options. Generally, students who are eventually accelerated already are performing at the upper limits of the new settings as well.

Clearly administrative in nature are options such as concurrent enrollment, Advanced Placement, credit by examination, or correspondence courses. Each of these has built in a product or examination that documents achievement so as to reward learning with the appropriate level of recognition. Pacing is not external in these options and they do not entail separation from age peers or the normal curriculum of schools. Options such as continuous progress and self-paced instruction are rarer. Still, they do not entail external manipulation of rate or pacing. By definition, they occur at rates determined by the student's interest and ability. Moreover, these options are most frequently employed in settings that retain contact with same-age peers.

There are some options that, on the surface, appear to involve manipulation of the pace of instruction. Curriculum compacting, telescoping curriculum, and extracurricular options like fast-paced math courses do imply external manipulation of the curriculum. Some of these programs use a purposeful search for likely candidates for the process, raising the specter of misidentifying students and endangering their social or emotional welfare. In fact, these options are generally firmly based on prior student achievement, and the amount of differentiation may be very small.

Fast-paced classes, for example, are most often extracurricular, offered away from the regular classroom. Students self-select for participation and are usually in class with other same-age peers. It is only when enough of these classes have been completed to qualify the student for admission to higher level of schooling that salient differentiation takes place. In this case, a long history of successful achievement precedes any placement outside of the normal age and grade. Students who qualify for such classes through the SAT or similar tests of academic achievement are not under great risks for inappropriate pacing. Though their achievements are gained through extracurricular experiences, it is learning documented by their test performance. The criteria for such selection of applicants is set so high as to preclude

all but the slightest chance of including students who would not be able to cope with the demands of a fast-paced instructional program.

The process of telescoping is also probably less drastic than it might at first appear. Although having 3 years of instruction collapsed into two may suggest a very rigorous academic effort, telescoping is most frequently employed for larger groups of students. Thus, a substantial group of age-level peers accompany each other through the process. The grouping not only provides for peer support, it also limits how extreme the effects of accelerated pacing will be. In high school, unselected students often complete all requirements in 3½ years or less, entering college 6 months to a year ahead of schedule with no apparent ill effects. Also in senior high school considerable homogeneous grouping is achieved "naturally" via the elective course structure (e.g., chiefly academically able students take physics, calculus, Latin, etc.). Telescoping is frequently applied during the middle grades. The history of curriculum development in the United States has helped insure that ill effects during middle school are unlikely. Tye (1984) states that one major purpose of both middle schools and junior high schools is to reduce the pace of instruction to allow students time for social development and to allow slower students to consolidate basic skills before high school. Hence, the expectation for academic achievement in the middle grades may be generally lower than in either elementary school or high school.

Options that place students in higher levels of education (e.g., early admission to high school or college) impose very different environments on students. However, once again, it must be pointed out that students who receive such interventions are generally selected because of an observed remarkable performance. Educators do not make a practice of initiating efforts to find prospective candidates for early college entry.

Since acceleration is not a process of speeding students along, some of the research outcomes and many of the assumptions of proponents and advocates need to be reexamined. In the first place, the outstanding achievement of accelerants in their new placements should be viewed in the light of the probable large initial advantage most will have even in the accelerated placement. That large advantage also may explain some of the results that purport to show adjustment or maladjustment in accelerated populations. The high degree of difference from age mates observed among students who are candidates, rather than the accelerative intervention itself, may be responsible for perceptions of difference in social adjustment.

Oponents and advocates of acceleration should also realize that describing acceleration as a process of intervention is probably inaccurate in most cases. The pace of curricula and instruction are manipulated relatively infrequently. Instead, in most options, the student is placed in a setting that merely recognizes what the student already knows, and does not accurately reflect his or her potential functioning.

That is why SMPY urged from its inception that admission to special, academic, accelerative supplemental courses for mathematics and science be based on clear evidence of superior quantitative reasoning ability or clear evidence of superior verbal reasoning ability for the verbal subjects. In fact, for most such programs only these abilities are required—not grades earned in school, teachers' recommendations, etc. The usual minimum score levels are, before age 13, at least 500 on the mathematical part of the College Board Scholastic Aptitude Test (e.g., SAT-M) or 430 on SAT-Verbal. Each of these two score ranges (500–800M and 430–800V) defines approximately the top 1% of 12-year-olds.

Ironically, the extreme levels of concern about social and emotional development connected with acceleration may actually cause difficulties. The rarity of employment of accelerative options makes those who do undergo the process appear less normal. Parents, teachers, school psychologists, and administrators agonize over decisions about accelerative options; this can communicate to students that there are tremendous dangers inherent in moving ahead of age mates. After the decision is made to employ an accelerative option, students may be carefully monitored in an attempt to determine if harm is taking place. All this communicates to students, peers in the new placement, and teachers that there may be potential consequences to acceleration that threaten the accelerant's social or emotional well-being.

It seems clear that much of the debate over acceleration and enrichment arises not from the merits of either, but from the protagonist's assumptions about the natures of both giftedness and school bureaucracy, and the prevailing currents of political and social demands. In fact, the implication that acceleration and enrichment are antithetical, even that they could be set in opposition, is naive. A number of authors (Davis & Rimm, 1988; Feldhusen, 1991; Kitano & Kirby, 1986; Stanley, 1979a; VanTassel-Baska, Feldhusen, Seeley, Wheatley, Silverman, & Foster, 1990) have pointed out that these processes overlap considerably, both theoretically and in practice. If enrichment is viewed as stretching the curriculum to a greater breadth or depth than normal, it is likely that elements contained in the original will be part of the revised curriculum for some school level. The curriculum can be pictured three-dimensionally as a funnel with the spout representing the entry point of school. Academic options are relatively narrow and more focused in early elementary years. Later, the funnel widens to encompass more areas of study. In the same way the curriculum in schools widens enormously. In fact, by the graduate level in college, nearly any field of human inquiry is included.

Those who advocate enrichment would be quick to point out that it is not their goal to supplement normal curricula with subjects totally outside any purview of study. The analogy is not meant to trivialize the concerns of those who would point out limitations in the standard curriculum. On the other hand, it is important to note

that any enriched curriculum is likely to include some significant measure of accelerated schooling. If a fifth grader is interested in genetic engineering, it is likely that pursuit of that interest will require knowledge and skills normally taught at higher levels of education. If a junior high school student engages in an independent project and works with local government officials, it would be difficult for her or him to avoid learning concepts of political science normally presented at the high school or even the college level.

Moreover, describing acceleration as simply more rapid progress through stultifying and trivial curricula is equally erroneous. It would be nearly impossible to progress through higher levels of any discipline without teaching the processes by which professionals in that discipline operate. This is particularly true of accelerative elements in secondary and post-secondary study. Accelerative options will eventually entail many of the processes most closely associated in the literature with enrichment, such as independent study, productive and critical thinking in the discipline, and higher-order thinking skills.

It is possible to imagine enrichment options that operate merely to hold students at grade level, regardless of their abilities to learn more. Schools sometimes place a high priority on the maintenance of bureaucratic convenience at the expense of serving the individual needs of the child, or believe strongly in the nativity of intelligence and development (Shepherd & Smith, 1986; Smith & Shepard, 1988; Jones & Southern, 1991). It is also possible to conceive of accelerative options that merely provide students with more rapid pacing of academic monotony or demands that emphasize only knowledge acquisition at the expense of application, analysis, or synthesis. While conceivable, these outcomes remain ones that require an almost malevolent, or at least stupid, intent. Enrichment that answers the goals and objectives of those who originally advanced the process for students will invariably contain elements that are accelerative. Acceleration that provides students appropriate learning experiences will also contain many of the elements that are touted as the strengths of the enrichment paradigm.

Research efforts to date have weakened the apparent dichotomy some advocates present. It is ironic that reviewers have pointed out the relative lack of evidence for the effectiveness of acceleration options. Slavin (1990) asserts that accelerative options have demonstrated only comparative effectiveness. It is unclear, in his view, whether acceleration offers clear benefits over other potential interventions in meeting the needs of gifted students. Moreover, proponents of acceleration, in their zeal to prove the processes involved are harmless, have neglected to look at potential differences among various kinds of gifted learners and how they may be affected by accelerative programs (Cornell et al., 1991). Advocates of enrichment are similarly indicted. Apparently as a result of being stung with complaints that enrichment is ineffective (Daurio, 1979), they have

concentrated on demonstrating academic gains at the expense of presenting evidence of other potential benefits for gifted students. Both sides have concentrated on the charges of the other rather than documenting the elements of each approach that can benefit specific types or the wide range of gifted children.

International Developments

What is to be learned from the American experience in this debate, and how does the debate take shape in other countries? Perhaps the most important lesson is that provisions for gifted and talented children are informed less by sound educational research than by broad generalizations of educational research, prevailing presumptions of common sense, extrapolations of personal experience, folk lore, and political agenda. These in turn are usually driven by the financial and social exigencies operating at the time. For any society, such demands will include the following themes: (a) the commitment to providing access to education, (b) the definition of basic education within the context of that society, (c) the resources made available to fulfill opportunity of access, (d) the social concern for the exploitation of talent as a national resource, (e) the degree to which schools function as gatekeepers to access higher levels of achievement, and (f) the general appeal of egalitarian social values. These factors will interact with each other to characterize the efforts that societies will take toward developing acceleration and enrichment options.

In societies where educational opportunities are limited by class access, by economic resources, or by a strongly perceived need to exploit talent, debate over options for the gifted will be moot. The same will be true in societies where the school is seen as a source of wisdom or as gatekeeper for access to higher social and economic status. In these societies, individuals with access are privileged. The debate does not concentrate on the nature of instruction. Instead, it focuses on the limits of access to instruction. In countries where the school is regarded as an instrument of upward mobility and where values for universal access prevail, debate over options for the education of gifted students is likely to occur. As in the case of the United States, transient economic and social forces may, however, intensify or quell the debate for some time. When a nation feels that its standard of living is threatened, efforts to provide universal access may be traded off in favor of exploiting talent, just as concerns for individual liberty may be set aside while efforts are made to bolster national security in times of peril.

For educational systems in many developed countries, class concerns and the schools' responsibilities may combine to limit access to all levels of education. In these instances, debate about educational provisions for the gifted will be notably subdued. In Great Britain, for example, relatively few students have access to the

highest levels of post-secondary training. The debate in the United Kingdom and in countries adopting a British model has devolved to one of class access rather than forms of programs available. In third-world countries, scarce resources have limited the number of educational options for the population at large. Debate over the type and variety of programs for the gifted is similarly limited, but for different reasons. When only a small number of citizens can receive education of any kind, and access becomes more limited as the level of education increases, questions about the nature of the educational experience diminish in importance.

Of course, there are areas where both conditions exist. South Africa and Venezuela are notable examples. Depending on the perceived need in these countries to develop talent that can compete with industrialized nations, concerns for the education of gifted students will differ. Many third-world countries and many nations in the former Communist bloc have gone through major commitments to exploit talent. The commitment to develop talent seems to be a paradox in an egalitarian Marxist system, but it remained a central tenet of much of the Communist bloc. The additional privileges and advantages that accrued to those whose talents were identified and developed were accepted as the Communist countries cast their efforts to develop resources in terms of a struggle for their existence.

Some nations have a heritage that provides a history of limited access, but also have major commitment to an egalitarian revision of those historic strictures. Australia, Canada, and New Zealand have had educational systems adapted from an English model. Today, however, these former British colonies generally have a goal of universal access and more egalitarian attitudes toward social mobility. In some cases these commitments are limited by economic resources. In others, it is limited by the weight of traditional views of the schools' role as a limiter of upward mobility. In some of the East Asian democracies, strong commitments to a view of schools as a repository of cultural orthodoxy (another manifestation of the role of school as gatekeeper to social mobility) governs some elements of the debate. For Japan, the development of talent as a national priority often conflicts with official commitment to provide open access to public school education. In Singapore there have been major commitments to talent development. The demand for the exploitation of human talent resources has far outweighed concerns for preservation of class. It has been accomplished largely through the the power of leaders to arbitrarily effect educational changes and there has been little debate about the form such educational programs will take.

While it is not possible here to describe more than a few national attitudes toward programming options for the gifted, some representative cases might be helpful. The background and educational history of Britain and Japan will be reviewed, and the implication for accelerative and enrichment options will be examined. A brief review of notable applications will follow. Finally,

in the conclusion we shall discuss reasons why, despite ongoing debate, accelerative options are more easily employed in the United States.

Britain

Through its once vast empire, Great Britain's education system became the most influential model in the world, adopted in widespread British colonies and possessions. Attitudes and beliefs about the purpose and role of education that are inherent to the British model were also distributed throughout the world. With independence, some former colonies have attempted to reform their adopted education systems. Several initiatives to reform the system have occurred in Great Britain also. The reforms, however, have not removed the effects of fundamental beliefs about the role of education. It is instructive to examine Britain's attitudes and the forces that interfere with recognition of the needs of gifted students.

In order to understand the attitudes of the British toward special provisions for the gifted and talented, it is essential to recognize that, for much of its history, the British education system operated as a major element of the class system. Education in general, and higher education in particular, were only gradually made available to middle and lower class social strata. University education was the province of upper class families (Furneau, 1962). The Education Acts of 1870 (the first attempt to mandate compulsory education) and 1902 established a system of elementary and secondary schools funded from local taxes (rate funded) that were very specifically organized to educate lower class children (elementaries) and middle class children (secondary). These options were provided as terminal educational opportunities (Simon, 1990). They also were intended to provide differential educational methods for each class. One of the principal authors of the 1902 Act writes that "The different classes of society, and the different occupations, require different teaching" (Simon, 1990, p. 24).

The social upheaval of two world wars placed demands on the system to open advanced educational options to lower and middle class as well as upper class children. The Education Act of 1944 was a commitment to opening larger opportunities for lower and middle class children. It provided for a three-tiered set of options that tracked students to university preparation, general preparation, and technical/vocational preparation. Students were selected for tracks on the basis of a test of potential aptitude, the "Eleven Plus Exams." Students from upper class and upper-middle class backgrounds scored markedly higher on the examinations than working class students, and, thus, accounted for most admissions to university preparation programs and to the universities themselves (Fleming, 1962). As a practical matter, the reform did little to open access to university education. Gradual disenchantment with the examinations, and the

rise of comprehensive schools, which rejected tracking by examination, eventually led to the decline of the predictive examination model. Since the 1960s, there has been strong popular mistrust of efforts which appear to track students early.

Unlike the United States, the British system maintained restricted access to higher, even to upper secondary, education. In 1987 only 18% of all 16–18-year-olds were enrolled in educational options (Simon, 1990). The proportions of British youth who enroll in post-secondary education are far lower than in either the United States or other nations of Western Europe (Simon, 1990). In 1960, applicants outnumbered admission places in universities by a factor of 20:1 (Fleming, 1962). Subsequent growth of university enrollments has increased and new universities have been founded, but demand still far outstrips the supply of places (Simon, 1990). To some extent, this restriction is explicable in economic terms. University is free for British students, so expanding access involves large central government support. British policy makers have been willing to open universities without cost to all students who qualify for admission. They have been unwilling, however, to provide sufficient funds either to expand post-secondary education or to put secondary schools in working and lower middle class districts on more equal footing with schools in more advantaged areas. In Britain, the university is one of the key institutions for the preservation of culture, and culture is clearly perceived to be for the minority (Simon, 1990).

Despite the initiatives of the Education Acts, Britain has had a strong tradition of local control. The extent of curricular offerings and the level of educational offerings are determined by Local Councils responsible for determining the ranges and levels of education programming and for funding those efforts through local rates. Parents who feel that locally supported school offerings are insufficient have two options. They can apply for scholarship support to attend a grammar (i.e., academic public high) school, or they can opt for private (called “public”) school. Access to the scholarships is limited, so only those who could afford it could avail themselves of private schools. The Education Act of 1988 aimed at imposing a national curriculum that would standardize offerings and set national standards for education. In addition, a series of competency tests was planned to be given to students at various age levels. By 1992, standardization of funding and of the initial curricula had been put into place.

Historical developments and traditions have limited recognition of the special educational needs of the gifted. First, limited educational access for lower and middle class students to academically oriented schools resulted in relatively limited opportunities for advanced education. Since the educational system is generally perceived as catering to an elite, there is less demand to review its suitability for populations of gifted students.

Second, the intense debate over tracking through differential levels of schooling and predictive examinations has left the public and liberal education theorists with a severe wariness about procedures that remove students from mainstream education. One of the few British texts about the education of the gifted (Freeman, 1979) concludes that most gifted children can be well educated in heterogeneous groups, and that exclusive attention to academics may result in harm to a gifted child’s social and emotional development. Gallagher (1985) suggests that in Britain grouping of any kind is viewed with distaste, but sentiment toward enrichment in regular classes is more favorable. Understandably, efforts like the Westinghouse Science Talent Searches or the SMPY model of Stanley and associates have not been received enthusiastically. Currently, students are grouped almost solely on the basis of chronological age. Progress from one grade to another and one level to another is age-based. Any provision made for individual differences comes from additions to the curriculum presented to all students, rather than varying of presentation or pacing (Freeman, 1979). The practical outcome of the suspicion with which ability grouping is viewed has stifled the development of accelerative options of all kinds.

Third, the establishment of a national curriculum may provide new impetus for examining the needs of gifted children. As curriculum is standardized, it may be more apparent that academically able students exceed the current level of demand for each grade. This will be particularly true if expansion of post-secondary options occur and expectations for higher educational attainment become more general. The impending connections with other nations of Western Europe in the European Economic Community (EEC) may serve to expand such expectations. Until and unless this happens, limitations in the number of post-secondary placements currently being experienced in Britain eliminate options for some students to progress more rapidly through the school curriculum. If few such places exist, it is unlikely that increasing the competition for them will be met with enthusiasm.

Finally, Britain represents a tradition of education as a social-status gatekeeper that is present in many areas of the world and limits concerns for the special needs of the gifted. Where access to education is limited for any reason, concerns about the gifted will be secondary. Ironically, the reaction to a class-dominated educational system arising in the 1950s and 1960s is also a factor that limits support for programs for the gifted. Many of the debaters who campaigned for maintaining separate (generally upper class) levels of education used the needs of gifted children to buttress their arguments. This has left a residue of distaste in the mind of those who wish to liberalize education in Britain. There the needs of gifted children are associated with elitist arguments. Where countries have attempted to widen

the educational mission from a legacy of aristocratic or oligarchic dominance, resistance to serving such a group may be expected.

Japan

As Japan has emerged as a dominant industrial and economic power, its system of formal education has attracted increasing attention abroad. In 1868 the Meiji Restoration rejected feudal systems of the Tokugawa era. Since then, formal education has occupied a crucial and rather obvious role throughout Japan's modernization and development (Beauchamp, 1991). Shimahara (1992) argues that, more than in any other nation, Japan relies on its educational system to build its industries, to modernize culture, and to foster the moral character of its children. Japan's emergence to preeminence in world economics has generated a great deal of attention to its educational system. Numerous articles and books have been written about various aspects of Japanese education, but very little has been written about provisions for the education of gifted students. The forces that shaped the Japanese system of formal education have contributed to accommodation for its most precocious students that differ enormously from those of European and American education systems.

All Japanese children, except those with the most profound disabilities, have access to formal education in the primary and lower secondary grades (Jones & Jones, 1986). More than 94% of the high school age students enroll in upper secondary schools. Ninety-seven percent of these graduate from high school. Of the high school graduates, more than one-third enter colleges or universities, and 90% of the university students graduate (Shimahara, 1992).

Access to the Japanese educational system is open, but progress through it is meritocratic—particularly in the transitions from secondary schools to universities. Social mobility and career options are largely decided by the university from which one graduates. Entrance to one of the most prestigious universities virtually guarantees entry to a good career. Thus, the goal for most secondary students is to gain entrance to the most outstanding college or university possible. Higher education in Japan is stratified, and over the last 30 years access to the best institutions has become dramatically more competitive.

With the exceptions of Keio and Waseda Universities, the most prestigious universities are public institutions. Although access to higher education expanded substantially in the 1960s and 1970s to meet the enormously increasing demand, virtually all of the expansion was provided by private universities and colleges. The national universities barely increased their enrollments. Although the Ministry of Education intended that resources should be concentrated in order to effectively develop talent, the result has been a dramatic escalation of competition and excessive emphasis on entrance examinations.

Performance on entrance examinations is generally the sole criterion for acceptance to public and national universities. Since entrance to these prestigious institutions is sought by so many students, the competition is extremely keen. Most of the major universities have their own entrance examinations that supposedly emphasize content most appropriate for their goals. In consequence, preparation for examinations is not the relatively simple matter of becoming acquainted with the general content and format of one or two entrance examinations. Students begin preparing for these examinations very early in their school careers. Public schools are required by law to provide a standard curriculum to all students without tracking groups of students or providing special instruction for individuals. Individualization of instruction, whether by content or pace, conflicts with the strongly held principle of egalitarian schooling. Thus, the academic needs of precocious students must be met outside of public school.

Options to enhance individual learning include private after-school instruction or *juku*, full-time private schools, and *yobiku* the special schools where high school graduates spend a year preparing for their examinations. Participations in these options is broad. Since success is attributed more to diligence than native talent or ability, families of average as well as gifted students will commit themselves to one or more of these options, if they have the financial means. The competition to gain access to the better preparatory schools and private schools is also competitive. The most capable students will seek out and will sometimes be sought by the schools that have records for preparing students to enter the most prestigious universities and colleges.

When they enter special schools, students are assessed and tracked according to their abilities and levels of prior achievement (August, 1992). Thus, special schooling for the most capable Japanese students could be described as accelerative. No acceleration, however, is provided in the public education system. The Central Council on Education, an advisory council established in 1952 to advise the Japanese Minister of Education, has proposed nongraded schools and grade skipping to accommodate the needs of precocious students several times, but those recommendations have been totally stymied (Schoppa, 1991).

For several reasons, enrichment programs for gifted students are generally not provided. First, the Japanese have committed to a standard basic curriculum for elementary and secondary schools. Proposals to diversify secondary curricula have been only partially implemented, and were never intended to provide accommodation for gifted and talented students. Second, enrichment programming for gifted students would be antithetical to the way egalitarian values are perceived in the Japanese education system. Third, as long as the pressures to compete for university entrance are as great as they currently are, it is unlikely that parents will seek programs that divert their children from study

of skills and knowledge that are evaluated by entrance examinations.

To date there has been only grudging official acceptance of the need for differential education for gifted students. Private options have developed to enhance the level and pace of instruction, basically through extracurricular options. A parallel might be drawn with the education of American students who have special talents in art or music. Challenging these students is most frequently done through private lessons and tutoring. In Japan, the strong rejection of class and status values, the role of pre-university schooling as a conservator of social values, and the centralized control of public education have led to a very rigid curriculum. In combination with very specific and highly competitive demands of university entrance examinations, these factors have effectively prohibited the public schools from meeting the needs of gifted students.

China and the Talent Search

One of the world's leaders in both educational acceleration and educational enrichment, especially for mathematics and science, is the People's Republic of China. Through its many talent searches and "Spare Time School" for the most intellectually talented students, which usually meet on Sundays, it has risen to dominate international high school competitions. In the 1992 International Mathematics Olympiad the PRC scored far ahead of anyone else among the more than fifty nations contending. Its margin over the second ranked (the United States) exceeded the margin by which the second place exceeded the tenth. The PRC was also No. 1 in both the International Physics Olympiad and the International Chemistry Olympiad. These achievements are due to diligent searching, intensive and long-term training, and the human resources of a country that has more than a billion inhabitants. Apparently, the Communist ideology of equality is transcended in the PRC by the desire to show the rest of the world how effective its educational methods are.

The PRC has become hospitable to grade-skipping for its ablest youth, more than are the United States or most other countries. In 1986, one of the authors (Stanley) spent a week on the campus of the University of Science and Technology of China (USTC) in Hefei, Anhui Province, interacting with about fifty truly extraordinary, markedly underage college students. He was assured that they were among the ablest boys and girls in the country. Their graduating from the UTSC four or more years early and becoming excellent graduate students in the United States and elsewhere testify to the quality of their selection and education.

Many members of SMPY's "700-800 on SAT-M Before Age 13 Group" (equivalent to the top 1 in 10,000 12-year-olds in the United States), live in the PRC. It is easy to locate such talented students there, because they are numerous and Chinese teachers and professors

cooperate fully in finding them. For a discussion of such searches see Stanley, Huang, and Zu (1986) and Stanley, Feng, and Zu (1989).

Stanley has found it extremely difficult to export to countries other than the PRC the essence of his search for youths who reason exceptionally, or even extremely, well mathematically. He has tried in Taiwan, Japan, South Korea, Singapore, Costa Rica, Spain, Germany, and elsewhere. There have been some advances in Germany, Taiwan, and Spain, but nothing to rival the rich responses from Shanghai, Beijing, Tianjin, and Nanjing.

Australia and the Talent Search

A bright spot in these respects at present seems to be Gross's work in New South Wales, Australia where she is training teachers of the gifted in acceleration principles and procedures. This seems to be creating possibilities for various kinds of educational acceleration in New South Wales and possibly in other Australian states.

Her interest in mathematically precocious youth may have been engendered initially by observing the almost unbelievable precocity of Terence (Terry) Tao of Adelaide. At age 8 he scored quite high on the Australian mathematics examination for entrance to the university, but did not enrol at that time. Stanley had the SAT-M administered to Terry when he was still 8. He scored 760, equal to the top 1% of male college-bound high school seniors in the United States. That is the Study of Mathematically Precocious Youth (SMPY)'s all-time age-score record. At age 10 Terry won a bronze medal in the International Mathematical Olympiad (IMO) competition. At age 11 he won a silver medal. The day before his 13th birthday he earned a gold medal (Stanley, 1989). That, too, is probably the all-time record for the IMO.

By the fall of 1992, Terry (born 17 July 1975) had earned the regular and the honor's Bachelor's degree and a Master's degree in mathematics from Flinders University in Adelaide and become a graduate student of mathematics at Princeton University in the United States. Even in egalitarian Australia Terry had been allowed to proceed at essentially his own appropriate level in each school, attending both high school and college at the same time. Several persons such as Stanley, Gross, and Professor M. A. Clements took a keen interest in him and helped his parents plan effectively for his academic, social, and emotional development. (See Tao, 1992, a book Terry wrote at age 15.)

Other Examples

A third example, even more unusual in some respects, concerns a 12-year-old Guatemalan boy of Indian and

Chinese parentage who was sent by the Bank of Guatemala to Baltimore to work with Stanley toward high school and college education. He scored 730 on SAT-M, even without being proficient in English. (The average college-bound male high school senior in the United States scores less than 500.) By age 17 he had earned a high school diploma from a fine independent school in Baltimore, Maryland, and also, concurrently, a Bachelor's degree in mathematics from a parochial liberal arts college, where he was regarded as being exceedingly brilliant.

The Guatemalan youth is not the only example of concurrently earning the high school diploma and a college degree. About the same time, an American boy of Taiwanese parentage received his diploma from an independent high school in Baltimore and his Bachelor's degree in biomedical engineering from Johns Hopkins University, both at age 17. He then enrolled in the Massachusetts Institute of Technology (MIT) and started as an undergraduate in a different field.

Acceleration and Educational Administration

Despite these examples, acceleration seems relatively rare in most countries compared to the United States. Standardized curricula, limited resources, and centralized control over instructional practice effectively eliminate options. In the United States, educational acceleration is more feasible than in most other countries because of the decentralized nature of education there. Below the college and university level, the educational unit that controls most curricular policies is the school board of the county, city, or school district. Each state and the U.S. government exercise some control, but usually only in general ways. Much of the power to decide about acceleration rests in the hands of the head of the individual elementary or high school, i.e., the "principal" or "headmaster."

State colleges and universities in the United States do have some external control. It typically comes, however, from an appointed Board of Regents that has the well-being of the university firmly in mind. Most private colleges and universities are largely on their own, although some (especially Catholic ones) still have ties to churches. Many institutions of higher education have a great deal of latitude as to which applicants they may accept. For example, Johns Hopkins University has never required a high school diploma of any applicant. Thus a student completing the eleventh grade is free to skip the twelfth and enter Hopkins as a regular, full-time undergraduate a year early if he or she wishes and the university's admissions committee is suitably impressed by the applicant's credentials.

Two Johns Hopkins graduates (B.A. degree in quantitative studies and B.A. in physics) illustrate this. The former skipped grades 7, 9, 10, and 12 and received his degree the month he became 17 years old. The latter skipped grades 6, 7, 9, 10, and 11 and received his degree

with several major honors at age 15 years 7 months, the youngest graduate the university has ever had since it awarded the first three Bachelor's degrees in 1879. The former became a full professor at a top university at age 31. The latter earned his Ph.D. in biophysics at a leading graduate school and is a postdoctoral fellow. Both seem well adjusted socially and emotionally.

SMPY does not recommend "radical acceleration" as a general policy (Stanley, 1989), but believes it should be available to those who are eager to move ahead extremely fast in this way. For most intellectually brilliant students, however, SMPY recommends only a year or two of grade-level acceleration, if any at all. It is crucial to get a fine liberal arts education along the way, rather than to emphasize mere speed through a part of the curriculum. Availability of the College Board's Advanced Placement Program, with its twenty-nine college credit examinations makes hurrying through the grades less necessary and, in SMPY's opinion, much less desirable than when the program started in 1971.

One of SMPY's "protégés" completed eleven Advanced Placement Program examinations and some college courses on a part-time basis before entering the Massachusetts Institute of Technology a year younger than average. In 4 years, by age 20, he had earned four Bachelor's degrees concurrently in electrical engineering and computer science, economics, mathematics, and physics. Was he "accelerated," or was he "enriched"? Obviously, that is a foolish distinction to try to make in this case. Quite likely, via this combination of enrichment and acceleration, he was exceptionally well educated and trained. That is the appropriate motto: enrichment and acceleration, not enrichment vs acceleration. If appropriately done, acceleration must be enriching, and enrichment must, in the long run at least, be accelerative. The title of a book by George, Cohn, and Stanley (1979) emphasized this symbiosis: *Educating the gifted: acceleration and enrichment*. The opposition implied by "versus" should be consigned to the junk pile of harmful stereotypes where it belongs.

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Instructional Strategies and Models for Gifted Education

DAVID R. GEORGE

Educational Consultant and President NACE, U.K.

Introduction

As the Year 2000 approaches, education throughout the world appears to be going through a major revolutionary change, a revision of the objectives of education. Today it is proclaimed that our schools exist for learning. There is greater emphasis on how to control teaching the essential three R's of reading, writing and arithmetic and in addition, safeguarding the environment. However, with the knowledge explosion it is increasingly important that future schools be designed not only for learning but for thinking. Increasingly, schools are being asked to produce men and women who can think, who can reason, who can argue, who can make new discoveries and serve and solve society's problems. If educators can succeed in incorporating thinking skills, democratic values, problem solving and related concept skills into the curriculum for all students, then the products of our schools will improve greatly.

This new interest has been influenced by the following factors, among others. Firstly, psychologists have become increasingly interested in the functioning of the human mind. In their efforts to understand how the mind works, these professionals discovered that some individuals in society are endowed with performance potential that is over and above what the average child in society possesses.

Secondly, education has been realized as one of the inalienable rights for all individuals. This fact prompts governments to make sure that all children are presented with the most relevant education. This also calls for the most appropriate method of teaching important but different groups of individuals.

Thirdly, in modern societies, certain necessary specialized services are identified from time to time. These services may require people with very high intellectual abilities for example. For such cases, society has a duty to identify those individuals who are endowed with particular high abilities to perform specialized services. For instance, some countries have established educational institutions to admit and educate individuals with high potential in science and mathematics to help meet society's need in those specialized areas.

Fourthly, the belief that education is one of the inalienable rights of the individuals in our society

implies that the cost of running schools is normally high for any government. It has also been discovered that children with a more than normal potential ability take a shorter time to learn certain tasks than average and handicapped children. If the government is able to identify children with more than potential abilities, it may end up spending less money on them.

Fifthly, some social scientists have discovered that children will engage in anti-social behavior for lack of anything better to do. These are children who, because of their high potential ability, take a shorter time to accomplish certain tasks than does the average child. In a classroom situation, such children may resort to making mischief because they are often idle or bored. Thus, it is important to identify these children and provide them with challenging classroom opportunities.

Sixthly, scholars are interested in understanding the nature of human beings, and particularly the limits of their intellectual potential.

Finally, educationalists are agreed that it is every child's right to go as far and as fast along every dimension of the school curriculum in order to reach their considerable potential. This is one of the major aims of education.

It is essential to continue the search for powerful ways to provide appropriate education for the unique needs and abilities of gifted children and to bring the results of that search into general education so that all children have the opportunity to reach their highest potential. Although the emphasis here is on all children, that does not mean to imply that all educational experiences for gifted children are good for all children for there must be an understanding of the differences in content, process, and product presented to the teacher by these unique children. It does mean, however, that educators have an obligation to enrich and involve the education of the community so that all children, regardless of their abilities and needs, will have appropriate educational experiences that best support these needs and abilities.

Having suggested that every child is entitled to the best program, the greatest love and respect as well as the most attentive care, then the case has to be made that these gifted children have special needs and require special programs. Although there are many choices, there are systematic ways to plan and organ-

ize the learning experiences and choose appropriate educational materials. There is no single method of providing for gifted children. Before discussing the various models available, it is advisable to consider the following questions:

- (1) Does the method emphasize the acquisition of a higher order thinking skills and concepts?
- (2) Is the method flexible and open-ended enough for the child to develop at his/her own pace?
- (3) Does the method provide a learning environment as emotionally protected as it is intellectually stimulating?
- (4) Is the method likely to alienate a child from the peer group?
- (5) Will the method be detrimental to the child's subsequent learning, introducing factors which will inevitably be repeated later which could consequently lead to boredom?
- (6) Does the method chosen provide a process which is more valuable to the child, rather than a product which is prestigious to the school?

These are just some of the questions parents and teachers should consider before adopting a model. All teachers employ techniques and delivery systems in the classroom to provide appropriate curricular for gifted children. Most instructional strategies have value in working with the gifted, but those that allow for more open-ended, interactive and generative learning behavior are probably most beneficial.

In the past two decades, the debate about curriculum development for gifted programs has been in response to the general question: what type of differentiated curriculum is appropriate for gifted students? As might well be expected, this question evokes a variety of responses, reflecting widely disparate philosophies and definitions of the term "gifted students." In spite of the progress that has been made in improving the quality of service available especially in the United States of America, designing appropriate curricula for the gifted is still problematic. In addition, there is still a great deal to be done in teacher training and in order to prepare teachers adequately for serving the needs of gifted children. Training programs require a healthy balance between the theoretical and the pragmatic. In the area of theory, publications have provided background material to aid teachers in the development of curriculum. A variety of paradigms have been proposed, ranging from Renzulli's, "Enrichment Triad Model" designed as a basis for gifted education programs to Guilford's (1967) "Structure of the Intellect" which provided a variety of thinking processes. Other texts such as, Davis and Rimm (1985), Gallagher (1985) and Clark (1992) have presented a broad overview of the field of gifted education emphasizing the needs and nature of gifted education and suggesting ways and means of meeting the diverse ways of these students. Still others have presented individual strategies such as thinking skills, creative problem solving, values clarification and simulations for use by teachers of all levels of education.

This chapter provides a review of available program structures that can be used for the benefit of gifted individuals generally and deals with the tasks of setting goals, developing standards and writing plans appropriate to individual children's needs. Following this, strategies for developing and implementing individualized and differentiated curricular are discussed by presenting a variety of models which could be synthesized to develop curricula to meet the needs of gifted children with special focus on integrating human functions in the process. This includes ways of developing responsive learning environments, strategies for an integrating learning approach and ideas for extending the learning into the community. Finally, there is a discussion on the future role of research in this area.

A model can provide a useful theoretical framework within which enriched activities can be planned and the following summaries are aimed at helping to make decisions as to what programs to propose to any group of students in any single school as well as pointing the way for future research. Program planners would consider all of these models along with more specific strategies which will be discussed later in this chapter.

A teaching-learning model is a structural framework which serves as a guide for developing specific educational activities and environments. A model can be abstract and highly theoretical or it can be more practical and structured. Regardless of how theoretical or practical, distinguishing features common to teaching models according to Maker (1982) are:

- (1) Identifying purpose or area concentration;
- (2) Underlying explicit and/or implicit assumptions about the characteristics of learners and the teaching/learning process;
- (3) Guidelines for developing specific day-to-day learning experiences;
- (4) Definite patterns and requirements for these learning activities;
- (5) A body of research surrounding their development and evaluation of their effectiveness.

Bloom's Taxonomy (1956)

Much of the work in types of objectives to be taught comes from the Bloom Taxonomy of Educational Objectives model and suggests that teaching involves six levels, progressing from lower level thinking to higher level thinking. The levels are knowledge, comprehension, application, analysis, synthesis, and evaluation. In teaching gifted students the teacher should try to emphasize the highest two or three levels. Indeed, if a child has a choice of activities based on a topic, for example, then where the child decides to start work will be an indication of that child's ability. This long recognized curriculum development structure serves as a basis for many curriculum projects throughout the world and certainly helps the educationalist to distinguish between important and unimportant learning

experiences. Additionally, the taxonomy serves as a common basis for communication about educational evaluation. It should be recognized that students with special talents in academic areas are able to master the knowledge and comprehension levels very quickly and accurately. To enrich the regular curriculum, developers of curriculum for the gifted should include educational objectives at the four higher levels of the taxonomy. Of course the taxonomy and its educational objectives do not constitute a total approach to curriculum development for gifted children. The taxonomy is sometimes difficult to justify at all due to its widespread use in regular education and the absence of evaluation. Its great benefit as indicated above is to show the relative emphasis on higher vs lower thinking in gifted programs. The following is a broad based worksheet used by the author with young children and serves to illustrate the above points.

An example of Bloom's Taxonomy of educational based on topic on *Food* for gifted young children (ages 5-7, for example).

Knowledge:	Name the four main groups of food. Cut pictures out of fruits and vegetables from a magazine. Label them and name your favorite.
Comprehension:	Compare two green vegetables according to their shape, size, taste and how they grow. Cut out pictures from magazines or draw them to make a breakfast, lunch and dinner. Find out how many calories these foods contain.
Application:	Make a collage of foods you like to eat.
Analysis:	List all the things that a cow gives us. Make up a crossword puzzle of tasty fruits. Give good clues.
Synthesis:	Pretend you are a bean seed. Write a story about how you feel as you grow. Make up your own recipe for a really nutritious cake.
Evaluate:	Work out how nutritional your dinner was last night. An apple a day keeps the doctor away. What does this saying mean? Don't eat between meals. Is this a good idea or not?

FIGURE 1. This worksheet is designed at Bloom's six levels of activity thus allowing any child to find a task at their right level and enable a teacher to recognize the thinking level at which the pupil is working.

Enrichment Triad

The Enrichment Triad model lends itself to self-contained classroom adaptation and is one of the most popular curriculum approaches in use. In this model gifted students need an educational environment that gives them more freedom of choice and individualization of instruction (Renzulli, 1977). To accomplish this goal, Renzulli suggests that students go through three levels or types of enrichment activities: Type 1 involves general exploratory activities and is intended to expose students to a great many topics. Type 2 involves enrichment in group training activities and aims at teaching analytical, critical, creative and evaluative thinking as well as encouraging good self concept, values, motivation and both library and research skills. According to Renzulli, these first two types are appropriate for any student, although the gifted student will benefit considerably more from them. Type 3 Enrichment consists of individual and small group investigations of real problems that have particular relevance for gifted students. Type 1 and the Type 2 activities are used to prepare the student to be able to do the Type 3 activities independently and therefore the model is developmental. Activities should be encouraged. Real investigations may involve practicing a scientific method where a student formulates a problem, determines a method to study the problem, collects data and draws their conclusion based on their own results. In addition, students are encouraged to develop a product that is somehow presented to a real audience and it is recommended that students should spend about half of their time on these activities.

Evaluation and research of the effectiveness of the Triad Model is being done increasingly. Teachers can adopt this model to great effect in that they can develop qualitatively different programs that are defensible to anyone who could question their existence. In addition, readers are recommended to consider the Multiple Menu Model, (Renzulli, 1988), which is a series of five planning guides that suggest sequences and alternatives for teaching content efficiently.

Self-Directed Learning

It is well accepted by educators that it is important to develop self directiveness or independent learning skills in students so that they can continue their learning without constant supervision or assistance from an adult. However, that is more than just the ability to think about an issue which is only the first step. Many gifted children do not possess the skills that will enable them to direct their own learning effectively or to conduct their own research. They require some practice in being self directed before they can be set free to learn on their own. Treffinger's Model (1975) suggests a structured approach which allows the student to develop the skills necessary to become independent in the instructional process. There are four levels in this model. At the first

level, *Teacher-directed*, the teacher is the prime person responsible for the educational program. *Self-directed 1*, the second level, allows the teacher to give choices to the students regarding the content of the program and the rate at which the student will work. This is followed by next level, *Self-directed 2*, which gives more responsibility to the student so that both the teacher and the student work together to develop the most appropriate educational program. In the final level, *Self-directed 3*, the primary response for choosing the teaching content of the learner is such that the teacher's role becomes one of a resource person providing input and materials where necessary. There are four factors to be considered for each of the four levels in order to develop an educationally satisfactory program: (1) the determination of the goals and objectives, (2) the assessment of the student's entering behavior, (3) the identification of the instructional procedures to be used, and (4) finally, the assessment of the student's performance. By this means, the independent learning skills of each child are enhanced, and by using learning contracts, students are given opportunities to work on independent projects of each successive level of self direction.

The following is a typical Independent learning contract:

Evaluation – How well did you work?

M T W T F

1. I moved quietly and settled to my tasks quickly
2. I listened carefully and followed the instructions
3. I worked quietly not disturbing others
4. I planned and organized my time well
5. I used my spare time wisely
6. I completed my tasks giving thought and effort
7. I participated in discussion groups
8. I proof-read and checked my work before handing in
9. I corrected any errors and added words to my learning list
10. I thought about neat handwriting/presentation
11. I worked well unsupervised
12. I handed in and collected my work daily

FIGURE 2.

For many gifted students, of course, it would not be necessary to start at the teacher-directed level although one should not assume that they are ready for a totally independent approach. The teacher must determine the appropriate entry level which the student can work at most comfortably.

In this model like many others, the teacher moves from being a director to being a provider of options and then to resource manager or facilitator — a person who encourages the student to pursue abstract, complex ideas, to choose learning experiences to develop higher levels of thinking and thereby to work at a level of sophistication commensurate with their abilities.

Treffinger makes some general recommendations for fostering self-directedness:

(1) Do not smother self-direction by doing for children what they can do for themselves.

(2) Develop an attitude of openness for such learning.

(3) Provide training in problem solving and skills of enquiry and independent research. Help students to learn to diagnose needs, locate resources, develop a plan, carry out appropriate activities, evaluate and present the results.

(4) Emphasize the inter-relatedness and continuity of knowledge to help students to synthesize and relate various topics and problems.

(5) Treat difficult problems at home and at school as opportunities for independent problem solving and not as problems requiring the unilateral wisdom of an adult.

Structure of Intellect

The Guilford and Meeker Structure of Intellect Model (Guilford, 1967, 1977; Meeker and Meeker, 1986) is a popular rather complex theory of the nature of human intelligence based upon 120 combinations of 5 operations, 6 products and 4 contents. Guilford suggests that intelligence can be depicted as having three major dimensions. It involves an operation acting on some kind of content that results in some form of product. According to this model the intersection of each of the three dimensions results in a component of intelligence. Meeker uses 26 abilities from the Guilford Model to guide and diagnose specific learning ability, especially those related to creativity, mathematics, reading and writing and by doing so focuses on an analysis of the student's strong and weak intellectual components. This model encourages an educational program for gifted students which includes both the development of strengths and the remediation of weaknesses, using a diagnostic-prescriptive program designed for the individual student. Some educators see this feature as useful in identifying gifted minority and disadvantaged students. It is generally recognized and recommended that the SOI approach should be used in combination with other curriculum content and not by itself (Maker, 1982). Meeker suggests that working on an SOI task for twenty minutes, three times a week ought to result in significant gains in a child's ability.

This theory of the structure of human intelligence has had considerable influence in all areas of programming including definition, philosophy, identification and testing, as well as teaching strategies and curriculum development. Perhaps as importantly Guilford's work has contributed to expanding the definition of giftedness which has long been synonymous with IQ. Research has shown that the approaches designed by Guilford-associate Meeker, can be effective in enhancing specific abilities. These approaches are practical and easy to implement. For example, when the SOI is used with science, there are many ways in which to construct a learning situation in which a student comes to appreciate, perhaps unconsciously, that science is not mere knowledge or developing skills but is something that the

scientist does which is to ask questions of nature as well as yield reliable information which on interpretation and analysis will permit him to construct generalizations that can be used as tools for expanding knowledge. (Edean & George, 1982).

Feldhusen (1981) Three Stage Enrichment Model

This Three Stage Enrichment Model focuses on fostering creative thinking, research and independent learning skills, and positive self concepts. It emphasizes teaching for creative development and aims at strengthening convergent problem solving. Whilst these three types of activities may be used intermittently throughout the program, there is an increasing emphasis on the higher level. Stage 1 involves short-term teacher-led exercises in creative, critical, and logical thinking. Stage 2 requires more complex thinking such as learning creative thinking techniques whereas Stage 3 activities focus on independent learning by challenging students to define a problem, gather data from various resources, interpret, and creatively report the finding.

This model shares some similar approaches with the Renzulli Model. For example Renzulli Type 2 Enrichment resembles Feldhusen's Stage 1 exercises. Renzulli's Type 3 Enrichment however, involves dramatically higher level thinking and activities than Feldhusen's Stage 3 activities.

The Feldhusen Model aims at social and affective goals as well as cognitive ones. Gifted students work with peers with similar ability, peers who understand and appreciate specific talents. This social contact and support helps gifted students view themselves as effective, creative, competent and independent learners.

Williams Model

The Williams Model aims at developing thinking and feeling processes. Williams (1970) developed a curriculum model that originally was intended to help teachers enrich educational programs for all students. It is now widely used in gifted programs. It is a relatively complete system as it includes teaching strategies across important content areas that are designed to produce specific student outcomes that can be evaluated with Williams' assessment instruments. The Williams Model is comparatively easy to implement because of its hundreds of detailed learning activities and projects. The approach is based on three dimensions: content, process and strategy. Dimension 1 includes a curriculum with six levels: art, music, science, arithmetic and language. Dimension 2 deals with teacher behavior strategies which include 18 activities and skills that teachers may use to teach skills in any of the six content areas. Dimension focuses on it the thinking and feeling processes called pupil behaviors.

As mentioned earlier some of these models overlap

and in this case, Williams (1979) has suggested how the Renzulli Enrichment Triad Model may be combined with his own curriculum model. The two seem to complement each other. As Williams, has put it "one is a guide for what should be done, the other a multi-strategy approach for how to get it done" The Renzulli Model provides direction, the Williams Model yields results. The Williams 18 teaching strategies could be rearranged into the Renzulli type 1 and 2 activities good for all students with some additional type 3 strategies judged by Williams to be appropriate for gifted students.

The Autonomous Learner Model

The Betts (1985) Autonomous Learner Model deals with the cognitive, emotional, and social needs of gifted students. It provides for individual development in areas of learning skills, personal understanding, interpersonal skills, as well as student enrichment and career development. Its five major components include orientation, individual development, enrichment activities, seminars, and in-depth study.

The Taylor Multiple Talent Totem Pole Model

Taylor (1979) suggests that if one looks at enough talents, most children will be at least above average in one area. Indeed, many people will agree that not many children are broadly gifted across the curriculum and most children have at least one talent area (Ogilvie, 1973). Taylor's Totem Pole Talents included academic ability, creativity, planning, communicating, forecasting and decision making. He suggests these areas be used as a basis for curriculum planning with activities aimed at strengthening each of these six talent areas.

Kaplan Differentiated

Most of the models discussed so far give a structure for developing just part of a curriculum, most are models for defining and developing the individual processes used in learning. However, Kaplan's (1986) model is the only one that includes all of the components of a differentiated curriculum. These components are based on the theme of content, processes (including thinking skills), research skills and basic skills as well as products.

Kaplan suggests that educators should start to plan the differentiated curriculum within a theme rather than a topic because a topic may limit the learning abilities of gifted students. Whilst topics will be incorporated in parts of the theme's overall aim, a wide variety of interests and an ability to generalize and see relationships are more valuable to learning when the larger units of themes are used. By *content*, Kaplan includes the knowledge and information defined as useful, timely

and interesting for students to acquire through their educational program. She declares that the development of skills and assimilation of content are interactive and therefore should be of importance in planning any lesson. By *process*, however, she means productive thinking skills, research skills, learning-how-to-learn skills, life skills, and the skills of technology. Rather than choose one such set of skills it is suggested that the integration of various categories of processes into the curriculum planning be implemented. By *product*, Kaplan means that time be allowed for students to communicate in a variety of ways, oral, visual, and written formats as a result of using these skills and materials as well as a self determined criteria for evaluation. Product is both a tool for learning and a means to communicate a synthesis and assimilation of both knowledge (content and skills) processes.

Clark Integrative Educational Model

The Integrative Educational Model is a process model for optimizing learning. This model developed by Clark (1992) was designed to synthesize the current findings from brain research, the new physics, general systems theory, and psychology as they relate to education as well as showing their application to optimum teaching and learning. This is a holistic approach because from these disciplines comes the concern for connectedness and wholeness. Brain researchers indicate that the complex human brain operates best when all of its functions are integrated and stimulated. This model is individualized and allows for variations in level, pace and grouping. It encourages student choice, participation and involvement by meeting the needs of each individual child. In addition it can be used in the regular classroom as it optimizes learning by offering brain compatible teaching experiences. In every subject area this model combines thinking with feeling, intuition and physical sensing and the author considers this to be essential because of the neglect of the affective curriculum (George, 1992). Through this model each function of the brain is allowed to support the others resulting in a very coherent, powerful learning experience.

The Integrative Educational Model has seven major components:

- (1) Responsive learning environment.
- (2) Relaxation and tension reduction.
- (3) Movement and physical encoding.
- (4) Empowering language and behavior.
- (5) Choice and perceived control.
- (6) Complex and challenging cognitive activities.
- (7) Intuition and integration.

Van Tassel-Baska (1986) has organized the models presented into three categories, content, process/product, and concept and points to the value and limitations of each:

(1) Content Models tend to emphasize the importance of subject areas and domains of enquiry. These are

often used with individualized, diagnostic, instructional approaches. They accommodate the gifted student's need for acceleration and subject mastery. The well known mathematics program at John Hopkins University uses such a curriculum model.

(2) Process/Product Models emphasize scientific and social investigative skills that result in high quality products. These serve the needs for independent enquiry and guidance by a mentor. The Renzulli Enrichment Triad Type 2 Model typifies this approach.

(3) Epistemological Concept Models. These stress the importance of systems of knowledge and expose students to themes, ideas and principles within and across disciplines. They meet the needs for complex and abstract thought as well as the ability to see relationships and appreciate them.

Other Theories and Models

There are other models which have contributed to the thinking about provision for gifted children. For example Sternberg (1981) identified the components of cognitive giftedness for the purpose of improving differentiated curriculum planning. He believes that giftedness can be understood in terms of superior functioning of, activation of, and feedback from information processing various kinds and that children can be trained along these lines.

Bruner's (1960) ideas in *The Process of Learning* have contributed to many of the other models and emphasizes the need for curriculum modification for the gifted. One of the strengths of Bruner's work is that it is a total approach that provides a framework for most, if not all the curriculum modifications discussed in this chapter. Many of Bruner's proposed adaptations are widely used in the enrichment, such as, content changes of abstractness, organization, complexity, higher levels of thinking and discovery, whilst others, although, less direct, give valuable guidance such as that of, pacing, openness, reasoning, real problem solving, the learning environment and free expression.

The Teaching Strategies Program (Taba, 1966) produced one of the most promising process models. The series of four sequential questioning techniques resulted from many years of research on children's thinking and how it could be nurtured. Taba incorporated many of John Dewey's ideas along with the research of Bruner, Piaget, and Vygotsky in developing her approaches to teaching and curriculum development.

Mitchell and Cantlon (1987) presented a model to train children in problem-solving skills that involve the identification of problem statements related to future issues, the creation of goals and objectives, as well as the forecast of probable consequences to the solutions of the problems. In the same area of higher order teaching skills Crump, Schlichter, and Polk (1988) describe a school district wide attempt at training these skills based on the Talents Unlimited Model.

Towards a Comprehensive Approach

A number of known models available for developing a curriculum for gifted students have been described briefly above. No one model by itself provides a comprehensive approach and, since many of the models reviewed were not developed specifically for gifted children programs, this is to be expected. Most of the models were developed for some specific, well-defined purpose. One should recognize that no-one model provides the basis for a curriculum that will meet all the needs of gifted children in that program. The Guilford Structure of the Intellect model, for example, was developed as a theory to explain human intelligence. The Williams' strategies were developed as a way to stimulate a narrow range of human behaviors. Bloom's Taxonomy was developed for the narrow purpose of classifying educational objectives. Maker (1982) has recommended that teachers should begin with what exists and move forward and choose the models which are most effective for a particular group of children. The number and range of curricular modifications needed in any program will depend upon the characteristics of the children.

In developing a curriculum for the gifted, Maker (1982) suggests the multi-faceted process including the following:

- (1) Involvement of the key individuals who assess the situation and assist in the development of goals and in program development.
- (2) Development in a definition of giftedness.
- (3) Assessment of the needs of the student.
- (4) Development of a philosophy.
- (5) Development of program goals.
- (6) Choice of teaching models.
- (7) Development of objectives and strategies.
- (8) Development of evaluation procedures.
- (9) Development of a plan for implementing the curriculum.

Each model needs to be assessed for its appropriateness for any particular situation and Maker (1982) suggests a checklist of questions for this purpose. All the evaluations are based on whether the model makes direct, specific suggestions regarding how to implement a particular curricular adaptation. From this assessment, she suggests that the most comprehensive overall are those of Parnes, Renzulli, Taba, Taylor, Williams and Treffinger. However, no model makes more than 17 out of the 25 total modifications. Bruner's approach, for example, though not one of the most comprehensive in overall ratings, provides most of the content changes needed. Taba's model though not the most comprehensive, provides more of the process changes than any other approach.

It is obvious that several models are acceptable, allowing a range of options for different purposes. The combination of several models will ensure that variety will be an important aspect of the curriculum and that modifications will be made in more ways than

one. Most model designers recognize that teachers will adapt their work so that it is most useful for them but teachers have to make sure that the strategies from any model fit their philosophy. It is probably best in the end to use an overall framework such as Kaplan's Differentiated Curriculum Grid when it will be easier to make the appropriate choices and present a unified plan using ideas from many sources.

Teaching Strategies

The models discussed earlier provide a useful, theoretical framework within which enriched activities can be planned and for judging what types of differentiated curriculum are appropriate for gifted children. As might be expected, the models evoke a variety of responses reflecting widely disparate philosophies and even definitions of the term "gifted students".

Any teaching strategy that results in advanced placement beyond a child's chronological age is titled "acceleration" and this is one of the most popular ways to cope with more able children in many parts of the world (NAGC, 1990; Brody and Benbow, 1987). Accelerated learning allows children to move at a rapid pace through a subject and it is generally believed that they will be more appropriately served by providing them with challenging learning experiences beyond their peer group. This strategy is probably most appropriate in school subjects that are sequential in nature, such as mathematics.

The Education Reform Act (1988) in Britain assumes that most children will reach attainment targets six or seven, but also that some will reach nine or ten. Thus, the Act recognizes gifted children who may reach this level. However, there is little cognisance of the wide abilities found in any one class nor of different needs of children and the curriculum context is the same for all.

The topic of acceleration has been studied extensively and, despite controversy, research has supported its use with these children (Gold, 1979). Brody and Benbow (1987) noted that acceleration offers students the opportunity to select a program of work that is both challenging and interesting. It is also helpful to the school because a special program does not have to be developed and implemented for such children. Gifted children should certainly have the opportunity to work at their own rapid pace, to progress through and out of primary school on into the secondary phase and beyond. Acceleration which speeds up learning time to match students potential and capabilities makes this policy.

Early admission to the infant school requires careful screening. Early attendees should be intellectually precocious, reasonable at motor co-ordination, have good health, social maturity and possess adequate reading skills. Early admission to the junior and secondary phases of education will benefit children who are ready for a specialized course, but may mean abandoning friends.

There are, however, critics of acceleration and warn of its potential problems. Coleman (1985) suggests that acceleration resulted in teaching the same material, only teaching it faster. He also suggests that it can lead to emotional and social maladjustment. Most of the literature does not support this latter point (Whitmore, 1981; Birch et al., 1965), but nevertheless, it is often a difficult decision to make. A check list (George, 1992) was developed to help parents and teachers in making decisions regarding acceleration.

For example, not all children progress steadily through their school career and if a child's development slows, it could cause feelings of failure and frustration. Perhaps most important of all are the differing rates of a child's emotional and social development vis-a-vis academic growth. A child could find herself in an atmosphere, having left behind friends, which is not conducive to personal growth and development. This is potentially a situation which can lead to difficulties in the development of her ability to make good social relationships and to consequent long-term unhappiness. The risk can be considerably tempered when acceleration is modified to part time attendance in a higher class for a child's specific talent area. Examples of this practice are John Hopkins University in the United States and the Royal Institution Maths and Science master classes in London and elsewhere. Vernon (1977) gives evidence that adverse effects can be minimized when the following criteria are carefully judged for each child.

- The child is adequately prepared psychologically.
- The teachers of the new classes are sensitive and aware.
- The child is both emotionally and physically mature.
- The child is not accelerated more than one year.
- The child really is capable of advanced work.

With acceleration, it is hoped that a child will be more stimulated, less bored and enjoy school more. It is also the easiest administrative method.

Above all, it needs to be emphasized that all programs must be designed to produce sensible, defensible and valuable educational goals.

A second general response to the challenges of providing for gifted children is that these children need enriched curricula made up of learning experiences with greater depth and breadth than their peer group. Literature, science and social studies are subjects that lend themselves to the development of enriched curricula and students with special aptitudes in these areas often respond with enthusiasm to programs that allow them to deal with complex and abstract ideas. Enrichment programs are frequently offered in many schools and are included as part of a pull-out program whereby children are allowed to leave the regular classroom for say, two hours a week, to work in a small group or on their own with enrichment materials or with a specialist teacher. There are now a number of published enrichment packages available although very few have been assessed as to the benefit children

gain from them. In England, for instance the National Association for Curriculum Enrichment Kits provide learning resources for science which are intended for use with gifted pupils. The NACE kits intended for use with gifted pupils mainly in the 14-16 age-range though some of the materials may also be useful either earlier in the secondary school or for young people beyond the age of 16, according to their ability.

They are designed to encourage young people to go as far and as fast, in pursuing a topic, as they are able without any brakes or narrow limitations. The assignments demand a general knowledge of science, supplemented on occasions by access to the science section of the library, a class textbook or a good encyclopedia. Although the materials have been prepared so that they are as self-supporting as possible, thereby relieving the pressures on teachers, it is anticipated that young people will normally undertake the assignments in small groups and thus benefit from their interactions with each other. Any additional interaction teachers are able to provide will clearly increase the educational potential of the activities.

The assignments may be useful in the following contexts:

- (1) To encourage further thought and interest in a subject beyond the core curriculum.
- (2) As more stimulating and demanding homework exercises. (Homework offers splendid opportunities for differentiated work).
- (3) Where gifted pupils have completed the core work in a topic well in advance of the majority of their classmates.

When developing the materials the following intellectual skills have been borne in mind:

- (a) The comprehension of an account of scientific research or phenomena in science, i.e., the ability to read and understand at a higher cognitive level.
- (b) The ability to draw conclusions and reason from presented scientific evidence.
- (c) The interpretation of numerical data.
- (d) The ability to place information in a wider context, to see interconnections and to draw conclusions.
- (e) To see the socio-political implications of scientific research and to develop empathy with scientists and society.
- (f) To organize and present the outcomes of their activities in a variety of styles and formats.

The above skills contribute a significant proportion of the assessment in modern science schemes, a contribution which is likely to increase during the next few years. Many of the assignments are written so that whilst they stretch the most able they are also accessible to all young people of above average ability. Since these assignments differentiate by outcome, rather than by task, they can often be used to develop skills with a whole teaching group.

NACE's aim throughout has been to develop work of greater difficulty, rather than greater quantity, for gifted students. The emphasis is not on the accumu-

lation of factual knowledge for its own sake but on developing such abilities as understanding, reasoning, applying "old" knowledge in new situations, seeing new problems, thinking laterally and creatively and realizing the social implications of science.

The assignments build on or complement topics normally covered in examination syllabuses. They are simply headed with an appealing title and an indication of the scientific topics to which they relate. The assignments vary widely in depth, time needed for completion, and in subject. This is deliberate in order to cater for the diversity of pupils and their interests as well as that of time. Although the materials are primarily concerned with the interpretation of presented material, there are some opportunities for experimental work through which science courses are nowadays predominantly taught and learned.

Davis and Rimm (1989) suggest that enrichment activities should be planned and designed with the following objectives in mind:

- Maximum achievement in basic skills.
- Content beyond the core curriculum.
- Exposure to a variety of fields of study.
- Student selected content. As we do not ask children nearly enough what they would like to learn.
- High content complexity.
- Creative thinking and problem solving.
- Development of thinking skills.
- Attentive development.
- Motivation.

As has already been indicated, enrichment is more than a simple provision of more demanding materials. Enrichment is an activity which is a function of the teacher's flexibility, sensitivity, individual needs, a sense of timing and a master of a subject.

A third response to the challenge of providing for gifted children is the provision of individualized curricula that emphasize independent study that they themselves

have selected. This implies that children with a special interest have to be given opportunities that do not necessarily fit into the regular curriculum but rather one that develops out of students' own interests. Children are usually more motivated to do better on a topic if it comes from their own interests. This also enables them to take ownership for their own learning, to do good research. The process begins with the ability to use the library well. Teachers still have a responsibility to see that the students understand the basic steps in preparing their research and topic report, including choosing the subject, planning, outlining, gathering information from a variety of sources, writing, revising and preparing the final report. In addition, students are provided opportunities to work with people who have a like enthusiasm and knowledge related to the student's choice of subject. This also means that the teacher has to locate experts to mentor a student from within the school or the community. This is necessary because with the growth or knowledge, no teacher can possibly know all there is to know about a subject, and some of these outstanding children need the stimulus, maybe only acquired from someone with the depth of knowledge that the average teacher cannot possibly have.

This form of independent study is more process orientated than either the acceleration or enrichment model and enables the pupil to perform as an independent researcher in a self-selected talent area.

Differentiation

Differentiation is often a buzz-word, a convenient portfolio term for an issue which has been around for some time. Inspectorate reports in Britain have frequently drawn attention to the scandal of undifferentiated lessons (H.M.I., 1992). Creating the conditions to achieve differentiation is a difficult task and an illusive goal.

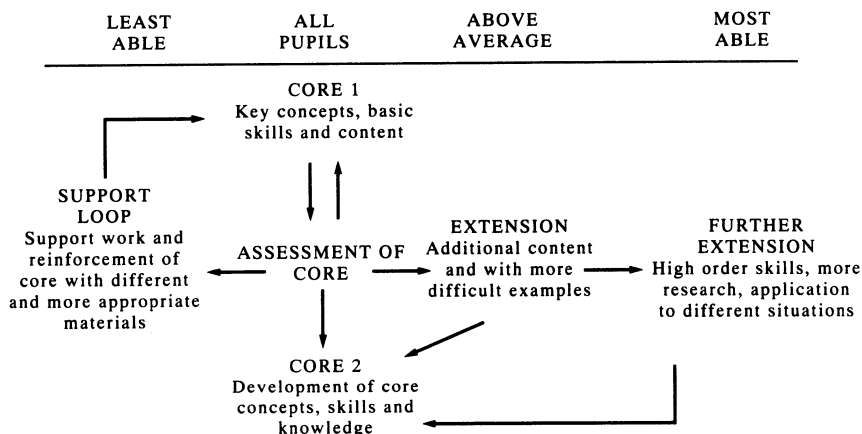


FIGURE 3. George's model for core extension (George, 1992).

A curriculum which is differentiated for every pupil will build on past achievements; present challenges to allow for more achievements; provide opportunity for success; and remove barriers to participation. This means teachers devising tasks appropriate to the range of abilities, aptitudes and interests of their children, regularly reviewing pupils' progress through observation, discussion and testing, which leads to variation in the tasks pupils have to undertake. Then teachers offer support for individual work, both in person and through the ready availability of appropriate resources. This word differentiation has become an issue because schools experience difficulty in coping effectively with the wide range of pupils that come through their doors. In the United Kingdom for example, the spread of comprehensive schools and the increasing access to mainstream schools of pupils who have quite acute learning or behavioral difficulties, has highlighted an issue that has always been there. The mixed ability groups, taken for granted and on the whole, well executed in primary schools, are seen by some as a threat to standards in the secondary school. There has been a long running debate about standards, which shows no sign of diminishing. For some, the solution lies in the return to grammar schools, which for those who thrived in them were often a great success, but there was also a great deal of underachievement in the old tripartite system, just as there undoubtedly is in many a comprehensive school today. To link differentiation to pupils at the extremes of the normal distribution curve of ability is to miss the point. No mass of 60% of our pupils in the middle range are doing well in our schools. Some are, but many are not.

Differentiation is not primarily about helping slow learners or disaffected pupils. Differentiation is not just about stretching the clever child. Differentiation is about all children, because all children are different, and one of the fascinating aspects of being a teacher is this very fact of human variation and all its attributes. Differentiation then is the process by which curriculum objectives, teaching methods, assessment methods, resources and learning activities are planned to cater for the needs of individual pupils. Differentiation is accessing the whole curriculum to the learning needs of the individual. With this definition in mind, it then becomes the linchpin of the entitlement curriculum. It is meaningless if access is not available. The other important point about this definition is the emphasis on the individual, and this could prove to be a much more helpful emphasis in categories like slow learner, average, bright or gifted, although it would be foolish to suggest that these categories are meaningless. They are all marked by individuality, and our children think differently, they behave differently, they learn differently, they come from different backgrounds and they bring different skills, attitudes and abilities with them. This is both a joy, but also the great challenge for the busy teacher. For this reason, differentiation must be regarded as an issue affecting all pupils of every age in every kind of

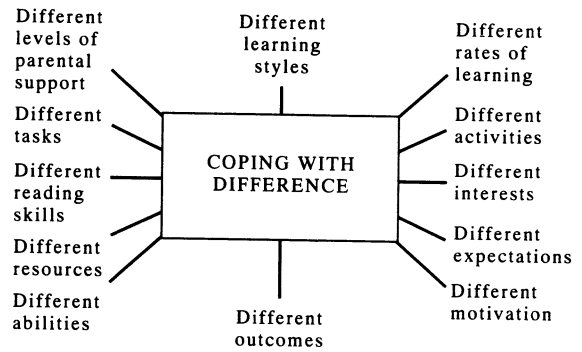


FIGURE 4.

school in every kind of grouping, for this is what makes the teaching profession such a skilled pursuit. Figure 4 summarizes some of these differences.

Teachers use two major ways of differentiating learning activities. The first is commonly called differentiation by *task*. After establishing curriculum objectives for a class activity, the next step is to develop tasks which help individual pupils achieve these objectives. There are many factors which affect the difficulty of the task, and these include:

- The required accuracy for measurements.
- How familiar the pupils are with the materials and apparatus to be used.
- How familiar the pupils are with the concepts and vocabulary involved in the investigation.
- The extent to which a teacher leads or prompts pupils.
- The number and types of variables involved in any investigation.

Secondly, there is differentiation by *outcomes*. This involves setting a common task for the class. The task is designed so that every pupil understands what is required of them. They use their knowledge and understanding to achieve success at different levels. The gifted student should be expected to:

- Plan and carry out more complex work.
- Use more difficult concepts in planning their work.
- Make more accurate measurements.
- Complete more stages in an investigation.
- Record results more precisely.
- Express findings in more sophisticated vocabulary.

Grouping

Grouping involves providing various organizational structures of either long or short duration, whereby students of a like ability can work together. One of these categories is full time homogeneous grouping, where students of various ability levels are taken to

the particular school that accommodates their needs and career interests. Another category is commonly called cluster grouping and involves placing a group of gifted students in the same regular class for special assignments and field trips. This could mean that the regular common core curriculum may be compacted to allow time for enrichment activities.

In some countries, of course, there are special schools for the gifted. In the United Kingdom, for example, there are famous Choir Schools, the Royal Ballet School and the Yehudi Menuhin School of Music, to name but a few. However, for ideological reasons, there are reservations in the U.K. to grouping and segregating children.

Indeed, for the same reasons, there has been a tendency to teach in mixed ability groups and here, the teacher has to be an excellent manager and disciplinarian in order to make sure that children reach the higher potential of which they are capable. Mixed ability grouping was, in part, a reaction to the rigid banding and streaming that had existed in most of U.K. schools.

Streaming is one organizational method of creating a situation which is in danger of hinging around quantity rather than trying to create qualitatively different kind of work. It is, however, based on the theory that people who are of a certain ability in one area are, therefore, of a similar ability in most areas. This is an outdated and disproved theory. Whereas setting, while being an improvement on streaming, has many drawbacks as well as some benefits. Primary school teachers in England seem to provide work of a more advanced nature to the top set in any one class, which should be appropriate to meeting the needs of those intellectual characteristics mentioned earlier. The work carried out in sets or bands is usually too rigid, too structured and lacking in open-ended problem solving elements so needed to allow the potential of gifted children to flourish.

A process-centred approach is an alternative for gifted children. If one can identify those higher-level intellectual abilities and talents, then it is these that would form the basis of any enrichment or extension work with gifted children.

Organizationally, such work could be designed to fit into normal school lessons, with the gifted children working on this kind of material in the same classroom as the rest of the class, who will proceed with their usual work. Alternatively, the gifted children could be withdrawn, some from their usual lessons, to attend some process-centred sessions. This imaginative and stimulating approach tries to provide qualitatively different work for the gifted student. It must be remembered, however, that not just the gifted children are capable of using these higher level intellectual skills, as process-centred work should form part of the curriculum for every child. The other concern is that much of the package material available for such children is still teacher-directed, lacking in the provision of opportunities for open-ended problem solving and investigation and is all too often carried out in much the same way as other school work.

Experience has shown that students of similar ability levels work well together despite age differences and the scheduling of some class time should be allowed for this type of activity. The time may be used for tutorial time work, with the older student instructing or leading the younger intellectual peer. Projects should be co-operative in nature, with students of different grades who have similar interests or strengths, being grouped to pursue a selected topic. Such grouping would allow for the efficient use of the resources necessary.

Mentorship

Teachers recognize that they are not always able to extend gifted children and that there are numerous people in the community who would be delighted to help in various ways, people who have similar enthusiasm and ability for a certain topic or subject. These community resources are available, and where curriculum compacting has been achieved, this mentorship model can provide a very worthwhile learning experience for gifted children. A typical scenario will be where an adult member of the community and a single student meet regularly over a period of months, with the student possibly visiting the mentor at the job site to learn first-hand and in detail, the activities, responsibilities, problems and lifestyle associated with a particular business, profession or art. Of course, mentorship presumes a commitment on the part of the student and the mentor to plan a detailed sequence of learning activities designed to achieve a specified goal.

Children can learn a great deal about the lifestyle of mentors and problems of industry, commerce and the professions, as well as acting as a role model. It is important to match the mentor to the child carefully; have a clear plan of objectives and evaluate progress carefully. Ideally, double mentoring is recommended, whereby a mentor from the community is shadowed by a professional teacher to ensure development is progressive. This may involve regular in-school and after-school meetings.

A most time-consuming and sensitive task is that of matching students to mentors. The school cannot expect to do everything themselves, teaching is too demanding, and therefore, the talent pool of the community is a vital resource. The School Co-ordinator for gifted and talented children should seek out members of the community from all walks of life, not only willing to share their expertise with children, but also time, patience and understanding. The success of the program for each child hinges on an effective match.

Counselling

Some gifted children and their parents as well, could benefit from counselling, which would provide a support system for gifted and talented students and pay attention

to the social and emotional well-being, as well as the academic means. Every effort should be made to improve the well-being of students through the provision of help with normal developmental tasks, as well as the special problems associated with being gifted.

The students could be helped with skills involved in studying and management of time. One challenge to any school is to identify the talent pool of staff, because teachers have hidden interests just like children. Other areas within a school where counselling could take place would be in small tutorial groups, or a few minutes in the lunchtime or after school with a teacher who has a like interest with that of the gifted child. Ideally, each school should have a counsellor, who would be part of the school team, consulting the classroom teachers, encouraging the use of the peer group dynamics to reinforce student co-operation. These children need assistance in defining career goals and identifying appropriate ways early in their school careers. Counselling is an important element in any gifted education program, but staffing levels in many, if not most schools are not usually good enough to cope.

The tutorial system in British schools is a sporadic one and needs a coherent plan, as many gifted and talented children need support. They may have personal and social concerns, as well as educational and careers decisions to make. Parents and teachers can support one another here to help their children discover interests and abilities and to relate these to lifestyle, educational and career opportunities. There is often a need for family counselling, as some parents are bewildered, disbelieving, fearful, or even resentful of their child's abilities. The National Association for Gifted Children Counselling Service provides needed services to both parents and schools.

Career development is one of the few areas of provision which is supported by research (Shore, 1991). Career counselling helps children to mark career possibilities early and should favor those open-ended ones that allow for further challenge and growth. This is vital for the broadly gifted child who is "good at everything" and yet, having gained 10 'A' grades in ten different subjects has to make a decision about higher education.

Some parents put considerable pressure on their children to follow in the family business, or to go into a career that does not coincide with their child's true desire. Girls in particular may need convincing that career and family are compatible, and children from poor backgrounds and some ethnic groups may need help in setting their sights higher. Professional models from similar disadvantaged backgrounds can be a vital component of a successful career service.

Flexible Progression

This involves the promotion of a child to a level of study beyond that which is usual for his or her age group. It may take the form of earlier enrolment, early

completion of a stage and entry to the next stage in one or more subjects, and even earlier entry to the next stage in one or more subjects, and even earlier entry to tertiary education.

Extra-Mural Activities

In most countries now there are special summer schools and Saturday classes where courses of study are provided in one or more areas for gifted and talented students. The students are able to pursue knowledge and skills with other students of superior ability, and this has been shown to be a stimulating experience for them. With their staff of experts, many colleges and universities would be delighted to help and meet a child or group of children who have a fascination for a particular subject (Endean and George, 1982).

Secondary schools and summer camps are increasingly popular and have the advantage of permitting gifted children to meet like-minded children away from the restrictions of a busy school life. In Britain most Saturday schools are run by the NAGC or by a higher education institution, and are taught by volunteer specialist teachers, lecturers or community experts, assisted by parents of the gifted child. Normally, the children attending are selected by teachers whose children would benefit from being extended and the programs designed to be inclusive and not exclusive (Endean & George, 1982; Davis & Rimm, 1989).

Using the Library More Efficiently

It is essential that gifted students receive their full entitlement to and access to books and literature. Access to various libraries needs to be facilitated.

Local Organizations and Agencies

Many local organizations and agencies often have junior membership and this can be a good outlet for students whose enthusiasm and abilities exceed the regularly offered course work.

Technology and computer technology has great potential for individualized learning and this could provide a valuable additional tool to be used in enrichment programs for gifted children. The skill of computer languages, such as Basic, Logo and Pascal, should be taught at an early age and can be used to generate ideas. Some children are capable of developing their own software and design their own technologies.

From the foregoing it is obvious that teachers should employ a number of specific teaching strategies when working with gifted students. Many fall under the general category of enrichment approaches which allow the student to work at his or her own pace on topics of specific interest and relevance. These should include the

use of individualized educational programs and studies. Mentoring is to be recommended and even double mentoring, in which an expert mentor works with the student in a specific interest area or expertise and the teacher mentors or addresses the development of affective needs of the student.

In addition to these strategies, we need to consider a method of how we present material to children and make learning opportunities available.

Some Pointers to the Future

(1) Research studies have shown that participation of gifted students in special programs improve the educational and professional achievements of every child who participated (Tremaine, 1979; Swing, 1973; Gowan, 1978). Gowan (1978) pointed out that virtually every outstanding professional athlete receives special attention, equipment and training in his/her youth. This and other studies suggest that the special cultivation of talent in other areas should also produce highly capable adult professionals in the art, sciences and in business but unfortunately, these studies are all too few and this therefore, would be a fruitful area for further research.

(2) Computer technology should provide a valuable addition to the education of gifted children with some software now available that can be used for enrichment purposes. Howley, Howley and Peddarvis (1986) noted, for example, that computer simulations had been used to teach a great variety of extra-curricular topics such as economics and even the maintenance of nuclear power plants. In addition, computer programming is also a skill that can be taught in gifted education programs early as young children seem to be attracted to this facility and be very competent in using computers. These can be used to generate many ideas and to re-organize elements of a problem.

(3) Earlier in this book definitions of gifted and talented children were discussed and if, for example, we were to adapt the Marland definition (1972) or the similar Ogilvie definition (1973) then, there is a great need to research into how we provide children who have specific talents such as, creative or productive thinking, leadership ability, visual and performing arts as well as psychomotor ability. Take this latter example of psychomotor ability, this area is often not considered as important in the gifted child movement because those who are already talented in sport are well provided for. If one, however, agrees that a healthy mind and a healthy body are important for the holistic education of children then, this area is important for the future of our movement as the aims of physical education are not just the physical development of each person but the development of the whole person in society through physical activities and the promotion of excellence and life-long participation in physical activity which is beneficial to health.

Holistic curriculum enriches each aspect of the body;

health, wholeness and holiness, and quality is the prize. That is, quality in human endeavor; quality in education; and quality of life. This idea of a holistic living program is now the fastest growing and most important development in the domain of health and healing and there is a great need for research within this area.

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Strategies for Nurturing Verbal Talents in Youth: The Word as Discipline and Mystery

ARNE E. TANGHERLINI

The International School, Manila, The Philippines

WILLIAM G. DURDEN

Center for Talented Youth (CTY), The Johns Hopkins University, Baltimore, U.S.A.

Introduction

In comparing the education he received at the lycee in France during the 30s and 40s to the curriculum his father encountered at a Vienna Gymnasium before World War I, George Steiner (1971) observed a striking continuity. In particular, Steiner noted the emphasis on forms: both he and his father were provided with ample opportunities to wrestle with “Homeric and Vergilian epic, the poetry of Ovid and Horace, the theory of genres in Aristotle and Longinus” (107–108) not in esoteric and marginalized graduate programs, but during early adolescence in the daily rites of schooling. The curriculum that Steiner described, with its emphasis on the classics and formal structures, held sway in the Western world, at least among the cultural elite, from the seventeenth century until the latter part of the twentieth-century. Thus, it is only recently that there has been any question about how one should go about nurturing linguistic talents.

The retreat from instruction in the classics, in literary forms—whether rhetorical or poetic—grammar, and the structure of language in general can be explained on several levels. Clearly, science and mathematics (the language of numbers) have supplanted *mere words* as the primary means by which we describe our position in the universe. At the same time, the popular media—with their ever-accessible images and instantly gratifying lyrics—have distracted many from the more challenging pleasures offered by such traditional forms as poetry, drama, and fiction.

One should not infer, however, that linguistic talents are no longer valued; in contemporary society, no skill may be as important as the ability to process vast amounts of linguistic information quickly and accurately and to communicate ideas clearly and concisely. Paradoxically, it may be the forms of linguistic expression traditionally considered the “highest”—the poetic and

rhetorical—which are no longer valued as they were in Steiner’s school-days and the three preceding centuries.

In recent years, there has been a persistent call, particularly from political conservatives in the United States and Europe, for a return to the classical curriculum of Steiner’s lycee. While these programs for the recovery of the lost intellectual Eden are tempting, under close examination they reveal considerable obstacles. Inevitably, one is reminded of Jorge Luis Borges’s Pierre Menard attempting to translate *Quixote* “word for word, line for line” to reconstruct in twentieth-century France the work of the popular seventeenth-century Spanish writer. As Steiner has observed on more than one occasion, the decision to retreat from the classical tradition and its forms was no accident: it grew from the recognition that “words are corroded by the false hopes and lies they have voiced” (71). The problem with humanism, as Merleau-Ponty (1969) suggested, is that it failed to humanize us.

Merleau-Ponty’s observation presents a question which all educators must address: to what end would we educate? Whereas exceptional accomplishment within the clearly delineated parameters of a specific discipline was the goal of education in Steiner’s day, contemporary Western pedagogical theory appears to be more concerned with notions of creativity, democracy, and the “empowerment” of children. The extent to which schools or teachers are able to achieve any of these noble aims remains unclear. What has become apparent, however, is that many talents are going unrecognized and unnurtured within the schools.

While it would be foolish to return to an uncritical acceptance of the classical canon or the rote learning and tyrannical classroom practices which accompanied it, there are both practical and theoretical reasons for recovering some of the formal rigor of the traditional curriculum. Beyond a certain point, when a child has mastered the basics of her native language, development

of linguistic abilities is deeply anchored in culture (Ervin-Tripp, 1964). As Vgotsky (1962) observed, "language is a historical phenomenon." Formal structures—figures of speech, rhetorical and poetic devices, grammar—should be considered strategies and tools developed to address specific problems of communication and expression. Cutting children off from tradition deprives them of the opportunity to develop a broad repertoire of linguistic tools and word "senses," which are the essential feature of participation in a language's culture. Structured linguistic expression—the genres and forms referred to by Steiner, Shakespeare's sonnets, Pascoli's tercets, Basho's haiku—encountered early and continuously, learned by heart and savored, provide young talents with a storehouse of culturally resonant knowledge, which may later be examined, criticized, reaffirmed or abandoned.

Although literature does not progress in the way that science does—towards ever-more precise and powerful predictions—it does grow: the emergence of new forms, interpretations and meanings is an evolutionary process. New works gain their power and significance, in part, because of their referential texture. A successful break with tradition invariably depends on a thorough knowledge of tradition: works like J. P. Jacobsen's *Niels Lyhne*, Joyce's *Ulysses*, or Charles Johnson's *Middle Passage* are effective because their authors knew exactly against what they were rebelling.

The model for developing and nurturing verbal talents presented in this chapter is not a call for an uncritical return to tradition, neither is it a *paean* to the educational status quo. A close examination of the literature on the development of linguistic abilities, language acquisition, and literacy combined with 15 years of experience providing effective programs for verbally talented youth provide the basis for the proposals set forth in this chapter. Recognizing what Perkins and Salomon (1988) call "the synergy of local and more general knowledge," this chapter presents a model which integrates grounding in traditional disciplines with society's need for verbal talents which are flexible and broadly transferable to a variety of complex situations. This model, based largely on the academic programs and research of the Center for Talented Youth (CTY) of the Johns Hopkins University, combines contemporary pedagogical methods, emphasizing the child's central role in the active construction of knowledge, with a curriculum rooted in the traditional forms and structures of language and linguistic expression.

Verbal Talent: A Working Definition

A precise definition of verbal talent remains elusive, in part because of the shifting grounds of culture, in part because of the difficulty in identifying instruments which can accurately predict long-term success in linguistic endeavors. Because language is not a closed symbolic system like mathematics, it is constantly transformed

by its cultural context: verbal talents recognized and celebrated in one culture may be overlooked in another. Some theorists (Olson, 1983, 1986) have even called into question the very notion of talent.

Psychometric approaches, long the dominant method of identifying verbal talents, have yielded some important insight into the cognitive profiles of verbally talented youth. Particularly important in this regard is Redding's (1989) work on verbally talented underachievers, which suggests that some students with exceptional linguistic ability may fare poorly in school because the material presented is not designed to provide optimal challenges, and the school environment is not compatible with the learning styles of the talented student. In particular, Redding found that verbally talented underachievers tended to prefer global strategies to solving problems and were motivated more by the desire to learn than by the desire to achieve.

In recent years, the psychometric approach has come under fire from a variety of quarters. According to Rose (1988), one shortcoming of the psychometric approach is that it tends to lead to cognitive reductionism—"the tendency to seek singular, unitary cognitive explanations for broad ranges of school . . . performance" (267). Others (Gardner, 1983; Gallagher, 1991) have criticized the psychometric approach on the basis that it is not longitudinal: it tends to construe the individual student's learning style, abilities, and temperament as fixed quantities, unaffected by developmental and environmental factors.

Gardner has attempted to clarify the muddle surrounding linguistic talent by linking research in neurophysiology to psychological models of intelligence. Current understandings of the structure of the brain and the biochemistry of learning and memory have not, however, advanced to the point where his theory of multiple intelligences can be proved or disproved. In particular, the notion that the brain consists of a series of separate systems working more or less independently remains speculative (Rose, 1988). Recent research has even called into question the widely accepted distinctions between the functions of the right and left hemispheres of the brain. Sinatra (1984), for example, noted that "as mental processing increases due to task complexity, the more likely it is that both brain hemispheres will be called into play to generate a solution." It is precisely at the moment when the brain is functioning at the optimal level, when the artist attains what John Barth (1984) calls "inspired mastery of craft informed by a unique angle on the world" or when the scientist or student makes a similar breakthrough, that a fragmented model of brain functions seems least tenable.

In the absence of an all-encompassing theoretical model of verbal intelligence, one must settle for a more modest working model, which permits the identification of students who may require modifications in the content, pacing, or style of delivery of the curriculum at a given point in time. The adoption of this perspective represents a significant, if subtle, move

away from the conventional approach to the problem of talent development. No longer is the emphasis on the construct—on attempting to sort the gifted from the “non-gifted”; now, the focus is on the individual child, on attempting to create an optimal match between the student’s abilities and the learning environment. This approach is associated with the use of domain-specific aptitude tests and increasingly with more holistic procedures for the identification of talent, including case studies and portfolio assessment.

For practical educational purposes, verbal talent may be divided into five categories, each of which may overlap to a certain extent but each of which may exist, in varying degrees, relatively independently of each other in the same individual. The categories are: oral expression, reading, foreign language, creative writing, and general verbal reasoning (Fox & Durden, 1982).

Possibly because programs focusing on the development of oral expression remain a rarity, a search of the literature yields no formal procedures for identifying students who exhibit this sort of talent. On the other hand, the manifestations of oral talents tend to be readily apparent: the quick, felicitous turn-of-phrase, the easy reproduction of the most complex rhythmic patterns, the ability to mimic the inflection and cadence of classmates, teachers, and popular figures are among the marks of the young orator, actor, or comedian.

Almost as easy to identify as the budding orator is the precocious reader. In the early years, standardized tests of reading achievement provide a fairly accurate picture of which students need to accelerate their progress through the curriculum. Teachers, parents, and school libraries can also play a critical role in the identification of a student’s hidden reading talents, which may, in some cases, be quite specialized. It is not unusual, for example, to encounter 9- or 10-year-olds who regularly consume highly sophisticated technical materials related to topics that interest them but simultaneously show no interest in school-assigned readings.

One way of identifying students who may have a talent for foreign languages involves looking for individuals who can readily imitate dialects in their native language or ones who have learned to speak *Ediging-lidigish* or similar transformational argots. The Modern Language Aptitude Test and similar instruments provide a more conventional means of predicting which students may have potential for learning foreign languages. A well-designed foreign language program should, however, eliminate the need for identification instruments of any sort. A state or territory which intends to have its populace learn languages other than the national one will, as a matter of course, follow the example of Scandinavia and many Asian countries and provide instruction in those languages beginning at the primary level and continuing intensively throughout the secondary level. Under such circumstances, early manifestations of talent will not determine who may benefit from foreign language instruction and who may not; instead, talent merely becomes a factor, along with persistence, in determining

who will attain the highest levels of accomplishment in the study of foreign languages.

Identifying talents in creative writing is a somewhat more complicated proposition. While general tests of verbal aptitude give some indication of an individual’s ability to abstract and analyze verbal material, a process which is fundamental to the rhetorical modes of expression, they provide little insight into the working of the gift for poetic usage of language. Recent case study research conducted on verbally and mathematically talented youth (Tangherlini & Durden, in press) confirms Aristotle’s observation that poetic talent is indeed distinct from other types of linguistic talent. Beyond the usual considerations of coherence, concision, and clarity, talents of the poetic sort may make themselves apparent in surprising figures of speech, distinctive word choice, unusual attention to detail, and early facility with metaphor.

It is the peculiar character of artistic talent that while it is readily apparent to the initiated, it remains largely obscure to the outsider, for as Roman Jakobson observed: the aim of poetry is “to make strange.” Given the extent to which poetics are cultivated in contemporary society, one should not be surprised to discover that many talents are going unrecognized. Literary competitions, magazines which publish the works of young writers, portfolio assessments conducted by experts, and programs which bring students into contact with practicing writers hold the most promise as identification procedures.

The CTY Talent Search Model, proposed initially by Stanley, Keating, and Fox (1974), may provide the most effective means of identifying students who possess exceptional verbal reasoning ability with applicability to a wide variety of situations. The Talent Search consists of a two-step process: an initial screening, using an in-grade, standardized test and the identification of exceptional talent, which involves the use of an out-of-level instrument, the Scholastic Aptitude Test (SAT). Thirteen-year-old students qualify to sit for the SAT by scoring in the top three percentiles nationally (in the United States) on an in-level screening instrument; those who subsequently achieve scores equivalent to those of the average college-bound high school senior on the SAT qualify for participation in CTY’s academic programs in mathematics, sciences, social sciences, or the humanities. Admission to the humanities and social science programs depends on the individual’s scores on the verbal subtest of the SAT and attainment of a satisfactory score on the Test of Standard Written English (TSWE), a test of usage and grammar. Students are accepted into the mathematics and science courses on the basis of a combined verbal and mathematical score. Keating (1974) found the SAT to be remarkably well-suited to this purpose because of its proven capacity to “predict success.” In a recent study, Gustin and Corazza (1992) confirmed the validity of including the measure of verbal ability in the identification procedure for science courses. Verbal ability was strongly correl-

ated to success in CTY's science courses: in fact, they found that "verbal ability as reflected by the SAT-V is consistently more valuable as a predictor of success in science than is mathematical ability as reflected by the SAT-M."

The SAT-V may be particularly well-suited to assessing the verbal reasoning skills of 11- to 14-year-olds because they are precisely at the stage when verbal skills are integrated with cognitive skills in the conventional Piagetian scheme of development (Piaget, 1954). This is a tremendously important time in the intellectual development of the individual; exposure to the right set of opportunities in a properly designed environment can result in tremendously accelerated learning and intellectual development, while neglect or exposure to the wrong sort of environmental stimulate can cause profound and lasting damage.

Although the model for the nurture and development of verbal talents presented in this chapter addresses the stages of intellectual development directly preceding and following the acquisition of formal reasoning and the integration of linguistic and cognitive ability (age 11–13 in Piaget's scheme), its primary focus is on this crucial transitional period when the ability to abstract and think in hypothetico-deductive terms is being acquired and meshed with linguistic ability. This is both because this period has been the focus of most of CTY's work but also because of its central developmental significance.

The Optimal Match: A Program for Nurturing Verbal Talents

Introduction

CTY did not set out to create programs with explicit grounding in the psychology of giftedness or of cognitive development. In fact, the underlying philosophy of CTY, like that of its direct precursor, the Study of Mathematically Precocious Youth (SMPY), is distinctly pragmatic and untheoretical. As Wallach (1978) observed, SMPY (and CTY) have been so successful in providing students with effective learning experiences because they have steered clear of the theoretical quagmire surrounding gifted education, choosing instead to focus energies on "arranging the environment" to facilitate the development of those "competencies one directly cares about," in the case of CTY, verbal and mathematical talents.

At the core of CTY's approach is Julian Stanley's (1976) ground-breaking discovery that students demonstrating ability in the top percentile for their age-group on a standardized test of mathematical aptitude (the SAT) are capable of learning at an accelerated pace material usually reserved for much older students. While the pacing of instruction is not as much of an issue in the development of verbal talent (it will often be desirable to have the student linger over a text, a passage, or a word, examining it from a

variety of perspectives), the same general principle holds. Students who demonstrate exceptional verbal reasoning ability at an early age (11–14) are often ready to tackle curricular material usually reserved for much older students. In particular, they appear to benefit from educational experiences which reinforce the development of propositional logic using the forms and techniques particular to the various disciplines: literary and rhetorical modes, linguistic devices, the scientific method of enquiry, research and data gathering methodologies, fieldwork techniques and so on.

On the basis of this initial premise, CTY consulted with the Classics, German, and Writing Seminars Departments at the Johns Hopkins University to develop courses which would introduce students to content and methods usually reserved for advanced high school students (ages 16–19) and college students. In the intervening years, CTY has expanded its offerings in the humanities to include six distinct writing courses, courses in history, logic, psychology, archeology, German, French, Japanese, and various sciences. Experience has shown that interest and motivation interact to produce exceptional performance which might not be predicted by test scores alone; hence, beyond the introductory level, students select their own courses.

Many instructional techniques are borrowed from the university setting but modified for use with adolescents. A conscious attempt is made to move away from what Friere (1970) described as the "banking concept" of education. Students are not viewed as empty vessels waiting to be filled with knowledge, but rather as young writers, scientists, historians, or linguists learning the techniques of their disciplines by applying them to genuine problems. Teachers are seen as mentors—as the leaders of group discussions, whose role is mainly Socratic: to prod, tease, question, and instigate (Reynolds, 1980). On the other hand, because teachers are chosen on the basis of their expertise in the field they teach—an approach which has long been the norm in Europe and Asia but not necessarily in the United States—they are also expected to coach students intensively on an individual basis, to share insights and *tricks of the trade* they have discovered in practicing their disciplines.

Classes are kept small so that students may interact with one another, for experience shows that students learn as much through intensive interaction with their intellectual peers as they do through direct instruction (Mills & Durden, 1992; Tangherlini & Durden, in press). Exercises and games also play an important role in the CTY classroom, never as ends in themselves but rather as the means to model important techniques and processes. Critical thinking and metacognitive skills are integrated into the disciplines rather than taught in isolation, for CTY instructors have found that if there is one thing that verbally talented youth have little patience or use for, it is excessive psychological jargon and "scaffolding."

At the heart of CTY's instructional approach is

a characteristic common to all effective approaches to nurturing intellectual talents: the Optimal Match principle. Simply stated, an appropriate educational experience is one which challenges the individual to perform at a level just beyond his or her cognitive grasp (Redding, 1989). As Csikszentmihalyi (1982) observed, optimal experiences blur the distinction between process and content, causing the subject to identify wholly with the object of study, engaging the totality of the individual, erasing all concept of the passage of time. Both learning and creative adult production appear to depend on the ability to perform at this optimal level, and effective educational strategies must be designed with this goal in mind.

In recent years, CTY has expanded its programs to include a component addressing the development of talents in languages for students at the primary level (ages 7–11). Thus, with the exception of the first few years of schooling and the last two years of secondary education, CTY programs currently address the needs of students throughout their pre-collegiate years. At the same time, recognizing that students from diverse cultural and/or financially disadvantaged backgrounds have historically been under-represented in programs for the verbally talented, CTY has developed a number of programs designed specifically to nurture linguistic talents among such special populations (Lynch & Mills, 1990; Barnett et al., 1992). With the expansion of its mission, CTY has come to recognize that creating opportunities for optimal educational experiences requires adjustment of the curriculum to meet the unique cognitive, developmental, and ecological profile of the individual student.

Within the framework of the Optimal Match, the following five sections set forth strategies for nurturing verbal talent in each of the subcategories mentioned above: oral expression, reading, foreign languages, writing, and cross-curricular applications. The discussion of strategies is divided into two sections, corresponding roughly to the primary grades (ages 7–11) and the transitional period during which linguistic and cognitive reasoning abilities are usually integrated (ages 11–14). In some instances, suggestions are also provided for addressing the needs of students at the secondary level (ages 14–16). Whenever appropriate, the unique needs of students from disadvantaged backgrounds or cultural backgrounds differing from the dominant culture are also discussed.

Since development is a process which varies from individual to individual, the age-frames mentioned above are merely suggested. Whereas mathematical talent almost invariably appears early and continues to develop at a rapid pace, verbal talents, because they are so closely linked to other life experiences, may surface at different times in different individuals, developing in uneven spurts. Thus, the success of the strategies outlined below will depend on the sensitivity, determination, and talents of the teachers and administrators implementing them.

Oral Expression

“What’s meaning but vanity? A word is a sound—one of the handmaidens of the seraphim” (O. Mandelstam.)

Commenting on what he calls the “organized amnesia of present primary and secondary education,” Steiner (1970) lamented the “catastrophic decline of memorization,” of students learning and knowing pieces by heart. In the name of liberation from rote, contemporary educational theory has systematically endeavored to detach thought from memory and experience. Instead of being taught sonnets, which are whole, integral things that may be possessed and contemplated once they have been memorized—students today, if they are lucky, are taught the rules of sonnetry so that they may recognize future specimens of the theory. Forgotten is the fact that language consists of words, and that words are first of all sounds.

A 7- or 8-year-old presented with something like this:

Qual di gemiti e d’ululi rombando
cresce e dilegua femminil lamento?
I fili di metallo a quando a quando
squillano, immensa arpa sonora, al vento.

does not need to know that the poem from which it is drawn consists of two tercets and a quatrain with alternately rhyming verses, that it is written in hendecasyllabic verses, or that these lines were described by the critic and poet Renato Serra as “pure music.” Enough to discuss the impression that the appearance of trains made on Pascoli and the people of his generation, enough to know some of the outlines of the poet’s life—for example, that he had three desks in his study (one for Italian, one for Latin, and one for the study of Dante)—enough to practice the rhythm of the words, enjoying the effect of a train coming down a track.

As Vgotsky (1962) observed, a child’s speech resembles an adult’s in form first and in significance later. A poem memorized in youth becomes a tremendous possession later in life—a key to a vast realm of memories, a source of rich meanings which otherwise might be lost. After his release from many years in captivity, a hostage said that he kept hope alive by reciting verses he had memorized in his youth. What greater gift could one give a child?

Transition and Secondary

While memorization and recitation are the key approaches to developing oral expression on the primary level, at the transitional stage, rudimentary rhetorical and linguistic analysis becomes increasingly important, both as a means to reinforce the acquisition of formal reasoning and to provide the student with fresh insight into the meaning of utterances. Students at this stage in development are increasingly ready to examine formal issues. Now, it becomes important for the student to

note that the rhyme pattern is irregular in the second tercet of Pascoli's poem and to note that this irregularity persists—that it is not so much an irregularity as a stylistic decision. At this point, the student may ask why hendeca syllabic verse was chosen and in so doing discover that this rhythm is particularly well suited to representing the sound made by a train as it comes down the tracks.

If memorization has occurred throughout primary school, by the age of 11 or 12, the student, having gone beyond the need for simple mnemonics, will be prepared to learn much longer pieces, with more complex rhythmic patterns and in some cases even prose pieces and dialogues.

The following lesson, derived indirectly from an exercise developed by Benjamin Franklin and used effectively for many years by teachers at U.S. overseas schools, illustrates an approach that is particularly effective for developing oral expression skills at the transitional level. First, students listen to recordings of speeches made by an exceptional orator: Winston Churchill, Nelson Mandela, or John F. Kennedy for example. After an initial broad sampling of speeches, the class chooses one speech, or a section of a speech for study. Over the course of several days, students then listen to the speech at least ten times, at school and if possible at home. Students should be instructed not to memorize the speech. Instead, they should listen carefully to what is being said and how it is being said, trying to pick out techniques the speaker employs to create an effect or strengthen an argument.

After listening to the speech one last time, students are paired with partners and instructed to practice the speech from memory—filling in with their own wording whenever memory fails them. At no time should words be committed to paper. Reproducing the argument of the speech is a secondary objective in this exercise, the primary goal being to reproduce the *effect* of the speaker. After adequate practice time has been provided, each student performs his or her version of the speech. Each performance is followed by a brief peer critique focused on the speaker's success in recreating the effect of the original piece. Comments solicited during the peer critique sessions should be recorded on the blackboard as a basis for later discussion. After every child has had an opportunity to perform and the blackboard has been filled with observations, the original version of the speech should be played again as a stimulus to discussion. After similarities and contrasts between the original and the various renditions are noted, the teacher should lead the class in a careful analysis of the techniques employed by the original speaker: the cadence, the pauses, stresses, grammatical constructions, figures of speech (e.g., anacoluthon), and word-plays uniquely suited to the art of speech-making.

Appearing on the comedy show *Saturday Night Live*, the Reverend Jesse Jackson demonstrated how a humorous variation of this exercise might be implemented. With all of the characteristic intonations, gestures, and emphases of the traditional African-American preacher,

Reverend Jackson read chapter and verse from the book of Seuss: "I do not like green eggs and ham. I do not like them, Sam I am."

Exercises like the one outlined above are no substitute for memorization; rather, they are an important complement. Starting in middle school and continuing through secondary school, oral expression skills may be reinforced by continued memorization and recitation, participation in debates and speaking contests, acting, and extemporaneous speaking, with increasing attention being paid to the ways in which techniques—diction, enunciation, cadence, timing—are used to make a point or create a particular effect.

Reading

Primary

Recent research on language instruction at the primary level has made it abundantly clear that the traditional basal approach, with its emphasis on skill acquisition, workbook exercises, and oral reading of simple passages, fails to address the needs of most students not to mention those of youngsters with exceptional linguistic abilities (Mangieri & Madigan, 1984; Robinson, 1986). All too often, students who enter school already reading competently and with a great sense of adventure are confronted in the primary grades with materials and classroom techniques which insult their intelligence. In recent years, the whole language movement has gained momentum, particularly in New Zealand and Australia, but also increasingly in the United States, Canada, Europe, and parts of Asia.

Instead of construing reading as a series of skills to be acquired in a predetermined hierarchical sequence, the whole language approach emphasizes the relationship between the individual child and the text (Freeman & Freeman, 1987; Goodman, 1986). Furthermore, reading, writing, and the development of oral expression are not viewed as isolated activities: in fact, the whole language approach, as the name implies, emphasizes the creation of connections across the curriculum. Thus, writing lessons may be explicitly designed to teach children how to make a clear presentation of scientific findings, or students may be encouraged to delve into texts not usually encountered in reading class: books or articles on internal combustion engines, aerodynamics, Impressionism, or chaos theory. Providing children with a choice of reading and opportunities to discuss reading with peers are hallmarks of the holistic approach. The hope is that children will develop the habit of reading and writing, that they will fall in love with language and the mysterious workings of words.

In general, the whole language approach is entirely consistent with findings regarding those approaches which are most effective for verbally talented students, particularly at the primary level. Individualized reading and peer discussion have long been recognized as

essential features of effective instruction for advanced readers (Barbe & Renzulli, 1971; Fox & Durden, 1982; Robinson, 1986). In implementing a whole language approach, one must bear in mind a number of caveats, however.

First of all, whole language is often linked with cooperative learning and attempts to eliminate ability/achievement grouping (Atwell, 1987). Although whole language approaches are entirely consistent with cooperative classroom arrangements, there is a tremendous amount of evidence which supports the grouping of students on the basis of ability or achievement levels, especially when the curriculum or mode of delivery is modified to meet the needs of advanced students (Kulik & Kulik, 1990; Gamoran, 1987; Mills & Durden 1992). There is no reason why a student who is ready to tackle Faulkner or Flaubert should be forced to read stories about Fluffy the Kitten's adventures in the forest. Naturally, grouping need not be permanent: one student who may show no aptitude for literary texts may prove to be quite advanced in his or her ability to digest technical materials.

A second reservation is also related to grouping. Advocates of whole language (Bos, 1991) have linked this approach to Vgotsky's socio-historical theory of education, which defines learning as the result of social interactions which "create meaning" (Vgotsky, 1978). On the other hand, research on the learning styles of the verbally talented supports the notion that high ability students tend to enjoy working independently and often make the greatest strides in their learning when they are allowed to work alone (McGinn, 1976; Bloom, 1985; Redding, 1989). Thus, while it is important to provide ample opportunity for students to discuss reading with their classmates, teachers must also make certain that children are given opportunities to work independently. Being provided with the chance to work independently with a mentor from the community is particularly important when students develop areas of expertise in which they outstrip their teachers. In such cases, forced interaction with peers who are at radically different stages in their intellectual development may become frustrating and counter-productive.

Transition and Beyond

For the reading of literature ever to become a habit and a pleasure, it must first be a discipline. (Flannery O'Connor)

A final caveat regarding the whole language approach pertains to students who have reached the transitional stage in their linguistic and cognitive development. While students should always have some degree of choice in their reading (e.g., one of the books that will be read over the course of a semester), as mastery of formal structures becomes increasingly important, the teacher must play an expanding role in directing

student reading. Once students have become fluent readers, once they have mastered the basic processes and strategies which permit them to cull the meaning from a variety of texts, their continued development as readers and writers depends on a more explicit instructional approach. At this point, one book is not as good as the next.

A practice that is particularly inappropriate but currently enjoys a great deal of favor in the United States consists of using pop fiction genres and novels written expressly for adolescents as the sole basis for instruction. The problem with this approach lies in the fact that such works tend to lack texture, substituting for the historically significant and culturally resonant form the glib or slick professional formula. Jim Stahl, the editor of *Merlyn's Pen*, a magazine of outstanding literature by young writers, suggests that students reap greater benefits by reading and discussing the works of other adolescents. According to Stahl:

"There's a certain hypocrisy in calling something 'Young Adult Literature' when it is written by adults, especially when there is a body of young adult literature written by young adults . . . In schools everywhere, there's at least one author writing good stuff. It's a matter of appropriate technology. There's more enthusiasm for the good writing of peers than there is for things written by adults." (Personal communication)

Stahl's point is welltaken: there is certainly room for more student writing in the curriculum, but student writing has its limitations. In order to go beyond the accomplishments of peers, students must be given opportunities to wrestle with the best. Does this mean that the curriculum of Steiner's schooldays should be reinstated? Certainly not. Contemporary literary criticism has performed no service more valuable than forcing the recognition that much of the best of what has been said and thought has been said and thought by individuals at the margins of Western culture or entirely outside of it. Thus, it is no longer tenable to view tradition from a narrowly Eurocentric perspective.

While this realization may at first appear to threaten the Western tradition, ultimately it serves to enrich it greatly by liberating young thinkers from cultural myopia. As the painter Romare Beardon observed: "There's only one art, and it belongs to (hu)mankind."

Every culture has evolved certain forms of expression which are imbued with the most meaning and resonance, and every form has found certain masters who have seized the possibilities of that form and, ignoring its limitations, have created works, inevitable and sublime, for which the form seems to have been invented. Furthermore, in every discipline there are articles and books distinguished by their lucidity, originality, or by the influence that they have exerted on subsequent thought and research. The teacher's responsibility is to nudge students in the direction of this great literature and scholarship.

Paradoxically, this task may have been simplified by the fact that the classics no longer loom above the classroom like great stone monuments. Many adolescents think that Leonardo and Raffaello are turtles, and, outside of Germany, most have never heard of Goethe. For the teacher, the trick is in the selling, and with adolescents, irreverence often makes the best pitch. *Faust* might be introduced via Walpurgisnacht, *The Inferno* via its farting demons or Dante's political commentary. The works of Shakespeare, Dickens, Twain, Rizal, and Dinesen all have moments of wit and stirring beauty which can be used to convert even the most reluctant young reader. After all, as Flannery O'Connor has observed, one of a teacher's primary responsibilities should be "to change the face of the best seller list" (O'Connor, 1962).

Once the student has been convinced to read important works, it becomes increasingly important to engage him or her in close readings of texts—what the French call *l'explication de texte*. A short passage is chosen for examination, because it is crucial to understanding the point the author is trying to make, because it requires further elucidation, because it creates a certain esthetic effect, or because it illustrates a masterful use of a particular technique. In this way, students are taught to view composition as a process of conscious decisions made by an author attempting to achieve specific goals. Thus, reading is no longer framed as an innocent act of consumption but rather as a means of gaining understanding and insight.

Textual analysis is one of the central functions of the writer's workshop, an educational strategy described in greater detail in a later section of this chapter. Seated around a conference table, students discuss a text from a writer's perspective, asking what techniques the writer has employed, why they have been effective or ineffectual, and speculating how such techniques might be integrated into their own writing. In the workshop, discussion focuses alternately on works of literature by established writers and on pieces written by students in the class. Using the same approach in both cases helps students to sense the profound connection that exists between understanding literature and writing effectively.

It has been argued that adolescents have not experienced enough of life to understand the complex ideas or the moral dilemmas which are the subjects of great literature. Certainly there is no 13-year-old child who can fathom the depth of the sorrow and bitterness of the doctor, called away from home by a frivolous dandy on the eve of his only child's death, in Chekhov's great story "Enemies." By carefully selecting passages for discussion, the teacher can, however, guide students to a greater understanding of the way in which the story has been crafted: the movement from darkness to light and back again, the contrast between the dandy's volubility and the doctor's stunned silence, the way the sounds and scents are orchestrated to create an effect, the significance of the stains on the doctor's

hands. In reading closely and carefully, the student can only develop a greater empathy for the doctor, for as Chekhov once observed, the effect of a story depends on the steady "accretion of detail."

With practice, close reading becomes a habit. Gradually, the student seeks out those sections of a text which seem the most complicated or significant and subjects them to further examination. The basic idea behind textual analysis is a simple one with broad application across the disciplines: attention. Confronted with a text or other "thing," the student must look closely, paying attention to every detail, to unravel the mystery it presents. Olson (1986) has even argued that learning to interpret texts is crucial to the training of young scientists. According to Olson, "developing notions of interpretation and ambiguity, of claims and evidence, would seem to be an appropriate introduction to notions of hypothesis and observation in science."

One should not expect the 13-year-old, no matter how well trained in textual analysis, to read a work of literature as a sophisticated and thoughtful adult would. What distinguishes the great work from the merely passable is that the great work is worth revisiting. This point should be made explicit to students: do not worry if you encounter many things in this work which are slightly beyond your grasp. Life would be dull if you were never surprised or baffled by new encounters.

Foreign Languages

Primary

The European Economic Community, through the Lingua Project and a number of other initiatives, has adopted the admirable goal of insuring that all students in its member states will be bilingual. Aiming for anything less would be pointless.

Individuals who speak more than one language have access not only to great stores of information which might not otherwise be accessible, but also to different approaches to viewing and experiencing the world, for languages are influenced in large part by their cultural context and serve in turn to shape that context. Terms fundamental to a culture are often untranslatable: the Danish notion of "hygge"—an otherwise undescrivable sense of warmth and comfort which permeates certain Danish homes, or the Tagalog notion of a "suki"—a reciprocal relationship between a merchant and a regular customer, each of whom is the other's "suki."

Introduction to a second language in the primary grades is often resisted on the basis of research which shows that students may encounter problems with their primary language if they are introduced to a foreign language before a "threshold of mastery" has been attained in the native language (VanTassel-Baska, 1987). Unfortunately, this understanding has resulted in an overly cautious approach to language instruction

at the primary level. Verbally talented students in particular may benefit greatly from opportunities to participate in foreign language instruction soon after they have learned to read their own language, often before they enter school. While research on the subject remains inconclusive, there is some evidence that young children may acquire languages more easily than adults because of the plasticity of brain functions (Gardner, 1983).

In the primary grades, the instructional approach should again be holistic: phonetics and the rules of grammar are not the right place to start with very young children. At this level, instruction should focus on the spoken language. Here, humor is a valuable tool. Students can be taught quirky dialogues, which are memorable for their silliness. These dialogues can be expanded into skits which students perform themselves or with the aid of puppets. Kjemis (in press) has developed a variety of approaches to using puppets in language instruction. Certain phrases and idiomatic expressions can be assigned to specific puppets as illustrations of their temperaments: the playboy might always say "I love you darling"; the grump, "leave me alone, I'm tired"; and the whiner, "this is boring; I hate it." Emphasis on idioms is crucial at this stage, for such expressions can be learned easily, even before their significance is grasped entirely. In learning a foreign language one learns to use the words of others, and though this may seem strange at first, it is only through practice that one may come to possess those words.

Kjemis has also suggested that students should be encouraged to make friends with their puppets, and to take them home from school. As friends, the puppets are always willing to listen to the students' problems; however, to communicate with the puppets, the children must speak the target language, which is the only language that the puppets understand. This process encourages students to develop inner speech in the new language, which, as Vgotsky (1962) has shown, is central to language acquisition.

At the primary level, students should be encouraged to memorize songs and poems in their new language: melodies, rhyme, and rhythmic patterns serve as wonderful mnemonics. Familiar items in the classroom: doors, windows, bookshelves, the blackboard, light fixtures should be labeled in the target language and students should be encouraged to refer to these items by their new names. From the first day of class, instruction should be carried out almost entirely in the target language, the goal being to suspend translation and to encourage students to think in the new language.

The gifted education tradition has contributed precious little to the practice of foreign language instruction: in fact, one of the least effective methods—foreign language "enrichment"—derives from the gifted tradition. Nothing is a purer waste of time than programs which encourage dabbling in a variety of foreign languages. As one frustrated student remarked: "I have learned to count to ten in Spanish, French,

and German, and I'm beginning to wonder—isn't there anything more?" (Tangherlini & Durden, in press).

The goal of primary instruction in foreign languages is two-fold. First, students should be taught a variety of songs, poems, dialogues, idiomatic expressions and phrases, which can be reproduced with apparent fluency. Secondly, they should be encouraged to feel comfortable expressing ideas and communicating in a rudimentary version of their second language, a pigeon dialect as it were, replete with approximations and grammatical infelicities. Correction of this early spoken language should be suspended for it will only force translation and shut off the student's emergent inner speech. It is only at the transitional stage that instruction can become more explicit, and when the methodical study of grammar and other formal structures must be incorporated to integrate the two strands of primary learning.

Transition

VanTassel-Baska (1987) presents a cogent argument for providing students at the middle school level (ages 11–14) with instruction in Latin. Because of its stress on "logical reasoning and analysis," "translation," and "the study of changes in form at increasing levels of difficulty." Latin, according to VanTassel-Baska, represents "a verbal analog to mathematics" (160). While the logical organization of Latin makes it especially well suited as a learning tool for students at the transitional stage of development, VanTassel-Baska's observations provide a more general framework for a productive approach to teaching any second language to students at this stage.

Assuming that students have received a solid grounding in their second language during the primary years, the goal of instruction in middle school should be to integrate the oral/phonetic skills with the cognitive/whole language skills through the study of formal grammatical and syntactical structures. This does not mean that the conversational and playful approaches adopted at the primary level should be abandoned. Instruction should continue to be conducted in the target language, with an expectation of increased fluency and more articulate expression. Students might, at this point, be encouraged to memorize and dramatize scenes from plays and to write and enact stories and dialogues of their own. McClain and Durden (1980) found that middle school students participating in intensive German classes learned the complete grammar of an introductory course in German in two-thirds the amount of time required by college students. While they did not handle abstractions with the same ease as college students, they were particularly adept at the mechanical aspects of grammar, such as "linguistic patterns and paradigms." It was also found that students readily acquired "the practical skills necessary for literary analysis," and that they could glean valuable insights by applying these techniques to the stories and poems they were studying. It was also noted that

instruction in German which, like Latin, involves a great deal of practice with increasingly complex forms, helped to reinforce students' understanding of the grammar and syntax of their native language. This was especially true when students were explicitly encouraged to make the connection through translation exercises and classroom discussions in which the structures of various languages were compared.

A combination of cooperative approaches and competitive activities appears to be particularly effective with this age group. Again, using a workshop approach is useful, for it encourages students to interact with one another in a context where the fear of failure is minimized.

Advanced Level

At the advanced level (15–18), if prior instruction has been carried out properly, students should be prepared to move into material usually reserved for college and university students. The comments regarding the value of using great literature apply here as well as to earlier sections. In advanced modern language classes, students should be fully engaged in workshop-style discussions, and the teacher's role should primarily be that of a diagnostician and mentor. On the one hand, the teacher should keep close tabs on the students' progress, using direct instruction and exercises to address specific weaknesses and deficiencies in the students' learning. On the other hand, the teacher should facilitate discussions of literature, current events, or other topics of general interest. At this point, all instruction should occur in the target language, and students should be expected to make frequent oral presentations and write lengthy, articulate stories and essays on a regular basis.

Creative Writing

Primary

Addressing an audience on the art of writing short stories, Flannery O'Connor (1962) made the following remarks pertinent to writing instruction on the primary level:

I have heard people say that the short story was one of the most difficult literary forms, and I've always tried to decide why people feel this way about what seems to me to be one of the most natural and fundamental modes of human expression. After all, you begin to hear and tell stories when you're a child, and there doesn't seem to be anything very complicated about it. . . . I suspect that most people start out with some kind of ability to tell a story, but that it gets lost along the way (86–87).

At the primary level, when children are just beginning to write, the responsibility of the teacher consists of

helping them to retain and improve the ability to tell stories—whether fictional or nonfictional. CTY begins its sequence of writing courses, both on the primary and the transitional levels, with literary nonfiction and personal narrative. At the primary level, fluency and confidence are the main objectives. Students are taught various approaches to generating ideas for essays and stories and are given ample opportunity to develop writing routines with which they feel comfortable. Criticism is accompanied by praise and focuses on issues of style and content rather than the minutia of grammar and spelling. Experimentation and word-play are encouraged. For example, students are asked to construct anagrams using their names and the names of classmates. No attempt is made to teach creativity explicitly, since there is no evidence that this can be done. However, when students demonstrate creativity in their writing, they are praised and encouraged to examine the processes which led to their success, so that they might repeat it.

As students become increasingly confident, they are provided with models of increasing complexity to imitate (e.g., limericks, haiku, terza rima, sonnets, and sestinas). Again, the principle described in the section on oral expression holds here also: while a student of 9 or 10 years may compose a poem which imitates the form of a Shakespearean sonnet, one should not expect Shakespearean insight. In imitating models, the student has not failed if meaning is sacrificed to form. At this point, it is the act of production that is crucial (Olson, 1983).

Transition and Beyond: The Workshop

As the students' understanding of writing becomes more sophisticated, they are increasingly exposed to new tools of the craft and taught to examine the ways in which writing works, in Flannery O'Connor's terms, to see how a story or essay is "made." Initiation into the more formal aspects of the writer's craft is accomplished through the workshop, a strategy derived from graduate writing programs—in the case of CTY, the Writing Seminars of the Johns Hopkins University. In a class arranged as a workshop, students are considered apprentice writers, practicing their craft and honing skills under the guidance of a more experienced writer, who serves primarily as a mentor and a coach, *primus inter pares* (Reynolds, 1980; Reynolds, Kopelke, & Durden, 1984; Albert et al., 1992).

Because they are actively engaged in the process of writing, CTY has found practicing writers to be the most effective workshop leaders. Further elucidation of this approach may be found in the poet Denise Levertov's (1970) discussion of her work as a writing teacher:

My inexperience . . . has meant that so far . . . I have inevitably brought to teaching a freshness, a quality of improvisation, that I believe my students have found stimulating.

What the non-professional teacher—the artist who is invited to teach *his thing*—has to offer must surely be precisely a fresh response to the individual group of students and his passionate interest in the art he is teaching. . . .

The fact that most schools do not have the luxury of being able to provide students with access to professional writers (although, given the current state of publishing, writers come much cheaper than most school administrators might imagine), does not mean that a workshop approach cannot be implemented. It simply means that teachers must be willing to attempt to change the way they conceive of their role in the classroom. First, they must adopt the perspective of a writer, and begin to ask of a text the sort of questions that a writer asks: Does this work? How does it work? How doesn't it work? What techniques can be employed to improve it? One way that teachers may begin to make this shift in thinking is to make a commitment to completing writing assignments themselves—to apprentice themselves, along with their students, to words. In so doing, the instructor may begin to understand that writing is a process of exploration, experimentation, and discovery, that writers do not always set out knowing exactly where they are going or how they are going to get there.

In the workshop, emphasis is placed on helping students to develop routines that will work for them: effective teachers recognize that there is not one “process of writing” but as many processes as there are writers. This does not mean that the more formal aspects of writing are ignored; however, students are taught to view forms not as inflexible Platonic ideals, but rather as structures with historical significance, which they may choose to employ to create certain effects or to give a piece of writing resonance. Or to put it another way, students are taught what Flannery O'Connor (1962) called “those conventions which, in the hands of the artist reveal . . . the central mystery of our position on earth.” While fostering an appreciation for this mystery is a central concern of the workshop, it is equally important for students to gain an understanding that writing which creates an effect or makes a point derives from hard work, from concentrated experimentation and continual revision—that the mystery of expression lies in the product, not in the process of production.

Although direct instruction has fallen into disfavor in recent years, it continues to serve a vital function even in classes which are primarily organized as workshops. There is simply no more effective way of introducing new concepts and broad contextual material, without which the workshop has a tendency to run out of steam, to become a rehearsal of concepts which students have already mastered. In order to achieve maximum effect with students of this age, lectures should be short and clearly focused; whenever possible, they should be accompanied by exercises designed to reinforce new concepts and skills.

After students have gained some fluency in the basics

of literary nonfiction—narrative, description, the use of detail to support a generalization, issues of voice, point of view, and audience—instruction focuses increasingly on more analytical approaches to writing. In CTY's second level writing courses, emphasis is placed on rhetorical devices and modes, logical analysis, and critical theory. In “Writing and Society” students discuss in the workshop setting and write critical essays about advertisements, television shows, movies, rock and roll music, and other “honorary texts.” In this way, they learn that the basic tools of hermeneutics are applicable to a range of subjects: that life itself may be considered a subject of textual analysis. In “Writing and the Arts,” students are encouraged to apply the techniques of close reading and the workshop to music, painting, drama, sculpture, as well as literary texts—to pay close attention to the ways in which an artist creates a particular effect. In observing parallels and contrasts between the plastic, the visual, the musical, and the literary, students are encouraged to formulate their own theories about art and artistic expression.

CTY also offers a third level of courses in creative writing, focusing on fiction, poetry, and drama. As in all CTY writing courses, the works of accomplished writers are used as models. The formal aspects of craft are introduced via Aristotle's *Poetics* and reinforced using exercises developed by Raymond Queneau, John Gardner, and CTY's instructors. Douglas Kincaid, for example, has the students in his *Poetics* class speak to one another in iambic pentameter one day and in rhymed couplets the next.

Caroline Payson, a fictionist and veteran CTY instructor, has developed an exercise that is uniquely well suited to developing a student's ability to control and modulate style. First, the teacher reads a fragmentary passage, marked by a distinctive style, to the class. Next, students are asked to complete the passage, imitating to the best of their abilities the voice, tone, and style of the author. Meanwhile, the teacher writes the author's continuation down on a piece of paper similar to the one where the students are writing their attempts. After everyone has finished writing, the teacher collects the various efforts and shuffles them together. Next, the teacher reads each of the attempts along with the author's version aloud to the class. Students then vote on which of the conclusions they believe to be the one written by the author. In the spirit of friendly competition, a tally is kept of the number of votes received by each author as the game is repeated several times. Such training of the ear and pen is particularly important for the budding fictionist, playwright, or lawyer.

Depending on the preferences of the instructor, the precise routines of the workshop will vary; however, there are certain elements that are shared by all effective workshops. First and foremost, an atmosphere must be created in which young writers feel that they can safely take intellectual risks: from the start of the workshop, the teacher must stress the importance of mutual respect. Since the primary mission of the workshop is to provide

a forum in which young writers take turns analyzing and discussing each other's work with a view to improving it, little progress can be made if students do not respect and trust one another. According to Elizabeth Albert (Albert et al., 1992), Coordinator of CTY's Academic Programs, "the workshop creates a kind of paradox: at the same time that instructors encourage their students to invest themselves in their writing, they must help students not to take criticism personally".

What follows is a description of one approach to the workshop; a more detailed description can be found in *Writing Instruction for Verbally Talented Youth* (Reynolds et al., 1984). In the workshop, students are seated around a conference table or with their desks arranged so that they face each other. Discussion focuses on an essay, a poem, a story, or text of some other sort, which has either been written by a student or by an established writer. In the case of a workshop focusing on a student's writing, copies of the piece under discussion are distributed several days before the class meeting, so that students may prepare their comments.

Many teachers like to begin the workshop with "an opening celebration," in which each workshop participant chooses an aspect of the piece to praise. The goal is not simply to boost the writer's ego, but to have students pick out particularly felicitous turns of phrase, effective uses of specific techniques, well-executed transitions, and then to explain why these are worth celebrating. This process is particularly useful for beginning writers, because it teaches them that there is much to be learned from classmates. After the opening celebration, a workshop leader (preferably not the teacher) offers a summary of the assignment and a general assessment of the piece's overall effectiveness. Many teachers find it useful to limit the workshop leader to three main points which will structure the subsequent discussion.

Once the full class becomes involved in the discussion, the workshop leader and the teacher serve mainly as facilitators: they keep the discussion on track by reiterating the main points raised in the opening presentation and by asking focusing questions. The teacher bears the added responsibility of insuring that the criticism remains constructive. Adolescents are notorious for making vague and sweeping assertions about their tastes. Teachers must make it clear, particularly through the rigor and specificity of their own comments, that such assertions are inappropriate in a workshop setting. The task facing a workshop participant is not to determine whether or not he or she likes a piece but rather to contemplate the means by which a piece may be improved. After the discussion has run its course, the workshop leader, aided by the teacher, makes a closing statement in which the main points and suggestions raised in the workshop are summarized. It is not until after the closing remarks have been made that the author is allowed to make a brief statement and to ask for clarification of any points that may not have been clear. As a service to the author, classmates return their

copies of the piece with detailed comments written in the margins and suggestions for revision noted at the end.

In CTY courses, the workshop process is integrated with the study of literature and literary forms, using the techniques of textual analysis discussed in a previous section. Students are introduced to new concepts and general contextual material through direct instruction, and exercises and games are used to model the processes involved in effective writing and to reinforce the acquisition of skills and techniques. The volume *Writing Instruction for Verbally Talented Youth* discusses a number of these games and exercises. In implementing the workshop, the teacher must always take care to avoid becoming formulaic, for it is only through freshness and spontaneity that the teacher may inspire in students that sense of mystery which is the precondition for all learning.

Inter-Disciplinary Approaches

While inter-disciplinary approaches are often recommended for meeting the needs of highly capable students, the justification for such approaches remains largely theoretical. Advocates of inter-disciplinary education are particularly concerned with issues of transfer: they fear that skills and knowledge garnered in English class will not be brought to bear in history class (or in life), unless the artificial barriers separating the disciplines are removed.

Recent research on the mechanics of knowledge transfer have brought to light new ways of understanding the relationship between domain-specific knowledge and general cognitive skills. Perkins and Salomon (1988, 1989) have shown that earlier advocates of general cognitive skills may have put too much faith in the ready transfer of skills across domains. While emphasizing the importance of a rich knowledge-base within specific domains, Salomon and Perkins have not abandoned the notion of general cognitive skills all together. What emerges from their research is the sense that while skills and knowledge may be best acquired in a domain-specific context (e.g., in history class or physics class) transfer does not happen automatically. Instead, lessons must be structured in such a way that students learn strategies and processes which help them to reflect and "mindfully decontextualize principles." In the words of Perkins and Salomon (1989) "the approach that now seems warranted calls for the intimate intermingling of generality and context-specific instruction".

At the International School in Manila, humanities instructor Gina Apostol has devised the following lesson to help students learn about the connections between the various disciplines. During one class period students are presented with a painting, drawing, or print. They are asked to examine the work and to write a story or essay describing the action or tensions depicted. When these pieces are read aloud to the class, students note that the same image has been interpreted in a variety

of different ways by a number of observers. Students are then encouraged to discuss general principles about point of view that might be drawn from this lesson. In a subsequent lesson, students are assigned to groups and asked to research an historical event or phenomenon: they might be asked, for example, to examine the causes of World War I. Each group is provided with sources which reach different conclusions about the event in question. After each group makes its presentation to the class, students are once again asked to discuss the general principles about point of view, drawing connections between the interpretation of history and art. This lesson can further be reinforced by a viewing of Akutagawa's famous movie *Rashomon* and a lesson on relativity introduced in science class. Again, students should be encouraged to discuss and formulate general principles, so that the connections across the curriculum may be made explicit.

At this point, one reservation should be expressed with regard to inter-disciplinary approaches. Although there is nothing sacred about the way in which the disciplines are presently configured, there are certain forms, techniques, and approaches to problems that are best learned within the context of a discipline. In combining the disciplines at too early a stage, one runs the risk of confusing students, of making them think that there is no distinction between history and biology, or literature and sociology.

This reservation having been voiced, it is important to note that effective cross-disciplinary approaches depend largely on helping students to grasp the broad transferability of a variety of structures and methods. As Olson (1986) has argued, "the differences between the human and the natural sciences . . . is one only of their objects of study, not of their epistemologies. . . . Seeing nature as of a piece with reading texts". Thus, one way to help students learn to apply skills and knowledge across the curriculum involves combining structures and techniques commonly associated with one discipline with those of another discipline, or in Olson's words to use the connections between the hermeneutic and scientific epistemologies. This might involve examining a dead fish as though it were a text, or attempting to develop testable models and theories about a poem, play, or body of artwork.

Working with inner-city children in Baltimore, Maryland and Washington, D.C., CTY writing instructors Greg Seagle and Christine Hoskins have successfully applied this principle to help students make connections across the curriculum and develop skills that are broadly transferable. After having observed that students participating in an outreach program appeared to lag behind their coevals in the acquisition of formal reasoning and higher order thinking skills, Seagle and Hoskins (Barnett et al., 1992) designed a number of exercises to link observation, prediction, and description skills commonly associated with the scientific method to the hermeneutic techniques of close reading and textual interpretation.

One particularly effective lesson included Ms Hoskins's 10-month-old-son Benjamin as a laboratory assistant and involved reconstructing a number of Piaget's experiments on object permanence. First, the class read a brief description of Piaget's experiments and discussed the goals and significance of the experiments. Then they made a number of predictions about whether or not Benjamin would be able to find things that were hidden from him. While the experiments were being conducted, the students were instructed to take notes and encouraged to discuss their observations. Thus, Benjamin's explorations were treated the way a text might be treated in the workshop, as an object that requires close examination, discussion, and consideration. After the experiments were completed, students were asked to write up reports of their findings. In discussing these reports, the instructors helped the students to see the importance of using precise language, choosing vivid details, and making exact observations, whether one is writing a scientific report, a short story, or an expository essay.

In order for cross-disciplinary lessons to be carried out effectively, instructors must be well-versed in the various disciplines they would seek to integrate. Furthermore, lessons must be explicitly designed to facilitate the transfer of skills. This is accomplished when students are encouraged to posit general rules that may be applied to other contexts and when structures from one discipline are incorporated into lessons in another discipline. In the next decade it will be important to explore knowledge transfer on the level of the basic linguistic structures that allow individuals to make connections between seemingly disparate objects and ideas. According to Aristotle, "metaphor is the one thing that cannot be learned from others; and it is also a sign of genius, since a good metaphor implies an intuitive perception of the similarity in dissimilars." Aristotle's observations notwithstanding, the challenge for those who seek to make learning transferable may consist of finding ways in which to make genius teachable.

Conclusion and Suggestions for Further Research

This chapter should be construed not so much as an exhaustive summary of effective strategies and programs for developing verbal talents but rather as a synthetic framework. An attempt has been made to draw connections between current understandings of language and literacy acquisition, developmental psychology, classical works in psycholinguistics, and the humanistic tradition. What emerges is a model in which emphasis is placed on individual development and the processes whereby the educational environment may be shaped to address the needs of the student.

The approach explored above bears a great deal of resemblance to widely accepted models for developing musical talents and parallels Bloom's (1985) findings

regarding the development of scientific, mathematical, and artistic talent. In the early stages of talent development, instruction should be holistic. Students memorize poems, attempt to imitate poems, and read for universal understanding. At the intermediate stage, if students are to move beyond the novice level of language usage, they must begin to examine and analyze linguistic processes on what has come to be known as the meta-cognitive level.

It is not, however, appropriate to introduce separate instruction in meta-cognitive thinking at this point. The tools of literary analysis and textual interpretation, which have been developed and refined over the centuries, are the ones best suited to the task of improving students' language skills.

Denying students access to these tools, because of one's ideology or stance on interpretation, is equivalent to using relativity as a justification for omitting Newtonian mechanics from an introductory physics course. The point is that in attempting to express themselves or communicate ideas, students encounter problems which have been addressed many times before by previous writers, speakers, and readers. Formal structures may be understood as the tools and strategies which other generations have developed to solve linguistic problems; while they need not accept approaches developed by predecessors, they are at a tremendous disadvantage if they do not know they exist. There is no reason, for example, why a student should be forced to deduce the structure of tragedy or epic when these have been described so concisely and elegantly by Aristotle.

Writing at the beginning of this century, Henry James observed that young people of the future would go for rides in airplanes but would know nothing about mystery (O'Connor, p. 124). This observation coincides with Steiner's description of the descent into a post-cultural condition, characterized by its "new stoic or ironic pessimism . . . at once realistic and psychologically hollow" (80). Oddly enough, it is the humanists who are most pessimistic about the role of mystery in current understandings of the position of this majestic earth in the universe. Physicists, in contrast, sound increasingly like poets of old when they describe big bangs, black holes, asymptotic freedom, and indeterminacy. Interestingly enough, Einstein himself felt that a sense of mystery was the prerequisite for learning of any sort. Thus, the most important question for researchers and educators to address may be: how can we nurture and develop a child's sense of the mystery of existence?

The following specific suggestions for further research are proposed in light of the framework presented above.

(1) Continue expanding the dialogue between the human and the biological/physical sciences, so that one may begin to understand the fundamental biochemical processes involved in memory and language acquisition.

(2) Extend models of language and literacy acquisition so that they begin to address higher levels of compet-

ence. A great deal of research needs to be done on the link between the acquisition of propositional logic, higher order thinking skills and literary production. In this regard, Olson's work on the basic processes involved in writing, and the connection between reading, writing and oral language should be extended.

(3) It might be interesting to examine the processes involved in the acquisition of slang and transformational argots of various sorts.

(4) Conduct research done on the nature of metaphor and the means by which students learn to make connections among disparate objects, ideas, and situations. Perkins and Salomon's (1988) theories about "high road transfer" may provide some clues here, but more work needs to be done on how one structures the educational environment to facilitate metaphorical thinking.

(5) Explore the extent to which the methods of textual analysis and critical interpretation are applied by students in other contexts, both with and without explicit instruction on how this is to be accomplished. In this regard, Olson's suggestion that young science students be trained in the methods of hermeneutics should be especially provocative.

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Programs and Strategies for Nurturing Talents/Gifts in Mathematics

WILHELM WIECZERKOWSKI AND TANIA M. PRADO

Hamburg University, Psychology Institute II, Germany

Introduction

When considering strategies and programs for nurturing giftedness in mathematics, one must be clear about what is actually meant by such constructs. It is equally important to recognize the interdependence among the problems of definition, identification and conceptualization of special measures. This is obvious enough with the relationship between the definition of a psychological construct and its identification. The definitions used affect how highly gifted pupils are to be identified (selected) and what measures are to be included in special provisions. It follows that reliable diagnostic strategies and error-free identifications are limited without a satisfactory operational definition of the construct derived from an unequivocal theory. Furthermore, proven partial functions, special abilities or characteristic aptitudes at a particular time are not the only factors important for the prediction of excellence. The interaction of potential with personal characteristics, motivation, task commitment, and outside support all lead to the acquisition of domain-specific knowledge and a high level of performance. In this sense, excellence can be regarded as the optimal goal for the development of the highly gifted, and the unfolding of talent viewed as a continual shifting within the internal structure of knowledge and metacognitive competencies acquired at each stage. Parameters of mathematical abilities have occupied the interest of researchers for more than 50 years. Two central questions have repeatedly recurred:

(1) Is mathematical giftedness an expression of specific cognitive characteristics or is it due largely to high general intellectual abilities?

(2) Is mathematical giftedness a uniform construct or does a consideration of many different profiles of mathematical gifts make more sense?

Questions such as these are not exclusively of academic interest; depending on the answers arrived at, quite different strategies are implied for the implementation of special educational provisions.

Mathematical Core Variables for Research on Intelligence

In general, research carried out from the 1930s up to the 1960s only examined general factors of intelligence and not the more specific parameters of mathematical giftedness. Identified factors of intelligence such as spatial relations, visualization and orientation, numerical facility, reasoning, induction, deduction, and flexibility (cf. overview in Pawlik, 1968) were first introduced in validation studies involving unusual proficiency in solving mathematical problems (Halpern, 1986; Merz, 1979; Lloyd & Archer, 1976; Maccoby & Jacklin, 1974; Terman & Tylor, 1954; Siegvald, 1944). Since research on factors of intelligence at this time (e.g., the work of Thorndike, Thurstone, Guilford) was basically concerned with attributing complex cognitive processes to general operations (primary factors), the relative lack of attention given to the complex structure of specific abilities, such as those related to mathematical giftedness, is quite understandable. Areas of achievement among individuals or homogeneous groups were ascertained by means of varying profile emphases within a scale of general ability. This procedure is still common in recent test diagnosis and is also regularly applied when describing components of mathematical giftedness. In this context, more general cognitive operations such as ability in abstracting concrete problems, ability to generalize, flexibility, reversibility of operations, fluency of thought, and strategic decision-making ability are applied as core variables for mathematical giftedness. The main objection to the use of general ability parameters lies in the lack of specificity involved. In order to facilitate understanding of a special gift (or special measures to nurture it), it seems reasonable to assume that the primary cognitive operators mentioned above are not functionally equivalent if applied in specific academic topics such as mathematics, biology, physics or even the social sciences. At least, concepts on general academic giftedness should be augmented with specific

characteristics and then analyzed as to their bearing on mathematical talent (Dummer, 1983; Heid, 1983; Gardner, 1983; Sternberg, 1981).

Structure of Mathematical Abilities

Krutetskii (1976) has made a significant contribution to the understanding of the structure of mathematical abilities. He has shown that the structure of mathematical abilities is comprised of three components: reception, processing and retention of mathematical information (see Table 1). These closely related components influence each another, and constitute a completely integral system, or a distinctive syndrome of mathematical talent: the mathematical cast of mind (p. 350).

A mathematically gifted schoolchild is mainly distinguished from one of less talent by internalized qualitative differences in cognitive processes. This subject-related analysis of talent has been accepted by other researchers (e.g., Marjoram & Nelson, 1985; Bright, 1977), but still remains relatively indefinite.

TABLE 1

Structure of Mathematical Abilities (Krutetskii, 1976, p. 350)

Obtaining mathematical information

- The ability for formalized perception of mathematical material, for grasping the formal structure of a problem

Processing mathematical information

- The ability for logical thought in the sphere of quantitative and spatial relationships, number and letter symbols; the ability to think with mathematical symbols
- The ability for rapid and broad generalization of mathematical objects, relations, and operations
- The ability to curtail the process of mathematical reasoning and the system of corresponding operations; the ability to think in curtailed structures
- Flexibility of mental processes in mathematical activity
- Striving for clarity, simplicity, economy, and rationality of solutions
- The ability for rapid and free reconstruction of the direction of a mental process, switching from a reverse train of thought (reversibility of the mental process in mathematical reasoning)

Retention of mathematical information

Mathematical memory (generalized memory for mathematical relationships, type characteristics, schemes of arguments and proofs, methods of problem-solving, and principles of approach)

students apparently master a task more swiftly and more effectively by being able to resort more effectively to an intelligence structure and thus opting for any of their internalized cognitive processing strategies. Acquisition, application and extension of mathematical knowledge vary on a time continuum not only quantitatively, in regard to more rapid insight or the mastery of a math problem, but also qualitatively, in regard to a broader and increasingly discriminant spectrum of knowledge and proficiency far in advance of curricular requirements.

The Hamburg System of Complex Mathematical Abilities

The most striking feature of the main mathematical activities described by Kießwetter (1992, 1985) is their operative mode or the "acting" definition entailed in them. In this system, mathematics is understood as a process of devising theories in the course of which four steps can be identified: (a) ascertainment of constellations (questions) of interest, (b) focusing on the mathematical object in question and specifying the statement of the problem to be processed, (c) creatively and by means of heuristic procedure arriving at new terms, mathematical formulations, proofs, and (d) broadly applied expedients which will place the established interconnections in an optimal series of mathematical expressions, formulations and conclusive evidence (Kießwetter, 1992, p. 11).

This concept of process-oriented mathematical activity is characterized by its predominantly qualitative nature, which appears to be more important than quantitative aspects when defining, identifying and implementing special measures. The Hamburg Test for Mathematical Giftedness (HTMB—Hamburger Test für Mathematische Begabung) developed along the lines of 6 system variables (see Table 2) not only recognizes correct answers in its evaluation but also the sensible application of these system variables (Wagner, Zimmermann & Stüven, 1986). High scores on the test indicate probable success of creative work within mathematical domains or/and related areas (Wagner & Zimmermann, 1986).

TABLE 2

System of Complex Mathematical Activities (Kießwetter 1985)

- (1) Organizing materials
- (2) Recognizing patterns or rules
- (3) Changing the representation of the problem and recognizing patterns and rules in this new area
- (4) Comprehending and working with highly complex structures
- (5) Reversing and inverting processes
- (6) Finding (constructing) related problems

According to Krutetskii (1976), characteristics such as speed of mental processes, computational abilities, memory for symbols, numbers and formulae, ability for spatial concepts, and ability to visualize abstract mathematical relationships and dependencies are not obligatory for mathematical aptitude. In contrast, a few

The CTY Approach

The Center for Talented Youth (CTY) at The Johns Hopkins University conducts talent searches using the College Board Scholastic Aptitude Test (SAT), a standardized test for 17- to 18-year-olds. The idea underlying the search is that 12- to 13-year-olds “who score highly on the SAT-M have enhanced problem translation ability and are superior in their ability to represent and manipulate information in short term memory” (Benbow, 1990, p. 96). In this pragmatic approach, mathematical giftedness is defined in terms of an extraordinary level of speed in processing and retaining basic mathematical information and in operating successfully with these novel terms in novel tasks. Yet, many mathematicians do not consider speed components and memory for symbols, numbers and formulae to be essential requirements for mathematical talent. Perhaps this discrepancy in the importance attached to speed and power components is rooted in a misunderstanding. Those unacquainted with, and making their first efforts in understanding, the findings of mathematical research are working with a qualitatively different cognitive background from those who are expert in the field.

Mathematical Giftedness from the Perspective of Gifted Youth

As perceived by youth of high mathematical achievement between the ages of 16 and 20 (174 males and 60 females), 71 of whom took part in the Hamburg Provision Program for up to six years, an exceptional mathematical gift is attributed to six dimensions obtained by a factor analysis. These are: general (unspecified) traits; task commitment; memory for symbols, numbers, formulae, principles, mathematical structures and patterns; flexibility in mathematical abilities; and visualization of problems and relations. The factor items and their loadings are shown in Table 3.

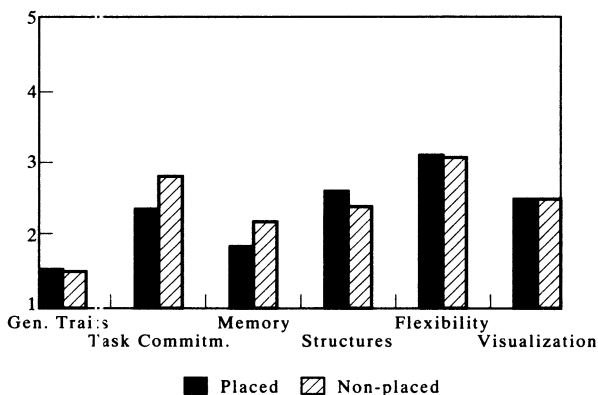


FIGURE 1 Aspects of mathematical talent

As Figure 1 shows, cognitive flexibility was viewed by the youth displaying high achievement in mathematics as being the most important, followed by perception of structures and patterns, the esthetic value and elegance inherent in a solution, and the ability to visualize abstract mathematical relations. However, statistically significant ($p < .01$) differences in attitudes towards the importance of the task commitment and memory for symbols, numbers and principles factors were found between those in the Hamburg Provision Program and those not in it. These two factors were viewed as more important for excelling in mathematical activities by those not included in the program.

Mathematical Excellence as a Developing State of Mind

As the above considerations have shown, the various conceptions of mathematics lead not only to varying perceptions of what mathematical giftedness indeed means, but also apparently affects the instructional methods and contents (Zimmermann, 1992; Wagner & Zimmermann, 1986), all of which has not been explicitly reflected in scientific debate thus far.

Aspects of mathematical giftedness are not in the least an expression of subjective experience and personal expectations. Statements on mathematical giftedness and its structure exhibit commonalities and uniformity as well as specificity supposedly stemming from different philosophies of mathematics (Steen, 1981, 1979) and being based on the rich variety of aspects within mathematics (David & Hersh, 1981).

The character of giftedness as being “in process” and the development of special ability as change in the internalized structure of a subject has often emerged in the scientific research (cf. Geuß, 1981). From this point of view, giftedness unfolds along with ongoing work in a given subject. Abilities are then extended within a dialectical relation between subject and (learning) object, i.e., between the learner and the subject material. The conception which sees changes in cognitive structure as being a result of constant interaction with accumulated and new experience has been put forward primarily by Piaget (1970).

Such an interactionistic-constructivistic perspective has been emphasized in most recent exchanges on mathematical giftedness by, among others, Bauersfeld (1987, 1988). Two fundamental qualities of processes are mentioned: (1) being able to easily shift from one subjective reality to another, and (2) being able to easily form new subjective realities. According to Bauersfeld (1988), there are six steps within these constructivistic processes in which categories of metacognitive competencies worked out by Sternberg (1985, 1981) can be filled in (see Table 4).

An analysis such as this probably comes closer to the problem-solving process than do ability-oriented definitions of mathematical giftedness. However, it must

TABLE 3
Aspects of Mathematical Talent

(1) General (unspecified) traits	Understanding and empathy	.579
	Emotional stability	.612
	Originality of formulation	.605
	Sensitivity	.604
	Originality in connecting ideas and information	.585
	Unusual suggestions	.572
	Fantasy	.566
	Aesthetic sensibility	.570
	Rhythmic feeling	.563
	Good verbal expressiveness	.523
	Willingness to take risks	.568
	Self-confidence	.543
	Musicality	.522
	Perseverance in attaining goals	.515
(2) Task commitment	Tenacity in problem-solving	.763
	Task commitment	.727
	Goal orientation	.719
	Ambition	.702
	Constancy in mastering tasks	.696
	Permanent readiness to learn	.605
	Ability to concentrate	.537
(3) Memory for symbols, numbers, principles	For formulae	.730
	For numbers and symbols	.676
	For relations	.637
	For methods and principles	.604
	For mathematical proofs	.549
	Searching out most apparent solutions	.431
	Reconstructing learning process	.480
Swift and precise calculations	.603	
(4) Mathematical structures and patterns	Flexibility of thought	.734
	Inversion of thought processes	.508
	Flexible application of solving principles	.384
	Generalizing a problem in terms of problem area	.346
	Trying various approaches to a problem	.324
Shift in representational level	.437	
(5) Flexibility in mathematical abilities	Flexibility of thought	.734
	Inversion of thought processes	.508
	Flexible application of solving principles	.384
	Generalizing a problem in terms of problem area	.346
	Trying various approaches to a problem	.324
Shift in representational level	.437	
(6) Visualization of problems and relations	Ability to visualize problems	.776
	Imagining spatial relations	.774
	Ability to imagine visually	.768
	Visualizing abstract relations	.738

TABLE 4
Metacognitive Analysis of Progress in Mathematical Activities (Bauersfeld, 1988)

Recognizing problem	Activating fitting subjective realities (constructions)
Planning strategies of problem-solving	Finding an appropriate initial approach
Selecting steps of action	Wider range of alternatives because of realities created by the subject
Mental representation of the problem	Finding a concise, condensed and generalized form of representation
Distributing attention	Frequent shifting of perspective and a wider overview of connected subjects facilitate complex decision making
Monitoring solution-related process	Monitoring the informational network at each phase of the process

be added that mathematical activities of young people will not always follow this ideal algorithm of thinking linearly and without fractions in the course of progress (Zimmermann, 1992).

Programs and Strategies in Nurturing Mathematically Gifted Students

Educational programs for the gifted student can, on the whole, be classified within a two-dimensional system. One dimension concerns instructional settings (in-school settings vs out-of-school settings), and the other concerns the special approach of provision (acceleration and enrichment). This two-fold formal structure is complicated by the supplementary factor of grouping according to either ability or interest. Though both of these criteria are, in practice, applicable to the same program: in most cases, ability or interest groupings are of significant importance for placement and selection when considered separately.

Acceleration can be described as a provisional procedure which allows highly gifted pupils to cover a curriculum in a shorter period than would be required by their peers at a normal classroom pace. Enrichment for the highly gifted involves giving them the opportunity to study in greater depth topics which are (or, possibly, are not) part of the regular curriculum of their actual grade.

Enrichment and acceleration are generally seen as principles in opposition to one another. In contrast, Stanley (1986, p. 228) has pointed out that "enrichment must, in the long run, be accelerating, if it is not to be stultifying. To be really effective, acceleration must be enriching." Nevertheless, each program type takes a different basic standpoint and expresses varying intentions, as can be seen in two examples of extracurricular course programs—an American one at the Center for Talented Youth and one which has been run as the Hamburg Model in Germany since 1982.

The Center for Talented Youth (CTY) offers fast-paced mathematics classes in intensive 3-week residential courses during the summer. Students registered for the Precalculus Mathematics Sequence are given an Algebra Diagnostic Test in order to place them at an appropriate instructional starting point. In accordance with the principles of diagnostic testing followed by prescribed instruction, the DT→PI model (Stanley 1991, 1978; Lupkowski et al., 1990), the students' approach is tailored to their individual needs. Progress in course work is paced according to the learners' specific intellectual talents and motivation.

The rationale of the CTY concept is to support young mathematically gifted pupils in the swift and improved mastery of math curricula (and other scientific subjects as well) in a manner which would not otherwise be possible in most public and private school math instruction. CTY students use their academic program

coursework for credit or placement purposes at their local school (Barnett & Corazza, 1993, p. 10).

The underlying philosophy of mathematics of the Hamburg Model (Kießwetter, 1992, 1988) is basically different from the rationale of the CTY. As Wagner and Zimmermann (1986, p. 275) have pointed out, the emphasis of the Hamburg Provision Program is on informal mathematics and mathematical ideas rather than on abstract structures. In this way, "good mathematics" is defined by the quality of problem-solving strategies. In this context, mathematics is seen as an open process of thought rather than a universe of fixed products. Therefore, the main educational goal is exploring mathematics by micro-research processes with as little guidance as possible. In this view of necessary mathematical provision, finding and creating problems are as at least as important as solving them.

The different basic positions of both approaches are obvious: while the CTY approach intends to speed up learning with a rather radical form of fast-paced learning of prescribed instruction aided by skilled mentors, the Hamburg approach is guided by the central thought of improving mathematical abilities through working with relatively complex problems. The conceptualization of strategy differs from one approach to the other.

Programs in Advanced Mathematics for the Gifted

Programs in advanced mathematics for the mathematically highly capable and interested can be divided into several types according to how they are implemented into either the in-school or out-of-school settings and according to the dominant didactic ideas underlying

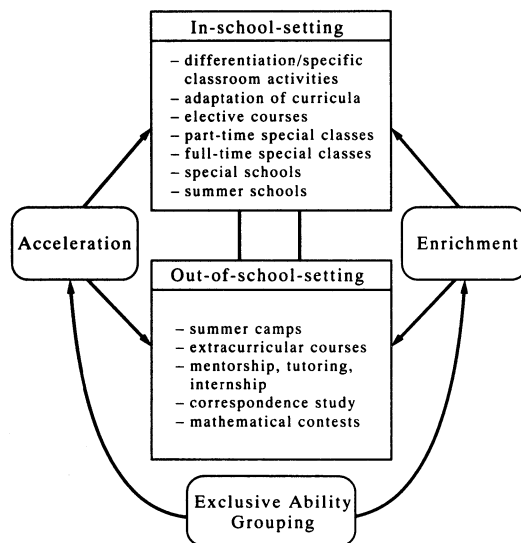


FIGURE 2 Strategies for special provision for the mathematically gifted

them (acceleration vs enrichment). A two-dimensional matrix cannot, of course, account for the wide range of programs for the gifted. The sheer number of programs meant to provide special measures for the highly gifted at a regional, national and international level would thwart any effort to ascertain their structure (see Figure 2).

Providing opportunities for the gifted has been established in in-school settings as well as in out-of-school ones. Programs in both settings follow either a radical or less accelerated strategy, sometimes with additional subjects included in the curriculum or an enrichment type of mathematical instruction.

Exclusive grouping is a prerequisite for participation and include three types of pre-selection: selection with the use of objective ability tests, placement on the basis of previous extraordinary achievement in regular class instruction, and a strong interest in mathematics.

These three criteria are not mutually exclusive and will often come into play in combination. On the one hand, interest in mathematical problems is almost always related to a higher level of achievement and conception of oneself as a bright achiever. On the other hand, the readiness to prove one's own skills in a talent search and to take part in a program is, as a rule, coupled with exceptional interest in mathematics. Grouping procedures follow a four-step strategy (Figure 3).

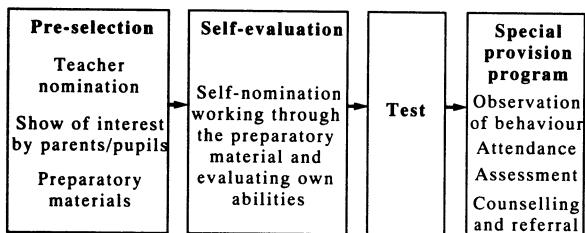


FIGURE 3 Identification by pre-selection, self-evaluation, testing, and special provision in advanced courses.

A strategy such as this (or very similar to it) is being followed by various programs which have been implemented worldwide. A few examples can be given.

The Country Day School in Seattle tests interested elementary school-age children with very high individual intelligence test scores (WPPSI or WISC-R), followed by an interview with the parents and an evaluation of previous school records. Selection criteria includes social skills, emotional stability and intellectual giftedness. The objective of the program is to support children in acquiring basic learning skills for their later academic career (Roedell et al., 1980). Elective and enrichment courses are offered on a rotating basis from a curriculum that includes, for instance, additional laboratory science, advanced mathematics, robotics and chess.

The North Carolina School of Science and Mathematics (Durham) is highly selective in its admissions policy. Sixteen separate criteria are used to screen students, including standardized tests, personal recom-

mendations, writing samples and out-of-class participation in science fairs (Cox et al., 1986). The teaching and learning processes include independent studies, tutorials, projects and a professional research internship (mentor program). Students get practical experience under the guidance of individuals away from the campus. For mathematics curricula and courses see Davis and Frothingham (1985).

Special schools have long been in place at Russian universities, such as the polytechnical and mathematical boarding school of the University of Novosibirsk, which includes a secondary school level comprised of the ninth and tenth grades. Pupils are chosen based on a selection process of several steps. First the university publishes mathematical problems requiring mathematical and logical capability and judgment in its solution. The most successful applicants taking part and the winners of regional Math Olympics are then invited to a four-week summer camp. Final admission to the special school is based on psychological testing which follows the final exam at the end of trial classes at the camp. A similar screening process is employed at the Moscow Lomonosov University (Hilgendorf, 1987; Kolmogorov et al., 1985).

An example of special class grouping within the regular schools can be seen in the former Czechoslovakia. There are twelve preparatory schools with special mathematics classes. In 1969 the first courses were introduced in Prague covering all four years of high school (grades 9–12). This provisional mode had as its objective the identification and nurturance of the mathematically gifted as well as the preparation of the students for further study in the sciences and engineering. In some cases special provision begins with math instruction at the elementary school level. Standard class instruction is extended at this level to include new areas such as permutations (subsets), working with graphs, and introductory math-based data processing. A similar concept can be seen at the secondary school level. Four more school periods a week are devoted to mathematics, physics and chemistry than in normal classes. After parents have nominated their children and the instructor agrees that testing is appropriate, an entrance examination is administered as a final requirement.

In the Federal Republic of Germany a similar program for highly gifted youth beginning in the eleventh grade (16-year-olds) and most recently starting in the tenth grade has been established at Jugenddorf-Christopherusschule in Brunswick, Lower Saxony (Eichholz, 1990; Hellert, 1990).

Part-time special classes in mathematics offers intensive contact with mathematical problems in grades 11–13 at Germany's preparatory Gymnasien. Course electives which allow high school students to determine for themselves the emphasis of their preparatory studies and which later constitutes the core of what subjects they will be tested on before graduating, include a special course in mathematics. A formal screening process does not

take place. Taking part in such a course is determined by achievement in the subject and a strong interest in mathematics.

In addition to this, there are also study groups being offered at Germany's preparatory schools with voluntary participation. Mathematics topics are covered which would not ordinarily appear in school curricula. Teachers of mathematics tend to encourage pupils to participate who they feel would most benefit from such study groups, yet all those displaying interest are welcome to take part. It is in this form of special provision that the fourth element of the pre-selection, self-evaluation, testing and special provision paradigm takes on more significance (see Figure 3).

In England the secondary level curriculum provides acceleration and enrichment opportunities for the gifted student of mathematics with courses in Additional Mathematics and Further Mathematics as well as Mathematics as an advanced-level subject. These accelerated courses contain more advanced material, but also require more in-depth study of the standard mathematics curriculum (Marjoram & Nelson, 1985).

Regional centers provide the participant with a wide variety of opportunities to engage in work beyond that offered in school, in many cases in conjunction with a nearby university (House, 1988). Examples of these well-organized activities may be seen in the Hamburg Model for mathematically precocious students, the CTY approach, the Master Classes of the Royal Institution and the MEGSSS program (Mathematics Education for Gifted Secondary School Students). For objective, organization, and contents, see Kaufman & Rising, 1983).

The Hamburg Model has already been described above. Admission is restricted to about 20% of the highest scoring students in the talent searches administered each year. In 25 weekly sessions held each year, participants work in small groups on demanding mathematical problems (theory of graphs, permutations, number theory, geometry). Each problem can be pursued further since they are chosen to serve as a point of entry into a problem field. Particular emphasis is given to devising problem-solving strategies and identifying problems stemming from the original problem by extension and formulating these as questions (Kießwetter, 1992; Zimmermann, 1992; Wagner & Zimmermann, 1986).

Admission to the Center for Talented Youth Summer Program involves a two-step screening process. In the first stage, seventh graders who are in the top three percentiles of standard grade-level testing are invited to apply to the talent search. In the second stage, they take the Scholastic Aptitude Test (SAT) for high school students preparing for college. Students with scores at or above 500 SAT-Math earn admission to the summer programs which offer demanding mathematics courses, among them Precalculus, Mathematics Sequence, Linear Algebra, History of Number Theory, Digital Logic and Calculus. Mastery of course material must be demonstrated by several means, including a

standardized examination (Barnett & Corazza, 1993).

Mathematics Master Classes for Young People held at the Royal Institution of Great Britain have been offered since 1981, both in London and in various other school districts. Over the course of anywhere from 5–10 Saturdays, 12- to 14-year-olds are given the opportunity to work on interesting math problems not otherwise handled in normal class instruction. University mathematicians lead these sessions and guide the young people through the day. For objectives, organization and contents, see Zeemann and Stewart (1985) and Tammadage and Crank (1983).

Very much in line with this program is one held in Hamburg for 12- to 15-year-olds interested in mathematics who can take part in student circles given every two weeks by university mathematicians. The Mathematical Society and the Institute for Continuing Education of Teachers provide help in organizing and supporting this program (Müller & Sielaff, 1988).

Two other programs should be cited for their efforts to provide interested pupils with additional impetus to explore areas of mathematics outside school. The Weizman Institute in Israel offers mathematics fans from the fourth to ninth grade membership in a nationwide correspondence course called the "Math by Mail Club". Those taking part submit answers which are reviewed, corrected and returned along with new problems. Participants are later invited to attend a math activity day including a lecture by a mathematician (Burg, 1989).

The Mathematics Department of Monash University in Victoria, Australia publishes *Function*, a school mathematics magazine. Its intention is to provide secondary school math students with demanding mathematical problems. Essentials of the magazine are: valid and interesting mathematics, high quality exposition, and access to all. The contents of the magazine include pure mathematics, statistics, computer science and applications of mathematics. Matters of special interest such as computer chess, problems and solutions, and discussions also fall within the scope of the magazine. It comes out five times a year (*Function*, August 1992).

Concluding Remarks

Participation in a special program—whether on the basis of high test scores in a talent search, exceptional achievement in the classroom setting or by virtue of expressing a strong interest in mathematical subjects and thought process—entails unmistakable prospective components. As Eccles and her colleagues have shown in a General Model of Achievement Choice (Eccles, 1985; Eccles & Jacobs, 1986), dynamic processes set off by challenging activity within a subject can have a significant bearing on how such activity is experienced and the way ensuing decisions as to career path are made (for a discussion of related sex differences

in mathematical achievement, see Wiczerkowski & Prado, 1992; Wiczerkowski & Jansen, 1990).

Taking part in a special program for the mathematically gifted, and the challenge which normally is inherent in such participation, causes change not only in the cognitive structure of knowledge and thought of the young person, i.e. heightened mathematical competence, but also induces change in a person's non-cognitive structure. Up to the present, only modest empirical investigation of these dynamics can be found in studies concerning the effects of such changes.

Concepts of the characteristics and components of mathematical giftedness mark the beginning and remain central to any effort to identify and nurture the mathematically highly able. Not only the selection process, but also concepts dealing with the form and content of what optimally should be included in a program are directly affected by assumptions made about the structure of mathematical giftedness. Assumptions which are implicitly presented to school children assist them in forming their "perception of mathematics", their subjective realities, something which, presumably, later influences their attitude toward the subject. Special provision for highly able students of mathematics may, as knowledge and mathematical competence increases, implicitly induce a continuous change toward a specific mathematical cast of mind (Krutetskii, 1976). In most programs, this aspect is not explicitly considered.

The variety of approaches which can be used to nurture talent is enormous. The multiplicity of organizational principles, course content, formal as well as informal settings, regional and national set-ups within the gamut of special provision concepts make clear that there are a large number of available program forms. When selecting or constructing a program from such a large variety, one cannot act on the premise of arriving at the "right" one. It would be more valuable to make certain that the selected form is viewed by students as stimulating and effective. Finally, any strategy aiming to nurture mathematical giftedness is dependent on the respective instructional objective and intention of the program. As Gallagher (1985) pointed out, in reaching certain instructional goals, any of the approaches eventually adopted have their own intrinsic value.

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Programs and Strategies for Nurturing Talents/Gifts in Science and Technology

MICHAEL C. PYRYT

University of Calgary, Canada

YURI P. MASHAROV

Siberian Branch of Russian Open University, Novosibirsk, Russia

CHENGDE FENG

Oklahoma School for Mathematics and Science, Oklahoma City, Oklahoma, U.S.A.

Introduction

The purpose of this chapter is to discuss effective strategies and programs for nurturing those gifted in science and technology. The basic assumption of this chapter is that “no single formula can be developed which can be followed by all schools and all science classes” (Passow, 1957, p. 112). Rather a smorgasbord of educational opportunities (Stanley, 1979) should be available to enhance student’s potential for future development in science. Some items such as field trips might be thought of as appetizers, which might spark an interest in science. Rigorous content-oriented curriculum such as Advanced Placement Biology would be the main course for some students.

Participation in special science summer camps might be just desserts that reward dedication throughout the school year.

The decision regarding which item(s) from a variety of possible educational opportunities are most appropriate for a given student is a complex one which must be based on the characteristics of the learner (aptitude/achievement patterns, interests, level of motivation, career goals, developmental level, and socio-cultural conditions), the nature of the discipline (content knowledge, methodological skills, and personal traits needed to be a skilled practitioner), and the nature of the instructional option (goals, instructional activities, and staff competence).

A brief introduction to research findings and insights from the sociology of science, the psychology of eminence, and science education provides an orientation for examining recommended practices for nurturing talents and gifts in science and technology.

Lessons From the Sociology of Science

The sociology of science provides insights into socio-cultural factors that influence the development of future scientists. It also examines the role demands and expectations that are placed on scientists. It also provides descriptions of various functions in science such the communication process.

Compelling evidence regarding the origin of scientific accomplishment is provided by Zuckerman (1977) who examined background variables of Nobel Laureates and members of the United States National Academy of Science. Fifty-five percent of American Nobel Laureates and 47% of members of the National Academy of Science received graduate degrees from one of these institutions—Harvard, Columbia, Johns Hopkins, University of California at Berkeley, and Princeton. About one-third of these laureates attended one of 20 elite undergraduate institutions. After finishing graduate school, they were most likely to pursue post-doctorates or begin employment at prestigious institutions. As part of their scientific training, 52% of American Laureates and 41% of the 286 Nobelists worldwide between 1901 and 1972 had at least one Nobel Laureate as supervisor or senior collaborator. From these masters they learned to attempt important problems, to appreciate elegant solutions, to maintain high standards of performance, and to work hard to achieve these standards. This work pattern leads to early publication of significant research which results in recognition among peers and academic promotions. It also leads to enhancements in self-confidence as future scientists learn that they can compete with the best. Zuckerman’s work clearly supports the operation of what Merton (1968) has called

“Matthew Effects,” which are the cumulative benefits that accrue to those who show initial advantage.

Garvey (1979) provides a historical account of research into scientific communication. The major vehicle scientists use to establishing priority of a discovery is to publish the results in a refereed journal. Within each scientific discipline, there is a hierarchy of prestige among journals. Scientific recognition is enhanced by publication in prestigious journals. The likelihood of publication is a function of the quality of the manuscript, rejection rate of the journal, extent to which the topic and methodological approach is within the current mainstream, and the competence of the referee.

Lessons From the Psychology of Eminence

The psychology of eminence seeks to understand the personality characteristics, cognitive aptitudes, stages of the creative process, developmental antecedents, and environmental interactions that are correlates of eminence. This literature provides insights regarding the manner in which initial aptitudes and talents are cultivated to produce outstanding achievement.

Albert (1980) proposed that two transformations are necessary to achieve eminence. The first transformation involves channeling intellectual giftedness into creative giftedness. The second transformation involves channeling creativeness into the configuration of talent, drive, and values that it takes to succeed. These transformations are viewed as occurring as a result of the dynamic interaction of early talent recognition, family socialization experiences and career development experiences. This interaction is most likely to occur when the particular talent is of special interest to the family. Irene Joliot-Curie followed the career path of her parents, Nobelists Marie and Pierre Curie, and was awarded the Nobel prize in 1935 for synthesizing radioactive elements.

The Development of Talent Research Project at the University of Chicago (Bloom, 1985) provides insights into the socialization factors that occur as an individual proceeds from initial interest and aptitude through recognized achievements. Sosniak (1985) described the pattern development of outstanding research neurologists. Their initial curiosity was actively nurtured by their parents who provided intellectual stimulation and high expectations. The parents often purchased equipment such as science kits or toy microscopes, which were used by these future scientists to conduct experiments at home. As they grew older, their experiments grew in complexity. Their commitment to research as a career was catalyzed by their introduction to formal research in prestigious universities and medical schools. They were attracted to neurology as an area of study because of its intellectual challenge, complexity, and importance. The amount of effort required increased dramatically as

they progressed from one stage to the next. The scientific ethos of dedication, joy of discovery, and scientific approach was modeled by their major professors.

The research of MacKinnon and associates at the University of California at Berkeley (Barron, 1963, 1969; Helson & Crutchfield, 1970; MacKinnon, 1962, 1965, 1975, 1978) provides insight into the personality characteristics of eminent individuals. Eminent individuals possess the unique combination of theoretical and esthetic values. *They are motivated to find elegant solutions to discovering the truth.* They possess ego-strength and are capable of tolerating ambiguity and disharmony to a greater extent than most people. They are curious and prefer novelty and complexity. Two factors, Adaptive Autonomy and Assertive Self-Assurance, characterize their profile on the California Psychological Inventory. Descriptive adjectives include individualistic, self-reliant, spontaneous, flexible, assertive, ambitious, competitive, and self-confident. They rely on intuition. Welsh (1975, 1977) has proposed that two personality dimensions named *origence* and *intellectence* describe the creative individual. *Origence* is the preference for open-ended experiences that allow the individual to structure the world according to personal principles. *Intellectence* is the preference for abstract rather than concrete ideas and experiences.

Traditionally, the creative process is viewed as involving four stages: preparation, incubation, illumination, and verification (Wallas, 1926). Preparation involves directed conscious involvement in a creative challenge. Incubation involves a period of inattention to the problem. After this period of incubation which may last years, comes illumination. During this stage, the resolution of the problem comes in a flash of inspiration. The individual is convinced about the correctness of an idea. Verification involves the conscious testing of the validity of the illuminating idea. In science, the verification process may take decades. Autobiographical accounts of the operation of these stages are provided by Ghiselin (1952).

Mansfield and Busse (1981) have used accounts of Johannes Kepler, Marie Curie, Albert Einstein and James Watson to develop another model of the creative process in science. Their model involves the following steps: selection of the problem, extended effort to solve the problem, setting constraints on the solution of the problem, changing the constraints, and verification and elaboration. Effective problem selection involves sensitivity to discrepancies between theoretical predictions and actual observations. It involves choosing problems that are capable of being solved with the available instruments, resources, and methods. The importance of problem-finding has been emphasized by Getzels and Csikszentmihalyi (1975). Most major discoveries are the result of extended effort over a long period of time. During this period, the scientists develop parameters or “constraints” that limit the scope of the inquiry. Mansfield and Busse (1981) classified constraints as empirical, theoretical, or methodological.

Empirical constraints represent the results of previous experimental work that frame the current investigation. The paradigms (Kuhn, 1970) or world views including the theoretical assumptions that scientists adopt in conducting their research are theoretical constraints. Methodological constraints are limits imposed by the available instruments, research strategies, and data analysis procedures. Insight that leads to scientific discovery involves the changing of original constraints. Once this illumination occurs, the scientist must verify the new insight and elaborate on the implications of the discovery. Whereas Einstein took five weeks to develop the special theory of relativity after his insights into the meaning of time and simultaneity, Marie Curie took four years to isolate radium after tentatively identifying it as a new element (Mansfield & Busse, 1981).

Although emphasis on stimulating divergent thinking abilities (Guilford, 1950) is popular in gifted education programs, perspectives from the psychology of eminence suggest that convergent thinking is more important for scientific achievement. Mansfield and Busse (1981) suggest that scientists use convergent thinking as they proceed through the steps in the creative process. Kuhn (1963) also described the use of convergent thinking as scientists operate within paradigms. Research by MacKinnon (1962) indicates that a certain level of intelligence, typically one standard deviation above the mean, is necessary for creative achievement. Once this threshold is reached, intelligence and creativity are uncorrelated.

Lessons from Science Education

Science education provides insights regarding science achievement in terms of curriculum requirements, content and instructional practices. The second international study of science achievement provides insights regarding the relationship between curricular requirements in science and science achievement. Results for meta-analytical studies provide information regarding the effectiveness of science curricula and instructional practices for fostering science achievement.

In 1983–1984, the International Association for the Evaluation of Educational Achievement (IEA) conducted the second international study of science achievement. As described by Postlethwaite (1991), there were three subject cohorts involving 260,830 students, 22,612 teachers, and 9578 schools in 23 countries. Results indicated that national science achievement at age 10 correlated .84 with national science achievement at age 14. Countries with a lower population growth had higher achievement. Developing countries had lower achievement than industrialized countries. The top 20% of 14-year-olds tended to have similar scores. At the final grade of the secondary school level, there was a negative correlation between the percentage of an age group in school and achievement in science. There was

also a negative correlation between number of subjects studied and science achievement.

Keeves (1991) examined the degree of specialization in science in 10 countries at the secondary level. The secondary curriculum in science consists of biology, chemistry, and physics in most countries. Earth science is taught to some students in Australia, Italy, Japan, and the United States. Examination of patterns of science teaching and degree of science achievement indicated that science achievement was highest for 14-year-olds when all fields of science were taught simultaneously during the lower and middle secondary level. Early concentration of science content was predictive of higher achievement for the top 5% of students in their last year of secondary school.

It is possible to synthesize the research literature in any area by using a technique known as meta-analysis (Glass, 1976; Glass, McGaw, & Smith, 1981). This technique involves calculating an index of effectiveness known as an effect size (ES) for all studies in a given area, which meet specified criteria, and performing statistical procedures to summarize the effect size findings and to relate study features with study outcomes. By convention, effect sizes less than .20 are considered trivial; effect sizes between .20 and .50 are considered small; effect sizes between .50 and .80 are considered moderate; and effect sizes greater than .80 are considered large (Cohen, 1977). The index of effect size is calculated by subtracting the mean of the control group from the mean of the experimental group and dividing that result by the standard deviation of the control group [ES = (Mean of experimental group – Mean of control group)/Standard deviation of control group].

Several meta-analyses have been performed regarding science curricula and instructional practices in science. Weinstein, Boulanger, and Walberg (1982) performed a meta-analysis to summarize research on the effectiveness of innovative science curriculum at the secondary school level. They calculated a study weighted mean effect size of .31 in their research synthesis of 151 outcomes from 33 studies involving 19,149 junior and senior high school students from the United States, Great Britain, and Israel. This result means that students exposed to an innovative science curriculum such as the Biological Science Curriculum Study (BSCS) performed about a third of a standard deviation better than students exposed to a traditional science curriculum on a variety of outcome measures. Shymansky, Kyle, and Alport (1983) synthesized the results of 105 experimental studies conducted in the United States contrasting the “new science curricula” (developed after 1955; emphasizing the nature, structure, and processes of science; integrating laboratory and classroom activities; and emphasizing higher-order thinking skills) with traditional curricula (developed before 1955; emphasizing factual knowledge of science; and using laboratory experiences to demonstrate previously learned factual materials). Elementary, junior high and senior high school students exposed to the

new science curricula outperformed students exposed to the traditional curricula by an average of .32 standard deviations on a variety of outcome measures. Willet, Yamashita, and Anderson (1983) used meta-analysis to examine instructional systems used in science teaching. The mean effect size for 341 outcomes in 130 studies examining the effectiveness of a variety of innovative teaching strategies was .10. The most successful innovative systems were mastery learning (Carroll, 1963) and the Personalized System of Instruction (Keller & Sherman, 1974). Mean effect sizes for these instructional systems were .64 and .60 respectively. Wise and Okey (1983) examined the effectiveness of various teaching techniques. Students exposed to various techniques in 160 studies scored approximately .34 standard deviations better on 400 outcome measures than students exposed to traditional techniques.

Although consistently positive and supporting the beneficial effects of the new science curricula and inquiry-oriented processes of science teaching, the results of the various meta-analyses in science education indicate that modest gains from the 50th to the 63rd percentile can be made through the use of innovative science curriculum and instructional systems and strategies in science. Kulik and Kulik (1982) reported an average effect size of .33 when honors classes were provided for homogeneously-grouped high ability students. Kulik and Kulik (1984) also conducted a meta-analysis of studies involving acceleration. The average effect size for achievement outcomes in the 13 studies comparing accelerated students with same age controls was .88. This indicates that the typical accelerated student scored .88 standard deviation units above the mean of non-accelerated control students.

Exemplary Models for Developing Scientific Talent

This section introduces a variety of models for nurturing gifts/talents in science and technology. The models represent programs judged effective in China, Russia, Israel and the United States. Identification procedures and particular type of curricular enhancement vary. The models are specifically geared to students who will specialize in science.

Smorgasbord of Accelerative Opportunities

The smorgasbord of educationally accelerative opportunities model pioneered by the Study of Mathematically Precocious Youth (SMPY) at the Johns Hopkins University provides much evidence for the effectiveness of accelerative practices to nurture gifts in science and technology. SMPY uses a talent search approach (Stanley, 1976, 1977, 1979; Stanley & Benbow, 1986) to identify superior mathematical reasoners. Seventh graders who score at the 97th percentile (national norms) on a standardized achievement test are eligible

to participate in a talent search by registering to take the Scholastic Aptitude Tests. SMPY encourages capable students to take advantage of numerous accelerative opportunities. Accelerative possibilities are limited only by the ability and motivation of the identified students. The more capable and motivated a student is, the more "radical" the accelerative possibilities. The following sections will describe some accelerative possibilities to nurture gifts/talents in science and technology and supporting evidence.

Early Entrance to College

Early admission to college (two years earlier than normal) is a possible option for some highly able and motivated youth. SMPY's first radical accelerant entered the Johns Hopkins University at age 13 after completing the eighth grade at a Baltimore City Public School and completed the requirements for a B.A. degree in quantitative studies and an M.S. in engineering specializing in computer science at age 17 years and 10 months (Stanley, 1974). He went on to earn a Ph.D. in computer science from Cornell University. Another student entered Johns Hopkins at age 12 with sophomore standing based on scores on Advanced Placement Examinations. The student became the youngest graduate in the history of Johns Hopkins University earning a B.A. degree in physics; graduating with general and departmental honors, sharing the Donald E. Kerr Memorial Award as outstanding Bachelor's recipient in physics, winning a Churchill scholarship to study biophysics at Cambridge University for a year, and winning a three-year fellowship from the National Science Foundation to pursue a Ph.D. degree at the California Institute of Technology after returning from England (Stanley, 1983). Favorable evidence regarding the progress of radical accelerants has been provided by Brody, Assouline, and Stanley (1990), Stanley (1985a,b), Stanley and Benbow (1983), and Stanley and McGill (1986). Students who enter college 2–5 years earlier than normal make good grades, graduate promptly, and win academic honors. Stanley and McGill (1986) performed a canonical correlation relating demographic variables (age, gender, SMPY affiliation, credits at college entrance, attendance at private high schools, oriental parentage) and indices of college performance (age at graduation, number of credits earned, simultaneously earning Bachelor's and Master's degrees, percentage of time on the Dean's List, cumulative GPA, honors at graduation) for 25 students who entered the Johns Hopkins University 2–5 years earlier than usual. They reported canonical correlations of .87 and .78 between composites of the two sets. Examination of canonical variate weights indicated that SMPY affiliation, credits at college entrance and attendance at private schools were most related to honors at graduation, cumulative Grade Point Average, age at graduation, and number of credits earned. Brody,

Assouline, and Stanley (1990) expanded the study of Stanley and McGill (1986) to include 65 students, who entered Johns Hopkins between the ages of 13 years 8 months and 17 years 7 months. Many of these students entered with credits earned through the Advanced Placement Program or through part-time college courses. Five entered with enough credit to be awarded sophomore standing. Of the 65 entrants, 54 remained and graduated in four years or less. Three additional students remained and also graduated. Compared to samples of non-accelerators, accelerators were more likely to simultaneously earn Bachelor's and Master's degrees, win general honors and departmental honors at graduation, and be elected to honor societies such as Phi Beta Kappa or Tau Beta Pi, the national engineering honor society.

Part-Time College Courses

Another accelerative opportunity is taking college courses during the summer, in the evening, or on released time from high school. This option permits students to have the intellectual stimulation of college teachers and still participate in social and athletic events with age peers. Solano and George (1976) reported that 131 precollege youths had earned an overall grade point average of 3.59 on a 4-point scale after taking 277 college courses. The majority of these courses were in the areas of mathematics and the natural sciences.

Correspondence Courses

Taking college correspondence courses provides another opportunity to accelerate one's progress. Although this option may be extremely viable for rural youths with limited access to college facilities, it is less preferable than part-time college study (Stanley, 1978a). Lack of feedback on assignments is a constant frustration. This approach requires much self-discipline on the part of the student. Still for students from rural areas, correspondence courses might be the only reasonable option for ensuring content-rich coursework in science.

Advanced Placement

Earning credit by examination is an extremely viable way to accelerate one's progress in science and technology. One example of this approach is the Advanced Placement (AP) Program administered by the College Entrance Examination Board (Hanson, 1980). These examinations are scored on a 5-point scale. Students earn college credit by receiving a specified score on an Advanced Placement examination. Each college and university has its own policies regarding scores

needed on AP exams to earn college credit and the amount of credit awarded. A grade of "3" (qualified) or higher will lead to the granting of credit at most institutions of higher education. Typically, selective universities require a grade of "4" (well-qualified) or "5" (extremely well-qualified) for the awarding of credit. Currently, there are 29 examinations in 16 fields. In the area of science, there are examinations in general biology, general chemistry, physics, physics/mechanics, and physics/electricity and magnetism. In technology, there are two computer science examinations. In 1991, 359,122 high school students representing 65 countries took 535,191 AP examinations. About 15% of the examinations taken in 1991 were in the sciences. Grades of 3 or higher were made on 64% of the examinations in science and 64% of the examinations overall (Advanced Placement Program, 1991). About 1200 colleges and universities award sophomore standing to students who earn satisfactory examination scores on enough (typically 3) AP examinations. There is a fee for taking AP examinations. Since tuition at elite American universities is steadily approaching U.S. \$20,000 a year, the ability to pass several AP examinations results in significant financial benefits for the student.

The Advanced Placement Program distributes course descriptions detailing the content that will be assessed on the AP examinations. Nearly 10,000 high schools offer Advanced Placement courses that address content assessed on the AP examinations. The Advanced Placement Program also provides assistance to universities offering AP Summer Teaching Institutes, which prepare secondary school teachers to instruct a specific AP course.

Longitudinal studies have shown that AP students are more likely than non-AP students to select an academic or scientific career, graduate early, and apply to selective colleges (Advanced Placement Program, 1991). Brody, Assouline, and Stanley (1990) reported that the number of Advanced Placement credits was the only statistically significant predictor of first semester GPA, cumulative GPA, percentage of semesters on the Dean's List, and honors at graduation in their study of early entrants at Johns Hopkins.

Fast-Paced Courses

SMPY has pioneered the use of fast-paced classes in mathematics (Bartkovich & George, 1979; George & Denham, 1976; Stanley, 1976) and science (Lynch, 1990; Mezynski, Stanley, & McCoart, 1983; Stanley & Stanley, 1986). In these classes, students learn content far more rapidly than in traditionally-paced approaches.

Stanley and Stanley (1986) described the application of the fast-paced class approach in science instruction implemented in 1982. Intellectually able students ages 11-15 learned the equivalent of a year of high school biology or a year of high school chemistry during an

intense three-week summer institute. Four students learned both subjects in six weeks. To be eligible for this special experience, students were required to score at least 500 on the mathematics section of the Scholastic Aptitude Test (SAT) and at least 930 on the combined mathematics and verbal sections of the SAT before age 13. They also chose to take the particular course which was offered as part of a summer residential institute on a college campus. The biology class met approximately 5.5 hours a day, including laboratory instruction for 15 days. Pretesting of students, *who had not taken a course called biology*, on the biology achievement test developed by the College Entrance Examination Board (CEEB) indicated that the 25 students in the class earned scores ranging from 420 (14th percentile of national norms) to 690 (89th percentile). The median score of 560 was at the 52nd percentile. At the end of the three-week course, which was taught by a well-qualified and enthusiastic instructor, knowledgeable about biology content at both high school and college levels, students were administered an alternate form of the CEEB's biology achievement test. Scores ranged from 590 (61st percentile of national norms) to 800 (the maximum possible score). The median score of 727 was at the 95th percentile on national norms. Since the norm group is composed of college-bound high school juniors and seniors who choose to take a particular achievement test as part of their application to colleges and universities, the achievement of these 11–15-year-olds is outstanding. The initial chemistry course also produced outstanding achievement, a median score of 743 (95th percentile) on the CEEB chemistry achievement test for the 13 students enrolled in the course. This initial success led to the development of a three-week physics course. Lynch (1990) presented results from fast-paced science classes conducted between 1982 and 1987. Mean post-test scores on CEEB achievement tests were 627 for 353 students in biology, 630 for 339 students in chemistry, and 644 for 213 students in physics. These average scores represent the 73rd, 67th, and 70th percentiles in biology, chemistry, and physics respectively.

Fast-paced classes can be geared to AP exams (Mezynski, Stanley, & McCoart, 1983). SMPY implemented courses in physics and chemistry which were taught by college professors to students aged 12–17. These courses met once-a-week for 2.5–3.0 hours throughout the 1979–1980 academic year. Ten students, from a starting group of 13, completed the physics course. Seven of these students earned a grade of 3 or higher on both the mechanics and electricity and magnetism sections of the AP Physics:C examination. Three students earned a grade of 2 on both sections of the AP Physics:C examination. Further analysis indicated that a strong calculus background was essential to performance in Advanced Placement Physics. Eighteen students, from a starting group of 22, completed the chemistry course. Twelve of the fourteen who took the AP Chemistry examination earned a grade of “3” or higher. Homework performance, in-class test scores, and AP

practice test scores were predictive of performance on the Advanced Placement examination.

DT-PI

SMPY has also pioneered the Diagnostic Testing-Pre-scriptive Instruction (DT-PI) approach to accelerate students (Stanley, 1978b). This instructional approach, which can be used in both individual and group settings, involves using standardized tests, analysis of items missed on a given test to determine needs, designing and implementing an instructional program to address these needs, retesting on a parallel form of the initial test to determine mastery, and proceeding to the next content level using the same approach (Benbow, 1986). In the biology class described by Stanley and Stanley (1986) an item analysis of the CEEB biology achievement test, administered as a pretest, indicated that students performed well on items involving reasoning skill and poorly on items involving technical knowledge.

Both the fast-paced and DT-PI approaches permit a student to accelerate in specific subject areas. These strategies permit individuals to accelerate in those areas where they most need to be accelerated.

Impact of SMPY

Benbow, Perkins and Stanley (1983) reported that participants in SMPY's first two fast-paced mathematics classes scored significantly higher in the mathematics portion of the Scholastic Aptitude Tests (SAT-M), expressed greater interest in mathematics and science, and accelerated their education much more than nonparticipants.

Brody and Benbow (1987) examined the effectiveness of the smorgasbord of the educationally accelerative opportunities model. Students who made use of accelerative options had higher college GPAs, won more honors, attended more selective colleges, and had higher career aspirations than students who decided against making use of these accelerative options.

The SMPY model has been replicated throughout the United States. Other universities operating projects based on the SMPY model include: the University of Washington, Northwestern University, Duke University, Arizona State University, University of Denver, Iowa State University, the University of North Texas, Purdue University, Sacramento State University, and the University of Wisconsin in Eau Claire (Stanley, 1991a). The SMPY model has also been successfully implemented in China (Stanley, Huang, & Zhu, 1986). Since the introduction of the SMPY approach in Tianjin is an integral part of curricular experimentation at the Tianjin Mathematics Spare Time School (TMSTS), discussion of this international replication of the SMPY model will be incorporated in the description of the TMSTS.

Specialized Program Models

There are various models throughout the world of specialized schools for students who show promise for achievements in science and technology. Models differ primarily in the initial age at entry, length of experience, degree of acceleration permitted, and the amount of university-level experiences provided. Entry to selective residential programs is typically based on either performance in competitions such as a regional or national scientific olympiads or through rigorous examinations. This section will describe some of the most notable residential programs.

Specialized Systems in the Commonwealth of Independent States Phystech

After initial industrialization and World War II, the U.S.S.R. entered a period of confrontation with the developed countries. The cold war era set in. This period in modern history saw the accumulation of huge resources by nations for rapid implementation of large-scale military research and development programs. These programs required large numbers of gifted specialists expert in natural sciences and high technologies. The Soviet Union developed an extensive and sufficiently effective system of selection and training of the gifted in those specified fields which is referred to as the "phystech" system after the Institute of Physics and Technology where it was originally applied on a large scale in the 1950s to ensure continuous training of thousands of highly qualified researchers and engineers. It has since been regarded as one of the basic systems and used in many of the best institutions of higher education in engineering and natural sciences of the Commonwealth of Independent States (CIS). The essence of the system consists in the closest possible cooperation between an education institution and a large research and development firm designed to prepare gifted students for employment in the firm. This expedites the training process and ensures conformity of the graduate's qualifications to the job requirements. The search for young talents in the system begins with correspondence involving students of the last two forms of secondary school (16–17-year-olds). In this period students are offered through the media various challenging problems in physics, chemistry, and mathematics. Those submitting solutions are invited to correspond with the base institution of higher education (IHE). Students are sent various manuals supplementing school courses and sets of stimulating problems of a more advanced level. Solutions mailed by the students are evaluated and returned with necessary comments. After one or two years of correspondence the best students receive personal invitations to apply for admission to the IHE.

After difficult entrance examinations students are provided in-depth fundamental education in all basic

subjects. It should be noted that the core of the faculty is composed of specialists working on the leading edge of science and technology at the research centers and companies which will eventually provide employment to the graduates. The work load reaches 50 hours a week, and there are up to 15 graded and pass-fail examinations at the end of each half-year term. This intensive theoretical introduction to the speciality is followed in the fourth and fifth years by active training in experimentation techniques at research laboratories of companies serving as training bases for the relevant IHE departments. This enables students to experience and master the state-of-the-art methods. Their diploma theses are typical results of full-fledged research and design work which are published in specialized periodicals and applied in industry.

Siberian System

The Siberian education system for the gifted originated in the early 1960s. It covers a longer period yet is no less intensive than the one described above. It is also widely used at present. The establishment of this system resulted from the implementation of a national program for the construction of major research centers in newly developed regions of Russia where no advanced research and development had previously been performed. These new science and technology centers required particularly highly qualified specialists who, as well as taking part in the work of research teams on specified projects, could open up new directions in science and technology. The Siberian system owes its name to the fact that it was originally applied at the university and the boarding school for gifted children in the well-known Novosibirsk Research Center. The Siberian system was developed to enhance the scientifically gifted student's knowledge of scientific methodology and structural relationships among the fundamental laws of nature and society.

The Siberian system begins close monitoring and support of the gifted from the age of 14–15. Full-time specialized education provides them with the basic methodological and systemic knowledge prior to entry into an IHE. In the Siberian system interaction with the gifted starts not through correspondence, but with selection of gifted children from all over the Asian part of Russia and their enrolment in special boarding schools for full-time education with special curricula. The work with gifted students is continued after completion of school and after graduation from the IHE.

Selection is performed in three stages through an olympic system whereby the winners of the preceding stage are admitted to the next one. The first stage is administered by correspondence; the other two require personal attendance. Tests are given and controlled by special teams of teachers and researchers. At the first two stages the emphasis is on knowledge and ability to find solutions in unconventional situations. The third stage tests the capacity for learning and self-education.

Following selection children go to a specialized school for one or two years and live in students' hostels away from their families. The school focuses on in-depth study of physics, chemistry, biology as well as mathematics. After successful completion of coursework, students usually go on to Novosibirsk University, although they are well equipped to enter any other university in the country. These are usually the most capable students, though at this point other gifted Siberian school leavers join the system, including those who have prepared on their own and successfully passed the difficult entrance tests of the university. The university education stage of the Siberian system is similar to the "phystech" system. Also, in the first three years at the University, undergraduate students are offered basic education in advanced curricula. In the last two years students engage in real research in institutes located in the vicinity. After graduation, it is the academic research institutes that run the next stage of training and selection of talent among researchers on probation. The probation program is open to the best university graduates who should prove their ability over a two-year period working as a laboratory researcher on a provisional basis. Following successful probation, students are admitted to permanent research staff or to a post-graduate school where they work on their doctorate thesis for three or four years. Successful defence of the thesis completes the process of training.

The system's full cycle lasts 11–13 years and involves gifted individuals as secondary school students, undergraduates and researchers over the age span from 15 to 27 years. In this process a trainee is required to take over 120 graded examinations and about 200 pass–fail examinations, a total of over 320 tests. All these barriers have to be cleared without major setbacks which may be caused, among other reasons, by troubles in private life.

The Siberian system of selection and training of gifted persons was designed to provide the education of talented scientists from the local population to work in the rapidly growing research centers of Siberia. Approximately 5000 of the 6000 researchers at Novosibirsk Research Center are graduates of the Siberian system. They command an incontestably dominant position in all research institutes and to a great extent determine the level of intellectual potential of the Siberian branch of the Russian Academy of Sciences.

A few years after the successful start of both systems under discussion, some negative aspects began to surface. Both systems of gifted education discussed above were conceived and developed in response to state needs. Like many other undertakings in the Soviet Union, these systems were on a large scale and of an equalizing industrial nature. Indeed, one cannot expect an individual approach to gifted children when the Siberian system in 30 years of operation has trained about 20,000 highly qualified specialists. This and other facts of disregard of the individuality of human talent in general and of intellectual property in particular

have by now produced consequences affecting both the destinies of Russian talents in the world science and technology and the international socio-economic and political situation. The grave situation regarding talents which has occurred in Russia highlights the general condition of the gifted taking shape in the world.

When a gifted person cannot adapt and fulfil him/herself in the social environment, the cause can be interpreted in two ways: either the talent has been unable to conform to the society's requirements or the society has rejected the talent. The main cause which has turned the Siberian gifted education system into its opposite has been precisely the gap between the lofty principles of intellectual endeavor built into the system and the pragmatic principles of socio-economic organization of real research institutions which employed the talents. It is this factor that largely accounts for the recent phenomenon which has been called the "intellectual Chernobyl" because of the massive migration of Siberian system graduates to other regions of Russia or abroad. There has also been an exodus from research to commercial and financial institutions. The only meaningful solution for this problem lies in the design and development of an appropriate infrastructure for effective fulfilment of the scientifically gifted students' potential. The main objective in the creation of this new infrastructure is provision of favorable conditions for the production and use of intellectual property by its authors. The next section contains a discussion of specific examples of the development of an infrastructure that provides a harmonious combination of such different entities as the needs of contemporary society and the scientifically talented individual.

MISIN System

In an effort to solve the specified problem, a new system was developed envisaging compensation of defects of the systems existing in the CIS by means of special programs geared to socialization of the gifted. The system is composed of a number of interrelated programs designed for the gifted aged from 9–11 to 35–40. It contains three phases to accommodate needs before, during and after the higher education level. The socialization of the gifted at each stage is conducted both through development of their world outlook and creation of certain institutional and economic infrastructures where the gifted could learn and work effectively. In particular, for the gifted at ages 9–12, this includes the setting up of "Islands of the Future" exhibitions containing scientific strands illustrating, in an entertaining form, the principal laws and phenomena of nature. The objective of "immersion" of the gifted in such exhibitions consists in early vocational orientation and easing their adaptation to the material components of their future environment which are widely represented at the exhibition. This program is particularly relevant to the education of gifted children in developing countries.

For gifted students aged 15–18, a creative environment is provided in the form of science camps. These camps are residential and permit association with gifted children from other countries during short visiting sessions. In these camps, teenagers experience all the stages of research and gain a better understanding of creative work organization. For gifted undergraduate students the “phystech” system is supplemented with visiting sessions and courses of lectures like “Introduction to the career path of the Siberian talent” given and discussed with a view to promoting self-awareness. Finally, in the post-graduate period effective activities of gifted specialists are arranged through their active involvement in the development of large infrastructural units in the form of research and development incubators designed for “hatching” their intellectual products for commercial application. Continuous nurturing of the fragile sprouts of scientifically talented students and their creative products is necessary to produce fruitful realization for the benefit of the society.

At present a practical experiment is under way in Siberia to create a specialized zone for the support of intellectual activities, the MISIN (MISsionary INtellect). The zone is being developed on an area of 400 hectares, four kilometres from the Novosibirsk Research Center. It will include a research and development incubator, a missionary center, a pilot production area, a science camp for teenagers, a science and technology center for children, and other relevant units. With the support of the regional and federal government, the zone will provide a positive environment for authors working with their intellectual property. The zone is set up as a prototype for subsequent replication in other regions of Russia (subject to the success of the pilot zone). The experiment is expected to be instrumental in the development of a more efficient system for the gifted, primarily through their better integration into society. The project has the backing of the regional and Russian government as it offers a clue to the solution of a number of other social and economic problems whose significance transcends the zone itself.

Youth Class of China Science and Technology University

During the Chinese cultural revolution (1966–1976), education in China was disrupted and ruined for years. In 1974, Professor T. D. Lee, a physics Nobel Laureate, made the suggestion that scientists can be cultivated in the same way as artists and athletes. Many intellectuals concerned about China’s prospects accepted Professor Lee’s thesis. The central government, Academy of Science, and the China Science and Technology University proposed establishing special classes for the precocious. The faculty looked for precocious youth all over the nation based on hints from recommendation letters, and after a strict test, the first group of 21 youths was selected

for the class on September 8, 1978. In 14 years, the youth class of the university has admitted a total of 519 students at an average age of 15. The youngest student admitted was only 11. Students live together for the first three years of a five-year program, with counselors taking care of their living arrangements. They have no major and mainly study general requirements, until the last two years when they join various departments in accordance with interest and major. Seventy percent of the 347 students in the first ten youth classes at the China Science and Technology University have been admitted as graduate students in China and abroad. Two hundred individuals are working for their Ph.D.s abroad. About 40 have already earned their Ph.D. degree. Notable accomplishments among members in this group include: being China’s youngest college student at age 11, youngest graduate student at age 15, Assistant Professor at age 19, Ph.D. at 23 and Associate Professor at 26. In short, the youth class of the China Science and Technology University has become a nationally and internationally attractive base for nurturing precocious youths in science and technology (USTC Admissions Office Youth Class Section, 1992).

Owing to the success of this group and the need for development, other top universities have followed suit. Starting in 1985, Beijing University, Qing Hua University, Jiao Tong University (Shanghai), Fu Dan University and Nanjing University succeeded in setting up youth classes, with differences both in admission and organization. Generally speaking, they are not distinctive as the youth class of China Science and Technology University. Most of them maintain only one year’s collective life and then students have to join their own departments in the second year. These youthful college students, as a whole, are preeminent learners of science and technology. They are able to graduate from college with distinction except for a very few who have initial difficulties adjusting to the university environment.

In conjunction with the college youth class, key high schools of some provinces and cities have founded a “youth preparatory class” or “extraordinary class”. High schools such as Beijing No. 8 High School, the Affiliated High School of Shanghai Teacher’s University, Tianjin Yao Hua High School, the Affiliated High School of Nanjing Teacher’s University, Suzhou High School and Wuxi No. 1 High School all have set up this kind of youth class. Despite different names for these classes, they all have the same objective, that is to help the gifted accelerate their academic program by taking 4–5 years to complete a 6-year high school curriculum and some college level courses and pave the students’ way to the university. Most of them who were 2–3 years younger than the regular students not only earned outstanding scores in all national uniform examinations for high school, but also did extremely well after entering top universities in China. Their majors spread all over the areas of science and technology, especially those most closely related to mathematics, such as physics,

chemistry, computer science, biophysics, astronomy, meteorology, statistics, and engineering.

Following the profound changes after the decade of openness and reforms in the 1980s in the People's Republic of China, the feeling of a severe lack of qualified personnel has lessened. Some youth classes in colleges have been replaced by so-called "intensified classes", which mingle talented students regardless of age. Nevertheless, the realization of the great national goal of modernization in 2000 will not be changed. The required scientists and technicians will hopefully be produced from the young generation of precocious youths.

National School of Mathematics and Science

Late in 1986, a National School of Mathematics and Science was founded in Beijing. The mission of the school is to foster students with exceptional talents in mathematics and science by preparation for the highest level high school student competitions: the International Mathematics Olympiad (IMO), the International Physics Olympiad (IPHO), and the International Chemistry Olympiad (ICHO). Each October, the junior winners of national high school mathematics, physics, and chemistry competitions are invited to take entrance examinations for attendance at this special school. Sixty students have been admitted to the mathematics class, and 30 each to the physics and chemistry classes of the school respectively. These classes, taught by noted mathematicians, physicists, and chemists, and affiliated with some top universities in Beijing, become the main resource of the Chinese teams and create a reserve pool for the next international competitions. Students from this school have occupied a large proportion in each year's National Mathematical/Physical/Chemical Olympiad programs. The Chinese teams have distinguished records in previous IMO, IPHO, and ICHO (Chinese Mathematical Society, 1986–1991; Chinese Physical Society, 1986–1991; Chinese Chemical Society, 1986–1991).

In connection with this program, the Chinese Mathematics Olympics Committee has sponsored the Math Winter Camp (MWC) for the winners of the National High School Mathematics Competition each year since 1986. The first annual MWC was held in January 1986 at the Nankai Institute of Mathematics, Nankai University, Tianjin (Hou, 1986). It was a meaningful start because six members of the Chinese IMO Team which ranked in fourth place on its debut in 1986 were all members of this MWC. These intensive one-week MWCs, which allow students to meet and be recognized by their peers, provide not only the national coaches with an opportunity to choose the candidates for the National Math Olympic Program for IMO, through a two-day examination, but also gives the scientists an opportunity to recruit these youths for subsequent graduate study. The top twenty at the MWC are

qualified to attend the National Mathematics Olympic Program. After four months training the Chinese IMO Team is determined on the basis of a series of tests given at NMOP and the recommendations of coaches (Zhang, 1987).

The camps and Olympiad programs sponsored by the Chinese Physics Society and the Chinese Chemistry Society have provided those students who are talented in science and technology with efficient and competitive learning opportunities. Provided with sound knowledge of basic theories and creative laboratory capabilities, numerous scientifically-talented students have emerged. Participants from these Olympiad camps and programs have won medals in International Physical Science Olympiads and International Chemistry Olympiads for several years.

North American Applications

Stanley (1987) advocated the establishment of three-year state residential high schools for science and mathematics for all states having at least 300 National Merit semi-finalists each year. These schools would identify students for acceptance after the eighth grade in terms of established minimum scores on the Scholastic Aptitude Test, performance on measures of nonverbal reasoning ability, mechanical comprehension, spatial visualization, and knowledge of science and mathematics, demonstrated interest through participation in science fairs and contests, and recommendations by science and mathematics teacher. Faculty qualifications would include at least a Master's degree, preferably a doctorate, in the subject area taught and successful experience as Advanced Placement teachers. The goal of the curriculum would be to facilitate successful performance on the Advanced Placement examinations in biology, chemistry, physics, computer science, and calculus. If located on or near a college campus, it would be possible for students to take college level courses. The combination of AP credits and college credits would hasten college graduation and commencement of graduate study. Participation in prestigious contests such as the Westinghouse Science Talent Search would be strongly encouraged. Some of Stanley's (1987) vision has been realized with the establishment of the Texas Academy of Mathematics and Science (TAMS).

Stanley (1991b) described the organization of the Texas Academy of Mathematics and Science, which is located on the campus of the University of North Texas in Denton, Texas. Students enter TAMS as eleventh graders, taking regular college courses. To earn a high school diploma from TAMS, students are required to complete at least 57 semester hours consisting of two semesters each of biology, chemistry, physics, and calculus; 24 semester hours of English, humanities, and social science; and additional electives. Minimum entrance requirements are scores of at least 550 on the

mathematics sections of the Scholastic Aptitude Test and combined scores of at least 1000 on the mathematics and verbal sections of the SAT. The SAT performance of students is substantially higher. The entering class of 1990 had average SAT-M scores of 660 and average combined mathematics and verbal scores of 1205. Students who complete TAMS can matriculate as juniors at the University of Texas, other institutions of higher education in Texas, or selective universities throughout the United States. Stanley (1991b) reported that 48% of the entering class of 1989 made the dean's list in their first semester, having a cumulative GPA of at least 3.5 on a 4.0 grade scale. The TAMS model is cost-effective since the use of college professors and university facilities spares the typical capital expenses of school buildings with science laboratories and dormitories as well as personnel expenses. The residential aspect of TAMS promotes social and emotional maturation.

Another model for state-wide residential high schools is the North Carolina School for Science and Mathematics (NCSSM), which also enrolls eleventh and twelfth graders (Eilber, 1987; Eilber & Warshaw, 1988). Established in 1980 as the first statewide school for students with ability and interest in math and science, the NCSSM is located on a 27-acre campus in Durham, North Carolina. In 1987, 475 students representing 89 of North Carolina's 100 counties were enrolled. Admission is determined through a two-step process. The first step involves rating a selection portfolio consisting of scores on the mathematics and verbal sections of the SAT taken in tenth grade, scores on a nonverbal test of critical thinking, grades in math and science in grades 9 and 10, ratings on a teacher checklist, student essays, and recommendations. The second step involves selecting students based on interviews conducted with applicants having promising selection portfolios. At NCSSM, there are 20 possible courses in mathematics and computer science, 16 courses in biology, 8 courses in chemistry, and 8 courses in physics. Student requirements include: at least one course in biology, chemistry and physics; two years of English courses which emphasize writing; choice of Spanish, French, German, Russian, Latin, or Chinese as foreign language; and American history. Courses in social science, music, visual arts, and interdisciplinary courses serve as electives. Although the content is advanced, the courses are not designed to prepare students to successfully take Advanced Placement examinations. Students are given opportunities to conduct research at NCSSM facilities or participate in year-long mentorships with researchers and professionals in the Durham-Raleigh-Chapel Hill area known as the Research Triangle. Students are required to perform three hours of work service each week during their stay at NCSSM and 60 hours of community service work in their home communities during the summer following their junior year. As part of its public service role, the NCSSM offers workshops each summer for secondary teachers in science and mathematics and coordinates summer research and laboratory-oriented

courses held for eleventh and twelfth graders throughout the state of North Carolina. Initial outcome statistics have been positive. About two-thirds of the graduates enter universities in North Carolina and about one-third enter other selective universities. A follow-up of the graduating class of 1986 indicated that most (80%) were pursuing a career in science or mathematics.

Non-residential specialized high schools for the scientifically gifted can be successfully implemented in large urban centers. For over 50 years, the Bronx High School of Science (BHSS) has been nurturing the scientific gifts and talents of students in New York City (Taffel, 1987; Kopelman, Galasso, & Schmuckler, 1988). The selection of 1000 grade 9 students from 4000 applicants is solely based on performance on an entrance examination, consisting of language aptitude and mathematics aptitude and reasoning. (Recently, the school has instituted a special program to admit minority and disadvantaged students, based on examination performance, feeder school nomination, and completion of an intensive summer program in English and mathematics.) Core curricular requirements include: four years of English, four years of social studies, four years of science including biology, chemistry, and physics, three years of a foreign language, three years of mathematics, one year of mechanical drawing, one-half year of shop experience. There are also required courses in computer literacy, music, art, health education and hygiene. Two advanced electives from among courses on science, mathematics, computer science, and advanced scientific laboratory techniques.

A unique aspect of the BHSS science curriculum is the use of block scheduling, whereby students have two consecutive science periods each day. This permits more intensive exposure to scientific content and integration of classroom discussions and laboratory experiences. Students are encouraged to do independent research in mathematics and science. The choice of research problems are outgrowths of the curriculum. Students are guided by the teaching staff at Bronx High School of Science and volunteer scientists from universities, laboratories, hospitals, museums, zoos, and botanical gardens in New York City. Students are expected to communicate the results of their research by writing research reports and submitting them to various competitions such as the New York City and New York State Science Fairs, and the Westinghouse Science Talent Search. The school also produces annual journals highlighting the best research in mathematics, biology, and physical sciences.

Data reported by Brandwein (1992) indicates that as of 1988 the number of finalists in the Westinghouse Talent Search from the Bronx High School of Science (106) was more than double every other high school in the United States with one exception, Stuyvesant High School, another specialized school in New York City, which had 63 finalists. Over a 50-year period, about 65% of the graduates of the Bronx High School of Science have become scientists.

Extra-Curricular Schools in Mathematics and Science

Recently, mathematics spare-time schools have been springing up throughout China. From the early 1980s, many Chinese educators have recognized the importance of mathematics education as the meeting ground of technology and education working to foster the economic reforms and openness policies of the Chinese government. In light of China's unique historical situation, educators are now acting decisively to identify and develop precocious youth in order to make up for the wasted decades of Chinese education during the 1960s and early 1970s. In order to achieve these objectives, many mathematical cram schools have been founded throughout the country. The competitive spirit among these schools produces the desirable effect of placing the most emphasis on the individual student's needs rather than on institutional needs or goals.

Models for mathematics and science spare-time schools were implemented in the three largest Chinese cities: Beijing, Shanghai, and Tianjin. These three cities were the first to develop their own mathematics schools for gifted middle and high school students around 1980. In April 1985, the Beijing Math Olympic Elementary School was established for fourth through sixth graders. Experienced high school math teachers and educators organized challenging supplemental courses for these talented young students who had been selected through a rigorous examination, on Sundays and during both summer and winter vacation periods. Because of the educators' aptitude and creativity in teaching mathematics, 10-year-old students were able to acquire the profound curricular content. In fact the educators' versatility and experience was able to capture the students' interest so that their wisdom and talent could be fully developed. Quite a few of this elementary school's graduates have won gold medals in national math contests. The first champion at the First Chinese Invitational Mathematics Competition for sixth and seventh graders, held in 1986, which involved more than 1.5 million able students all across China, was a graduate of the Beijing Math Olympics Elementary School.

Math competitions play an important role in the developing nationwide system of extra mathematics training for precocious youth. Beijing, Shanghai, and some other cities started hosting regional and inter-scholastic math competitions as early as 1956. There has also been a system of nationwide math competitions for middle and high school students since 1978 and 1983, respectively. At the same time as these domestic competitions have been growing, China has sent students from several larger cities to participate in overseas math competitions. Students from mathematic cram schools in Beijing, Shanghai, Tianjin, Hubei, Sichuan, Jiangsu, and Anhui were superior in all of these overseas competitions. From 1986 to 1991, almost all of the six members of the Chinese team participating in the International Mathematics Olympiad (IMO) were

students in mathematics cram schools in different parts of China. They have won many gold and silver medals (Chinese Mathematical Society Olympic Committee, 1986–1991).

The Tianjin Math Spare-Time School (TMSTS) was founded in 1981. A total of 1500 gifted, math-loving seventh to twelfth grade students were chosen through a general city-wide examination. Twenty classes were organized for middle, while ten were organized for the senior high school students (Chen, 1990). The students' abilities were cultivated through a strict training program requiring three and a half hours each Sunday and one month each summer and winter holidays. The school chose high school mathematics teachers with ability and insight, as well as learned scholars and professors to conscientiously design the academic plan, curriculum, prepare lecture notes, and deliver a series of lectures on specific topics by turns. The content of the lectures not only represent an extension of the students' regular math textbooks, but supply both supplementary and innovative mathematical knowledge. The students work with their teachers to support each other's work. The approach in these schools is also a highly democratic one, in that students listen attentively and think deeply about the lectures, but the students also warmly discuss and fiercely argue with each other. The school has gradually generated a serious dynamic academic atmosphere among these youths.

During 1987, an SMPY program was implemented in Tianjin (Stanley, Feng, & Zhu, 1989). Using a translated version of the mathematics section of the Scholastic Aptitude Test (SAT-M), a mathematics talent search was sponsored in Tianjin. Three hundred and sixty students below age 13 who had been recommended by their teachers were administered the SAT-M in 1987. Scores on the SAT can range from 200 to 800. The top 90 students with scores of at least above 640 were selected to enter the TMSTS and divided into two honors classes for intensive training (Feng & Xu, 1988a,b). Forty-two of these students earned scores of at least 700. These students either have excellent reasoning ability or the ability to think about and solve problems independently. They are highly motivated and understand the curricular materials much faster than their age group. They have tremendous potential for achievement in mathematics and related subjects such as physics, computer science, and engineering. For these students, it is really tedious and awkward to study math at the same pace and in the same classrooms as their age group. They quickly tire of the dogmatic method of teaching. Thus, a newly devised accelerated educational program was provided in order to stimulate their interest in further math study and challenge them to pursue academic excellence. Teachers invited to teach special classes were subject-matter experts, highly responsible, good at heuristics, and possessed excellent instructional management skills. During two years in the spare time school, in addition to completing the regular secondary math course curriculum, these students received amazing

extra curricular enrichment. Moreover, they had been provided great opportunities to compete nationally and internationally with other high ability students across China and the world. Students treasured these activities, which gave them the chance to apply the knowledge they had learned and to show their ability and talent. They performed extremely well on the American Junior High School Mathematics Examination (AJHSME) and the American High School Mathematics Examination (AHSME). For example, one seventh grade girl in this group beat millions of participants and won the second Chinese Invitational Mathematics Competition for seventh graders in 1989. The success of this group provides further evidence of the validity of the SAT-M test as a simple and effective tool for discovering mathematically precocious youth.

During 1985–1991 four Chinese municipalities had administered this kind of test nine times. A total of 329 students (the ratio of males to female being 263: 66) have been recognized as members of the “700–800 on SAT-M before Age 13 Group” of the Study of Mathematically Precocious Youth at Johns Hopkins University (Feng, 1992). Many of them have been among the best of the successful candidates in all kinds of mathematics competitions and have displayed good performances in physics, chemistry, computer, and mechanics as well. Moreover, their skills in learning foreign languages and humanities are far above the average.

In its ten-year history, the TMSTS has successfully produced four national champions, and sent seven students to the National Mathematical Olympiad Program, which was formed to prepare students for the IMO. The school also nurtured one gold medalist in the 1986 IMO and one silver medalist in the 1988 IMO. These are noteworthy accomplishments since Tianjin, with a population of four million, competes against provinces with populations as large as 100 million (Chen, 1990).

Besides Beijing, Shanghai, and Tianjin, the other provinces and big cities have also implemented programs for identifying and training mathematically precocious youths. For instance, in Nanjing, the capital of Jiangsu, the Nanjing Council of Secondary School Mathematics Teachers sponsored talent searches using a translated version of SAT-M in 1988 and in 1990. Those who had been recognized as precocious youths (males and females who scored 700 or above before age 13) and females with scores between 640 and 700 were recruited by Nanjing Mathematics Spare-Time school for further coaching (Qui, 1988, 1990). This school has a distinguished record of success in training mathematics students. For example, Shen Kai, who scored 780 on SAT-M in 1988, became a member of NMOP after only three years' training. He was one of the very few students with a perfect score in the 1992 IMO.

Nanjing plans to implement the strategy of developing mathematically precocious youths pioneered by Dr Julian C. Stanley, Director of SMPY at JHU, in a larger area in 1992. The math spare-time schools in China regard offering students who are talented in science and

mathematics and show promise of exceptional achievement the special supplementary educational opportunity as its sole duty. Once these persons have been discovered in its region, the schools will organize supplemental math courses for them. These schools, highly regarded throughout the country, have always been strongly supported by local education departments and the parents of students. In September 1992 there was a meeting of representatives of various math spare-time schools in Tianjin. Participants discussed the syllabus of each course offered and the strategies and techniques for coaching mathematics students, revised and developed the curriculum, designed special programs for particular students, and exchanged experiences in identifying and recruiting precocious youths.

Many physics and chemistry spare-time schools have been set up to nurture talents in science and technology. These schools have adopted similar methods as those used in the mathematics spare-time schools. They have enrolled students with special interests and exceptional talents in physics and chemistry, and engaged in intensive training during weekend and holidays, but on a lesser scale. In some cities of China, mathematics spare-time schools and their physics and chemistry counterparts have merged to form spare-time schools of science, where students could have the opportunities of choosing their favorite subjects among the three fields.

Most elementary schools and secondary schools have provided added educational opportunities and challenges for gifted students after class and in special interest clubs. Advanced studies under individual faculty are available in all disciplines to encourage individual differences and competencies. In general, these talented students are eager to join the math, physics, chemistry and computer groups, which are responsible for the success of the school teams in competitions. The key to success of nurturing talents in science is the development of an educational community through the integration of inside-the-classroom and outside-the-classroom components. Many Chinese mathematicians and scientists, while busy with teaching, and research are concerned with the growth of the future generations of China. They are actively involved in science and mathematics competitions, presenting lectures to teachers and students, writing and translating articles, and publishing popular scientific books. For instance, the former president of the Mathematical Association of China, Professor Hua Logeng, was the initiator of mathematics competitions for high school students in China and the author of a series of mathematical books which have fascinated hundreds of millions of teenagers. In recent years, in addition to many high quality books for preparing fourth to twelfth graders for national and international math and scientific competitions, a number of magazines have been published. These periodicals, edited by teachers, universities or scientific associations in all parts of the country, emphasize instruction in the fields of science and mathematics, and introduce the latest

developments in science and technology. One special feature of them is that there are many test problems from all over the world. For example, a fifth grader may find the contest problems for elementary schools in Long Island, U.S.A., a senior can try the physics part of the past entrance examinations of Moscow University, and the members of a math team are able to discuss the different solutions of the problems proposed by many countries for IMOs over the last several years, but not selected. That is the reason why those mathematically or scientifically talented Chinese youths excel at the highest-level competition problems in the world. These publications become the best teachers and helpful friends of talented students. As more and more students and their parents have realized the significance of investment in intelligence, they spend much time and money in the quest of good books. Finding books suitable for instruction of scientifically talented students is definitely an indispensable step in the process of successful nurturing of talents.

Public School Programs

Successful programs can also be offered in non-specialized schools. The pioneering work of Brandwein (1955, 1962, 1981, 1986, 1988, 1992) at Forest Hills High School in New York City provides insights into how schools can organize science programs to challenge scientifically gifted students. Unlike other programs described, no tests are given. Rather students are given the opportunity to conduct independent research.

Brandwein (1955) suggested that three clusters of traits called *genetic*, *predisposing*, and *activating* are necessary for the developing of scientific talent. Genetic factors are the mathematical and verbal abilities that a student brings to the situation. These abilities contribute to the acquisition of scientific knowledge and the communication of the results of scientific investigations. Predisposing factors are motivational in nature and include the students' persistence and questioning attitude. Activating factors relate to the school climate and environment that facilitates scientific development. Some of the components of the specialized curriculum in science include: conducting original research, learning laboratory techniques and the use of laboratory equipment; engaging in library research; taking adequate preparation in mathematics, preparing research reports and exhibits, participating in seminars and conferences, entering the Westinghouse Science Talent Search, and taking college-level courses. The model developed at Forest Hills High School has been successful in developing scientific talent as evidenced by the success of its students in the Westinghouse Talent Search. A non-selective school, Forest Hills, ranks third among all high schools in the United States in producing the number of finalists in this prestigious competition.

Extension Programs

There are a variety of worthwhile opportunities for students interested in learning more about science. Passow (1988a) highlighted some programs available for high-ability pre-college students. These included programs offered by prestigious universities such as Columbia and Johns Hopkins universities; conducted by national laboratories such as the Argonne National Laboratory (Illinois), the Los Alamos National Laboratory (New Mexico), Fermi National Accelerator Laboratory (Illinois), and the Lawrence Livermore National Laboratory (California); and provided by museums such as the Chicago Museum of Science and Industry. These programs provide opportunities for students to take coursework, engage in research, or combine coursework and research. Similar opportunities are provided at science centers (Sitkoff, 1988) such as the Talcott Mountain Science Center in Connecticut (LaSalle, 1979).

Extensive use of science centers is evident in the People's Republic of China. Innumerable children's palaces and youth science and technology centers have been established in the People's Republic of China to provide the talented with an opportunity to go in for scientific pursuits. These centers admit elementary school and secondary school students who are interested in and talented in science and technology in an effort to keep them learning how best to put their talents to work for themselves and for the country either in their spare time or on holidays. These activities include: astronomy, meteorology, biology, oceanography, traditional Chinese medicine, geology, radio communication, remote control model aircraft and ship, geodesy, electronics, and computer science. Peer group socialization through informal interaction provides the atmosphere that can foster each student's highest potential. The availability of laboratory facilities, along with evening and weekend programs of special interest conducted by experts, serve to challenge the students to develop their own projects and to stimulate further studies. In each summer and winter vacation, a diversity of summer/winter camps of science and technology are available for these talented students. Their creative work and inventions are always highly encouraged and supported. Promising inventors and their wonderful designs are constantly emerging through various competitions.

Contests/Competitions

Participation in contests and competitions provide students the opportunity to demonstrate their talent. One of the most prestigious scientific competitions in the United States is the Westinghouse Science Talent Search. Each year high school students submit 1000-word research summaries reporting results of an original research investigation. From the submitted reports, 300 are selected as honors recipients. Forty participants are designated as semi-finalists and interviewed to compete

for ten positions as finalists. Subotnik (1986, 1988a,b) has reported results from several studies of a sample of 146 combined honors, semi-finalists and finalists in the 1983 Westinghouse Talent Search. These results indicated that many of the participants (61%) were assisted in problem selection by laboratory supervisors and professors. Much of the work was carried out in laboratories in hospitals and universities. There was the possibility for practicing scientists to serve a mentoring function. Participants in this study were most likely to report using convergent production of semantic implications as the structure-of-intellect factor used in problem selection. Subjects tended to choose curiosity as the major motivating reason for conducting research.

China has used competitions as a vehicle for recognizing and developing talent in science and technology. Students are encouraged to participate in all kinds of mathematics and science competitions. Many gifted students begin to show their talents in these competitions. Some students show outstanding ability in competition during their senior high school years for the first time when given the opportunity to compete. Once recognized, special training is provided. In China a consensus has developed that taking mathematics tests as the main means of finding the talented and taking the science spare-time school as the main base for nurturing the talented achieves positive results. For example, the Chinese mathematics team, physics team, chemistry team, and information science team all came in first place in 1992's International Olympiads. Seventeen out of the nineteen participants won gold medals and the other two won silver medals (Kon, 1992).

An Israeli Program to Advance Science and Technical Education

In the less-populated Upper Galilee region of Israel, the North Star Project has been designed to raise the level of scientific and technological education in order to enhance the general standard of living and increase employment opportunities for high achievers, thus reducing the brain drain of able youth from the region. The wide cultural diversity of the population, the remoteness of the region from Israel's academic and industrial centers and the relatively low educational achievements of a largely rural population were factors that triggered the initiation of the project organized by the non-profit Association for the Advancement of Science Education in the Galilee (Marchaim, no date).

The heart of the project is the MIGAL Research Institute, an applied research and development center in northern Israel involved in agro-industrial research which is then tested in pilot demonstrations before being applied commercially. Some 22 high schools from towns, villages and settlements in the region are involved in a variety of programs including the following:

(1) Matriculation Project. As many as 40 students each year undertake research projects using the sophisticated

resources and facilities, supervised by the MIGAL scientific staff. Some of the projects are planned with local industries enabling the student to see actual applications of the research. The student's research report is substituted for the usual matriculation examination in biology.

(2) Biotechnical Courses. Students are organized into discussion groups for discussion, experimentation and the topics to enrich the curriculum—e.g., tissue culture, chromatography, spectroscopy, microbiology, animal behavior, etc.

(3) Fast Plant Project. Eighth and ninth graders from a number of schools in Israel and abroad are linked by means of a computer network enabling them to perform experiments simultaneously—collecting, analyzing and sharing data.

(4) Greenhouse Activities. Students perform research projects in the computerized greenhouses located at their schools and then use the Institute's facilities to perform sophisticated agricultural research.

(5) The Integrated Experiment (The "Bubble"). This course teaches the student to use a computerized control system to set up a biological, agricultural or biotechnical experiment, manipulating variables and understanding the potential of technology in the research process.

(6) Land of Brooks. Involving both outdoor experiments and in-depth laboratory inquiry, students study the quality of water in local streams as well as the biotic and abiotic parameters of the environment.

(7) Demonstration lessons. This program provides class instruction in a specific subject in the curriculum, including demonstration of experiments at a level not normally available in schools on such topics as radioactivity, biotechnology, microbiology and fermentation.

(8) Computer Network Program. This program provides a communication network which ties the region into national and international networks and increases the integration of computers into the study of biology and agricultural sciences. Students use computers as a tool to collect and analyze scientific data from biological and chemical experiments, sharing and exchanging data with students from other schools in Israel and abroad.

(9) Teacher Education. In addition to student activities, the North Star Project undertakes the training and retraining of science teachers, including new immigrants.

The North Star Project aims at providing exceptional opportunities for students to engage in advanced research in the sciences, enrich their curricular studies and enhance their understanding and use of sophisticated technology. While providing for upgrading science education for able youth, the Project also aims to improve science education generally through its teacher education and staff development activities. An entire floor of this research facility is devoted to this science education undertaking.

Parallel to this project for high school youth, another project brings more able children in the upper elementary grades to a regional college one day a week for

enriched science programs. This project, centered at Tel Hai Regional College also has a component aimed at upgrading teachers and science teaching.

The North Star Project provides a good example of an research facility using its sophisticated staff and facilities to initiate a variety of program activities aimed at identifying and nurturing scientific-technical talent potential.

Recommendations for Nurturing Talents/Gifts in Science and Technology

The description of exemplary programs in China, Russia, Israel, and the United States in conjunction with the insights from the sociology of science, psychology of eminence, and science education provides a knowledge base for making recommendations regarding the discovery and development of gifts/talents in science and technology. These recommendations relate to the topics of identification, science curriculum, and teachers/mentors.

Identification

The use of talent searches, olympiads, entrance examinations, and science fairs provides the opportunity for scientifically gifted students to demonstrate their ability in science and technology. These identification practices permit the opportunity for self-selection since students' participation is voluntary. Formal examinations should focus specifically on scientific content. Since mathematical reasoning ability facilitates the acquisition of scientific concepts, the identification of mathematically precocious youth through measures such as SAT-M is also beneficial.

Science Curriculum

Science curriculum should provide the opportunity for advanced study of scientific concepts and methodology. Students should know both the content of various scientific disciplines and the processes scientists use to discover knowledge. Students should be given the opportunity to conduct original research projects. In addition to conducting research, students need to have the opportunity to communicate the results of their research by presenting at seminars and conferences and by writing articles for publication in journals.

During secondary schooling intensive coursework in mathematics and science taught at an accelerated pace should be coupled with adequate coursework in the humanities and social sciences. This training will provide a solid foundation for majoring in physics, chemistry, or biology as an undergraduate.

There is also a need for the science curriculum to address the ethical dilemmas that scientists face (Passow,

1957, 1988b; Pyryt, 1979; Tannenbaum, 1979). This need has been stated most eloquently by Tannenbaum (1979), who quotes Commoner's (1966) warning that "no scientific principle can tell us how to make the choice, which may sometimes be forced upon us by the insecticide problem between the shade of the elm tree and the song of the robin" (p. 104). The well-known instances of computer virus epidemics and computer hackers' tricks provide another example of the need for gifted individuals to use technology as a productive rather than destructive force.

Teachers/Mentors

All of the successful programs for nurturing gifts/talents in science and technology acknowledge the importance of the teacher. Passow (1957) identified the following characteristics as exemplifying a quality science teacher: is inspired and inspiring; knows science and its techniques; understands the meanings of science and its relationship to the world, encourages individual excellence; guides the student to locate resources; adapts teaching methods to stimulate problem solving; attempts to provide flexible programming to meet the unique needs of rapid learners.

Mentorship experiences provide students the opportunity to learn the nature of the discipline by personal contact with practicing professionals. Through such experiences, individuals are socialized into the processes scientists use as well as their work habits, attitudes, and values. Exposure to appropriate role models seems especially beneficial for scientifically gifted females (Tobin & Fox, 1980).

Providing scientifically talented individuals with challenging curricula and effective teachers/mentors are the keys to nurturing their gifts/talents.

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Nurturing the Talents of Exceptionally Gifted Individuals

MIRACA U. M. GROSS

University of New South Wales, Sydney, Australia

Keeping in mind that developed talent exists only in adults, a proposed definition of giftedness in children is that it denotes their potential for becoming critically acclaimed performers or exemplary producers of ideas in spheres of activity that enhance the moral, physical, emotional, social, intellectual, or aesthetic life of humanity (Tannenbaum, 1983, p. 86).

One of the most striking examples of extreme intellectual precocity in childhood, which flowered into truly remarkable productivity and influence in adulthood, is provided by the life and achievements of the great English scientist Sir Francis Galton. Galton has, with justification, been called the grandfather of the gifted child movement (Stanley, 1976). He is generally credited with the earliest significant research devoted to intelligence and intelligence testing, but Galton's scholarship and vision went much further than this.

From his studies of the achievements of members of prominent British families, Galton concluded that the prime determinant of intellectual functioning was heredity (Galton, 1969). Contrary, however, to the later claims of his detractors, he was more than ready to acknowledge the impact of demographic and environmental variables. In his seminal work, *Hereditary genius: An enquiry into its laws and consequences* (1869), Galton pre-empted the work of several later scholars, both in the United Kingdom and North America, in discussing the socio-affective influences of both birth order and the traditional place in British society accorded to eldest sons. He noted that first-born children were more likely to be treated as companions than subordinates by their parents, that in general they were given family and social responsibilities at an earlier age, that in less well-endowed families they would be likely to have more living space, better care and better nourishment in their earlier years than would their younger siblings, and that all these factors could combine to facilitate superior physical and intellectual development and increase the likelihood of their emergence as social leaders.

Galton believed that intellectual ability was highly correlated with visual and auditory acuity, color and perceptual discrimination, tactile sensitivity and reaction time, and his sensory acuity tests, even although they proved largely unproductive, are the first recorded

efforts to measure intelligence. He was certainly the first to propose that the distribution of intelligence follows a normal curve, and indeed he introduced statistics to the social sciences (Grinder, 1985). He is credited with conducting the first research into intellectual and physiological similarities in twins (Forrest, 1974). Before turning his attention to the measurement of human intelligence, Galton had published books on travel and weather prediction, and at the age of 32 had won the British Royal Geographic Society's Gold Medal for his pioneering work in opening up areas of Africa which had not previously been explored.

Galton, who was fascinated with the origin and measurement of intellectual capacity, was himself profoundly gifted. From family diaries kept during Galton's childhood and from the writings of his biographers such as Forrest (1974), it is clear that both his intellectual and psychosocial development in childhood were extremely precocious.

In a paper published six years after Galton's death in 1911, Terman analyzed salient characteristics and events of Galton's youth in an endeavor to estimate his mental age in childhood and, through this, his intelligence quotient (Terman, 1917). Employing the techniques which he developed in association with Catherine Cox and other colleagues to estimate the intellectual status in childhood of historical figures (Cox, 1926), Terman proposed that between the ages of 3 and 8 Galton's intelligence quotient would have been in the region of 200. Terman's techniques would scarcely be accepted as psychometrically valid today; his strategy centered on a retrospective assessment of the performance or behavior of a young person in terms of his or her chronological age compared with the mental age at which such behavior of level of performance more usually occurs. Nonetheless, the young Galton as portrayed in Terman's paper certainly displayed many of the aptitudes, interests and behaviors which research has subsequently shown to be associated with exceptional intellectual precocity.

Terman (1917) related that Galton was reading by age 2½. In a letter to his sister Adele, written the day before his fifth birthday, he writes: "My dear Adele, I am four years old and can read any English book. I can say all the Latin substantives and adjectives and active verbs

besides 52 lines of Latin poetry.” Terman commented that if Galton could indeed read any English book at such a tender age, he was without doubt as far advanced in his reading as the average English or American 10-year-old of that era. One wonders what Terman would make of the reading capacities of 10-year-olds of the present day!

Galton’s love of the classic literature continued. He was particularly devoted to the work of Sir Walter Scott and by the age of 5 could repeat by heart much of the epic poem *Marmion*. That his reading was not simply mechanical, but embraced a sound understanding and appreciation of what he read is illustrated by an incident which occurred in his sixth year. A young friend asked Galton’s advice as to what he should write in a letter to his father who was a political prisoner and in danger of being executed. Galton replied by quoting from Scott:

And if I live to be a man
My father’s death avenged shall be.

A further illustration both of the young Galton’s appreciation of the classics and of his intellectual and social maturity is his response, at age 6, to a visitor to the Galton home who was irritating the boy by continually cross-questioning him about points in Homer. After tolerating the inquisition for some considerable time, Francis politely said: “Pray, Mr Horner, look at the last line in the 12th book of the *Odyssey*.” The line in question reads: “But why rehearse all this tale, for even yesterday I told it to thee and thy noble wife in thy house, and it liketh me not twice to tell a plain told tale” (Terman, 1917).

Galton’s reading interests and abilities at age 10 are indicated in a letter written from boarding school in which he asked his father to send him a number of books including Horne’s *Commentary on the Psalms*, Paley’s *Evidence on Christianity* and Jones’s *Biblical Cyclopedia*. He had a deep and abiding interest in religious and moral questions and, like his younger cousin, Charles Darwin, developed in youth a keen interest in questions of man’s origin and destiny (Forrest, 1974).

The qualities that distinguished the young Galton from his age-peers in childhood and early adolescence have been noted as characteristics of extremely gifted children in several subsequent studies: extremely precocious reading development coupled with unusually mature reading comprehension (Terman & Fenton, 1921; Hollingworth, 1926; VanTassel-Baska, 1983; Gross, 1993), a love of the classics of literature and especially the poetry and novels of Scott, Dickens and Stevenson (Burks, Jensen, & Terman, 1930; Witty & Lehman, 1936; Malet, 1946), a remarkable breadth of hobbies and interests (Burks, Jensen, & Terman, 1930; Hollingworth, 1942), a preference for the company of much older children or adults (DeHaan & Havighurst, 1961; Gross, 1989a); and unusually advanced levels of socio-emotional maturity and moral development (Terman, 1926; Carroll, 1940; Hollingworth, 1942;

Janos, Robinson, & Lunneborg, 1989; Silverman, 1989; Robinson & Noble, 1992).

Galton, then, exemplifies the child of truly astonishing educational promise who developed, in adulthood, as the quintessential “producer of ideas” and a paradigm shifter within his chosen field. Whether or not exceptionally gifted children succeed in developing their potential to the fullest, or whether their gifts remain quite untapped, may depend upon a confluence of catalytic factors (Gagné, 1985): these may include the nature and extent of the child’s aptitudes, aspects of their socio-affective development, the provision of a facilitative educational or social environment (Tannenbaum, 1983; Gagné, 1985, 1991), elements of luck or chance (Tannenbaum, 1983), or the developmental stage of the discipline with which they choose to engage themselves (Feldman, 1986), and the political and cultural priorities of the nations and eras in which they live (Csikszentmihalyi & Robinson, 1986; Morelock & Feldman, 1991).

The Exceptionally Gifted: Defining the Population

Degrees of Giftedness

Who are the exceptionally gifted and how can they be recognized? Silverman (1989, p. 71) has described highly gifted children as “those whose advancement is significantly beyond the norm of the gifted”. By “advancement” Silverman implies potential rather than performance, as research on the school performance of extremely gifted students suggests that the majority of them are required to work, in the regular classroom, at levels several years below their tested achievement (Hollingworth, 1926, 1942; Pringle, 1970; Gross, 1992a, 1993).

Educators working with deaf students recognize four levels of hearing impairment—mild, moderate, severe and profound (Moores, 1987). In the same way, the field of special education recognizes at least three levels of intellectual handicap. The level and type of intervention prescribed for hearing impaired or intellectually handicapped students are dictated by the degree of severity of the condition (Payne & Patton, 1981).

Until very recently, and with very few exceptions, educators working with the intellectually gifted have tended to treat their students as if they were a homogeneous group. Identification strategies have been developed, curricula designed and programs established on the premise that what has been shown to work for moderately gifted children would also work for the extremely gifted. Fortunately, this perception is breaking down and the field is beginning to acknowledge the need to recognize degrees, as well as types, of giftedness, and to recommend appropriately differentiated interventions (Passow, 1980; Tannenbaum, 1983; Webb, Meckstroth, & Tolan, 1983; Kline & Meckstroth, 1985; Silverman, 1989). Ironically, the need for such differentiation was

proposed over 60 years ago, by both Terman and Hollingworth (Hollingworth, 1926; Burks, Jensen, & Terman, 1930).

Giftedness is much more than intellectual precocity. As early as 1926 Hollingworth reported on what she defined as "special talents"; areas of outstanding potential or performance which seemed independent of general intelligence. Only four years later Terman and his colleagues (Burks, Jensen, & Terman, 1930) reported the prevalence of special abilities identified among children in the gifted group. One of the earliest structured definitions of multiple talents was developed by DeHaan and Havighurst in 1957. These researchers proposed six "domains of excellence" in which children could display unusually high capacity; these were intellectual ability, creative thinking, scientific ability, social leadership, mechanical skills, and talent in the fine arts. In the subsequent 30 years a multiplicity of definitions has arisen, all emphasizing multiple talents, but, in the majority of cases, acknowledging the importance of intellectual giftedness as one domain or sub-category (Marland, 1972; Tannenbaum 1983; Gagné, 1985; Feldhusen & Hoover, 1986).

Few scholars would define intellectual giftedness solely in terms of IQ scores; nonetheless, the intelligence quotient is a useful index of the relationship (and, in the case of the gifted child, the discrepancy) between mental age and chronological age. The moderately gifted 9-year-old with a mental age of 12 and an IQ of approximately 135 is "out of step" with average ability age-peers by a matter of 3 years before she/he has even passed into fourth grade; however, the exceptionally gifted 9-year-old with a mental age of 15 and an IQ of approximately 170 looks across a chasm of 6 years from the age at which he/she is capable of reasoning to the grade level on which he/she is likely to be placed on the basis of chronological age. The IQ can assist us to understand the fundamental differences in mental processing between moderately gifted and exceptionally gifted students.

Employing the lexicon of special education, intellectually gifted children can be classified as moderately, highly, exceptionally or profoundly gifted (Webb, Meckstroth, & Tolan, 1983; Kline & Meckstroth, 1985; Silverman, 1989; Gross, 1992a). Levels of intellectual giftedness, as defined by IQ ranges, may be classified as follows:

moderately gifted 130–144
highly gifted 145–159
exceptionally gifted 160–179
profoundly gifted 180+

Exceptionally gifted children comprise a population characterized by their scarcity. The incidence of children scoring at or above IQ 160 on the Stanford–Binet Intelligence Scale (L–M), as predicted by the statistical tables, lies somewhere between 1 in 10,000 and 1 in 30,000 (Marland, 1972), while children scoring above

IQ 180 are fewer than one in one million. (As will be discussed later, the newer Stanford–Binet Revision IV is not regarded as appropriate for the measurement of extremely high levels of cognitive ability.) Researchers over the last 60 years have repeatedly found that the number of children actually identified in the range 160+ far exceeds the theoretical expectations derived from the normal curve of distribution (Terman, 1926; Burt, 1968; Robinson, 1981; Silverman, 1989; Gross, 1993); nevertheless, even the most generous over-prediction must acknowledge that these young people comprise an extremely small minority of the child population.

Because moderately gifted students so greatly outnumber their exceptionally and profoundly gifted counterparts, identification procedures, curriculum design and program development for the gifted population have generally been based on the characteristics, learning styles and needs of the moderately gifted. Yet researchers have noted radical differences in the cognitive and affective development of moderately and extremely gifted students. In terms of intellectual capacity alone, the child of IQ 190 differs from moderately gifted classmates of IQ 130 to an even greater degree than the latter differ from intellectually handicapped children of IQ 70. To require profoundly gifted young people to undertake all their school work with age-peers of average ability is somewhat akin to requiring children of average intelligence to spend 6 hours a day, 5 days a week, interacting solely with children who are profoundly intellectually handicapped.

A Confusion of Terminologies

Gallagher (1975), Tannenbaum (1983), Gagné (1985) and others have discussed the plethora of terminologies which has beset the field of gifted education and which renders even more obscure many concepts which are already notoriously difficult to define. It is difficult to tell, from the writings of some theorists, precisely what they mean by "giftedness" or "talent", or indeed whether they make any distinction between the two terms. To confuse matters further, the terms "gifted", "highly gifted" or "exceptionally talented" are often used without any clarification as to the level of potential or performance being indicated. The authors of at least one text in special education inform their readers that "the terms gifted, brilliant and exceptional will be used interchangeably" (Telford & Sawrey, 1977, p. 166), while Csikszentmihalyi and Robinson (1986) open their chapter in Sternberg and Davidson's *Conceptions of Giftedness* by signaling that they will use the term "prodigious performance" synonymously with talent and giftedness!

In Europe, the use of "surdoué" or "hochbegabt" for "gifted" (where the prefix "sur" or "hoch" implies an advanced or superior degree of the quality under investigation) may have led to further ambiguity as the word "giftedness" itself, for example, is generally

translated as “douce” without any modifier. Heller and Feldhusen (1986) reported on three European studies of students described as “highly gifted” (p. 23). The first of these studies (Mönks et al., 1986) examined 7th–9th grade Dutch students scoring in the top 25% of their class on tests of intelligence. However, a later paper by the two senior authors (Van Boxtel & Mönks, 1992) reporting research on either the same or an identical subject group (the year of the study is not reported) described the students merely as “gifted” and acknowledged that these were students “who by some other authors would be called only modestly gifted or not called gifted at all” (p. 175). By contrast, Trost (1986) reported a talent search for “highly gifted” students in the former Federal Republic of West Germany, which identified and awarded scholarships to “about the top 1% of the successive populations of pupils leaving secondary school” (p. 86). This is a very different population from the 25% studied by Van Boxtel and his colleagues; nonetheless, many educators would suggest that neither group could realistically be described as highly gifted.

These terminological ambiguities may lead to considerable confusion in the minds of practitioners and educational bureaucrats. Thus Landvogt (1992), an Australian teacher working in the state of Victoria, described the highly gifted as up to 3% of the school population, while Morrow, then chief executive of Victoria’s Ministry of Education, is reported as claiming that she viewed one-third to one-half of the students in her state as “especially gifted or talented” (Boag, 1990, p. 49). Also in Australia, the New South Wales Government, in its document *Excellence and Equity* (Metherell, 1989) emphasized the need for special programs for “exceptionally gifted children”. It is pleasing to note, however, that in later documents (Government of NSW, 1991; NSW Board of Studies, 1991) the terminology was modified, with “gifted”, “highly gifted” and “exceptionally gifted” used operationally to define appropriate types and degrees of provision. As Stanley has pointed out, it is essential that researchers should use appropriate and consistent terminology to convey, to practitioners, some of the operational meaning of high scores on tests of aptitude or achievement (Stanley, 1991).

This chapter will review the research on three groups of extremely gifted individuals: (a) investigations of the childhood and adolescence of individuals who as adults developed as “exemplary producers”; (b) early studies of children whose cognitive development, as indicated by their academic achievements, seemed remarkably beyond the norm for their age; and (c) studies since the 1920s of children whose scores on tests of cognitive ability placed them in the exceptionally gifted range of IQ 160+, regardless of whether or not these students were able to achieve their remarkable potential. The primary focus, however, will be on this latter group of studies and will present the key research, from the last 70 years, on this population of students.

Research on Exceptional Potential and Achievement

Early Studies of Exceptional Adult Achievement

Although Galton was one of the earlier pioneers of formal psychometric testing, he did not use the instruments he developed to predict the emergence of high abilities in young people; rather, as Tannenbaum perceptively phrases it, he seemed to view genius as “a matter of reputation for greatness, judged by contemporaries or by posterity” (Tannenbaum, 1983, p. 67). Not surprisingly, early studies of exceptionality, influenced by the work of Galton, focused not on the optimization of youthful potential but rather on analyses of the achievements and personality of adult mathematicians, artists, musicians, scientists and others who had already achieved success and who were thought of as “men of genius”. These studies focused on the eugenic, economic and environmental factors which were seen to have influenced the individual’s rise to prominence.

In a paper in the *Psychological Bulletin* of 1920, Terman and Chase summarized the then current literature on “the psychology, biology and pedagogy of genius”. Cattell (1910) reported on the families of 1000 prominent American “men of science”, discussing the influences both of heredity and upbringing. Davenport and Scudder (1919), writing at the end of World War I, investigated the heredity and juvenile traits of great naval officers and concluded that what they termed *thalassophilia* (sea lust) was not only genetic but also was especially marked in certain races. Seashore (1919) believed that the psychophysical traits which underlined extreme musical giftedness were innate and could be improved only very slightly by training.

Several studies at this time, however, did examine the influence of the educational environment, socialization and training on extraordinary achievement. Nutting (1918) discussed the influences of education, social incentives, and even fortuitous circumstances, as factors in achievement. Todd (1918) in *Theories of social progress* argued that the “exemplary producer” is more a product of social evolution than a cause of it. Tanner (1915) analyzed the impact of economic and industrial conditions upon the flow of inventions at the time of the industrial revolution and the consequent rise to prominence of men such as Watt, Hargreaves and Cartwright, and concluded that the primary factor in the adoption of new technology was the readiness of the field and the culture to assimilate it.

It is fascinating to note, in these early papers, the first heralding of what, in later years, would swell into major themes in the psychology and education of the gifted; the influence of heredity; the contribution of personality and interests on the emergence of talent; the influence of the environment; the impact of factors of chance or good fortune; and the developmental stage of the disciplines with which the gifted individuals chose to engage themselves.

Early Studies of Intellectual Precocity in Children

The majority of the research on extreme giftedness undertaken before 1920 focused on adult achievement. In 1894, however, Yoder published the earliest retrospective study of the childhood of very eminent men, analyzing genetic and environmental influences on their early development. This was followed, in 1926, by Cox's study, described earlier, which attempted to estimate the intellectual status in childhood of noted historical figures through a retrospective analysis of their behavior and achievements in their early years.

In the earlier chapters of her remarkable text *Children above IQ 180: Origin and development* (1942), Leta Stetter Hollingworth outlined the research on several extraordinarily gifted children. Many of these children were noted for an extraordinary facility for languages at an early age. Christian Heineken of Lübeck, who was born in 1721 and died before his 5th birthday, could read fluently in Latin, French and German. Otto Pohler, born in 1892, was reading before the age of 2, and by age 4 was passionately devoted to history, biography and geography. Karl Witte could read Italian, French, Greek and Latin at the age of 7 years 10 months, passed tests of preparedness to matriculate at the University of Leipzig when he was 9 years old and received his Ph.D. at the age of 14 and his Doctor of Laws at 16.

As Hollingworth pointed out, however (1942), these early studies were retrospective, undertaken in the children's adult lives or even after their deaths, they were generally narrative rather than analytical, and because of the absence of appropriate instrumentation, there was no way of obtaining a valid measure of the subjects' cognitive abilities.

With the advent of the Binet-Simon tests, and still later the Stanford-Binet, it became possible to measure the intellectual status of children whose precocious achievements attracted the attention of researchers. Langenbeck (1915) described a prodigiously gifted young girl of IQ around 220 who at 16 months of age had a vocabulary of 229 words in English and German and who at age 3 could write letters of several pages length. Goldberg (1934) reported the case of "K", of IQ 196, who at age 2 could repeat the addresses and telephone numbers of a dozen members of his family. A remarkably gifted child author, Betty Ford, was referred to Terman and his colleague Jessie C. Fenton on the basis of her phenomenal vocabulary and her personal anthology of original stories and poems which already, at the age of 7½ contained almost 200 entries. Betty was tested 6 weeks before her 8th birthday, achieving a mental age of 14 years and 10 months and an IQ of 188. Terman and Fenton (1921) described Betty's early development in some detail and nine years later Burks, Jensen, and Terman (1930) continued her story, but under the pseudonym of "Beatrice", Terman having by then adopted the custom of disguising the identity of his subject children. The literature on psychological and educational measurement in the earlier part of this cen-

tury contained some fascinating case studies of unusually precocious intellectual and academic development.

Before examining the third set of studies, investigations of children of IQ 160+ over the last 50 years, it is necessary to address some issues of methodology and measurement which are particularly pertinent to research on subjects of exceptional intellectual potential.

Some Issues of Methodology and Measurement

Case Study Methodology

As discussed earlier, exceptionally gifted children comprise a population characterized by its scarcity. Because of this factor, research on extreme intellectual precocity in children has mainly comprised isolated case studies of individual students such as these described above. Such group studies as do exist (Gallagher & Crowder, 1957; Barbe, 1964) are generally of short duration, examining the children during only one part of their school lives, rather than tracing their academic, social and emotional growth through childhood and adolescence. Longitudinal studies which do follow the subject group's development through adolescence into adulthood, such as Hollingworth's landmark study of children of IQ 180+ (Hollingworth, 1942) or Terman's "study within a study" which traced the development of those members of the gifted group who scored at or above IQ 170 (Burks, Jensen, & Terman, 1930), are extremely rare. Furthermore, many of the best known studies of childhood or adolescent precocity are, in fact, retrospective, undertaken when the subjects have already attained adulthood, or even after the subject's death (Cox, 1926; Montour, 1977; Bergman, 1979).

If a true picture is to be obtained of the needs and characteristics of extremely gifted children, it is important that studies of these young people should be undertaken not retrospectively but in current time, while the children are actually experiencing the environmental, social and educational influences which contribute to their overall development. In this way, events and situations which impact on the child's development can be observed as they occur, rather than being recalled in adulthood through the filter of an unintentionally biased and selective memory. In the case of exceptionally and profoundly gifted children, where the subject's psychosocial development may differ radically from that of age-peers, it is particularly important that the young child's feelings and perceptions should be recorded at the time when they are influencing his or her thoughts and actions, rather than related in later years.

The case study method is a sound approach for developing specific knowledge about exceptional giftedness. It is ideally suited to the investigation and description of events or people characterized by their rarity (Foster, 1986). It provides a holistic view of the subject and

allows the researcher to develop and validate theories grounded in direct observation of individual students. Indeed, close observation of the student in natural settings, the analysis of subjective factors such as the subject's attitudes, desires and perceptions, and the use of a wide range of observation procedures, all of which are characteristic of good case study research, enable a more comprehensive observation of a subject or process than is possible with any other research methodology (Merriam, 1988). The majority of the studies which will be reported in this chapter have utilized individual or group case study methodologies conducted in current time. The most effective of these have been longitudinal studies, tracing the subjects' development over several, or many, years.

Issues in Measurement

A major difficulty in the assessment of extremely high levels of intellectual giftedness is the systematic depression of scores at the high end of the scale, on all currently used instruments, because of ceiling effects. Group IQ tests are notoriously ineffective in discriminating between the intellectual capacities even of moderately and highly gifted children (Pegnato & Birch, 1959) and even certain individual tests such as the WISC-R and WISC-III, the WPPSI and WPPSI-R and the Kaufman-ABC do not have items of sufficient difficulty to assess the full range of abilities of extremely gifted students. Indeed, Hagen, in an interview with Silverman on the construction of the Stanford-Binet Revision IV, commented that in general, items are purposely omitted from IQ tests if they can only be solved by intellectually gifted students (Silverman, 1986).

The extremely gifted children studied by Langenbeck (1915), Goldberg (1934), Terman (1926), Hollingworth (1926, 1942) and their colleagues were psychometrically assessed on the Binet-Simon (in the earlier cases) or on the Stanford-Binet. Both instruments had the capacity to assess mental age which could be used to generate a ratio IQ for subjects whose scores went beyond the range of norms in the manual. Until 1986 the Stanford-Binet L-M was generally regarded as the best single available measure of general intellectual ability (Martinson, 1974; Stanley, 1977-1978) and the most reliable method of measuring very high levels of intellective ability (Hagen, 1980; Silverman, 1989). Silverman and Kearney (1989) have reported discrepancies of over 50 IQ points in scores of extremely gifted children assessed on the WISC-R or K-ABC and subsequently tested on the Stanford-Binet L-M. Gross (1993) reported similar findings, including an emotionally disturbed 12-year-old girl whose full-scale score on the WISC-R was 147 but who scored in excess of IQ 180 on the Stanford-Binet L-M and a 9-year-old boy who scored 154 on the WISC-R but 198 on the L-M.

In 1986, however, the publication of the Stanford-Binet Revision IV replaced the L-M version. Unfortunately, the new test appears to generate significantly lower scores for the entire gifted range. The Revision IV manual itself reports that mean composite score for a group of 82 gifted children (average age 7 years 4 months) was 135 on the L-M version but only 121 on the Revision IV. Robinson (1992) found the mean IQ of a group of gifted pre-schoolers to be 138 on the L-M but only 125 on the Revision IV; this is a score depression of almost a whole standard deviation, equivalent to that reported in the Revision IV Manual. Kitano and De Leon (1988) reported that in studies of children being assessed for possible entry to a pre-school program for gifted students, between 35% and 43% of the children assessed on the Stanford-Binet L-M achieved IQ scores of 124 and above, while only 16% of similarly aged children scored at this level on the Revision IV. Again, this suggests a serious depression of IQ scores for young gifted children when the newer test is employed. Tyler-Wood and Carrie (1991), assessing elementary school children for entrance to a gifted program, found mean differences of 8 points between the L-M and Revision IV, a difference significant at the .05 level, and this finding was mirrored in a study by Schecter (1992) whose sample, tested on both versions of the Stanford-Binet, included Caucasians, African-Americans, Asian-Americans and Latin-Americans. Schecter concluded that "the Fourth Edition is generally much more conservative (than the L-M) in identifying eligible students for gifted programming from an ethnically diverse population" (p. 15).

An additional problem in the construction of the Revision IV is that it eliminates the mental age which, in its predecessor, could be used to calculate a ratio IQ score for exceptionally and profoundly gifted children. The many problems associated with this instrument have led psychologists with a special interest in the highly gifted to recommend that the Stanford-Binet L-M should be retained for use with children who are suspected of being very highly able (Vernon, 1987; Silverman & Kearney, 1989, 1992). Silverman and Kearney further recommend that in cases where a child obtains three sub-test scores at or near the ceiling of any current instrument, he or she should be tested on the Stanford-Binet L-M and ratio IQ scores computed for any child who scores beyond the test norms.

The Major Studies of Exceptionally Gifted Children

The most thorough and comprehensive examination of the origin and development of intellectually gifted children has certainly been that of Terman and his colleagues. The longitudinal research reported in five volumes under the general title *Genetic studies of genius* (Terman, 1925; Cox, 1926; Burks, Jensen, & Terman, 1930; Terman & Oden, 1947, 1959) derived from an

initial study of 1528 children, the majority of whom scored at or above IQ 140 on the Stanford-Binet Intelligence Scale, and follow-up studies undertaken as these children passed through adolescence and adulthood.

In the third and fourth volumes of the study, *The promise of youth* and *The gifted child grows up*, Terman reported on a secondary study of those subjects within the gifted group who scored at or above IQ 170. No significant differences were found between the exceptionally gifted and the total group on measures of early development or health. The exceptionally gifted group, however, learned to read significantly earlier than did their moderately gifted age-peers, they were more often accelerated through school, and a greater proportion went on to college (Terman & Oden, 1947). Interestingly, Terman noted that there was no appreciable difference between the high school grades attained by the high group and the total group, but as will be adduced from the results of research by Hollingworth and Cobb (1928), there is a strong possibility that a ceiling effect may have been operating for the extremely gifted students due to their participation in the regular high school curriculum.

In the 1930 follow-up, when the mean age of the gifted group was 14 years, 60% of the extremely gifted boys and 73% of the extremely gifted girls were reported by their teachers and parents as being definitely solitary or "poor mixers". Terman claimed that this did not imply that those children were disliked or even unappreciated by their schoolmates; the majority of the extremely gifted group had been elected by their classmates to various class offices within the previous few years. Terman suggested, indeed, that the children of IQ 170-180 were loners from preference rather than from social rejection; in his view it was not until the IQ approached 180 that the problems of salience and social isolation became acute (Burks, Jensen, & Terman, 1930). Later research, however, was to call this belief into question.

Undoubtedly the most significant and influential research in the field of extreme intellectual precocity has been that undertaken by Leta Stetter Hollingworth. Her landmark study *Children of above IQ 180: Origin and development* (Hollingworth, 1942) analyzed then current and previous conceptions of intellectual giftedness, described 19 children of IQ 180 and above reported by previous researchers, and described in great detail the intellectual, academic and social development of 12 New York children of IQ 180 and above whom she herself had been studying over 23 years.

Hollingworth was fascinated by the differences she found in the cognitive and affective development of moderately and extremely gifted children. She defined the IQ range 125-155 as "socially optimal intelligence" (Hollingworth, 1926). She found that children scoring within this range were well-balanced, self-confident and outgoing individuals who were able to win the confidence and friendship of age-peers. In contrast to

Terman, however, she claimed that above the level of IQ 160, the differences between exceptionally gifted children and their age-mates were so great that they led to special problems of development which were correlated with social isolation. Hollingworth believed that these difficulties appeared particularly acute between the ages of 4 and 9 (Hollingworth, 1931) and argued that to ensure both the optimization of their academic potential and a healthy social adjustment, extremely gifted children should be placed in full-time grouping with intellectual peers. "In the ordinary elementary school situation, children of IQ 140 waste half their time. Those above IQ 170 waste practically all their time" (Hollingworth, 1942, p. 299).

In 1922 Hollingworth proposed and oversaw an educational experiment designed to discover whether, under conditions of equal educational opportunity, moderately gifted and exceptionally gifted children would attain different levels of scholastic achievement. Two special opportunity classes for gifted children were established at Public School 165 in New York, for an experimental period of three years, Group A housing 26 children of IQ 150-183 and Group B housing an equal number of children of IQ 134-154. The two classes were taught under identical conditions (Hollingworth & Cobb, 1928) each being taught by a team of no fewer than seven teachers, including Hollingworth herself. The enrichment and extracurricular opportunities offered were the same for both classes and the curriculum was differentiated within each class to enable each student to progress according to his or her capacity. Hollingworth reported that even under these conditions of equal educational opportunity the achievement of the exceptionally gifted children was consistently superior to that of the moderately gifted. Hollingworth's conclusion stands in striking contrast to Terman's finding that the school achievement of his subjects of IQ 170 did not differ significantly from the total group, and suggests that further research is required on the scholastic achievement of extremely gifted children in the regular classroom compared to the achievement of equally gifted children in ability grouped settings. Little research of this nature has been undertaken.

Three studies have compared the family, academic and social characteristics of moderately gifted and exceptionally gifted children. Gallagher (1958), comparing the friendship patterns of gifted children scoring below and above IQ 165, noted that the exceptionally gifted tended to have greater problems of social acceptance than did children scoring between IQ 150 and 164. DeHaan and Havighurst (1957) examined the differences between what they termed "second-order" (IQ 125-160) and "first-order" (IQ 160+) gifted children. They claimed that second-order gifted children attain good social adjustment because they have sufficient intelligence to overcome minor social difficulties, but are not different enough to induce the severe problems of salience encountered by the extremely gifted. Barbe (1964), comparing moderately gifted children (IQ 120-134) with highly and exceptionally gifted age-peers (IQ 148-174),

found little difference in the emotional adjustment of the two groups, with the exception of a significant difference in "freedom from nervous habits" in favor of the moderately gifted (p. 66); it should be noted, however, that the majority of Barbe's "high" group scored safely within Hollingworth's range of "socially optimal intelligence". These three studies, however, were of short duration; no attempt was made to trace the emotional development of the children through their school careers.

A number of other studies, although lacking comparison groups, have made valuable contributions to the literature on the psychosocial development of the extremely gifted. Selig (1959) studied the personality structure of 27 New York elementary students of mean IQ 180, as revealed by the Rorschach technique, to test a hypothesis of association between emotional instability and exceptional intellectual capacity. In this group the incidence of emotional maladjustment was five times the estimated incidence among school children generally. Sheldon (1959) found that 15 of his sample of 28 children of IQ 170+ reported feelings of isolation and rejection, but concluded that an extremely high IQ is not in itself a sufficient cause for perceptions of isolation; he believed that the negative self-perceptions of his subjects arose in part from the dynamic roles played by the school and family. A significant contribution to the research on extremely gifted students was made in the early 1980s by Paul Janos, who compared the psychosocial development of 32 children aged 6-9 with IQs in excess of 164, with that of 49 age-peers of moderately superior intellectual ability (Janos, 1983). Although the exceptionally gifted were generally rated higher in terms of their academic performance, they were more isolated than their age-peers, had greater problems of social development, and in the case of a substantial minority, seemed to lack the motivation to develop their intellectual talents. Janos emphasized, however, that the social isolation experienced by these children was not the clinical isolation of emotional disturbance but was caused by the absence of a suitable peer-group with whom to relate.

These studies are extremely valuable; however, they examined the psychosocial development of extremely gifted students during only one period of their school lives. Silverman and Kearney (1989, 1992), however, are engaged in longitudinal studies of children in Denver and Maine who score above IQ 170. They have found, as did Hollingworth, that these children have unusually advanced affective and moral development, and that both the children and their parents may need counseling to cope with the child's intensity, sensitivity or perfectionism (Silverman, 1989). Gross (1992a, 1993) and Gross and Start (1989) reported on a 10-year longitudinal study of 40 exceptionally gifted Australian children scoring above IQ 160, which will continue at least until the children reach adulthood. Children in this study who were retained in the regular classroom, or who were accelerated by only one year, displayed

disturbingly low levels of social self-esteem, lacked motivation, and deliberately underachieved academically in attempts to gain social acceptance by their classmates. By contrast, those children who had been accelerated by two or more grades displayed positive self-esteem and higher levels of motivation, reported that the pressure to underachieve for peer acceptance had significantly diminished or disappeared completely, and believed that their advanced grade placement benefited them both academically and socially (Gross, 1993).

In his book *Nature's gambit* Feldman (1986) gave a fascinating account of six highly unusual children whom he termed "prodigies" —children who are "unique in having an extremely specialized gift that is expressed only under very specific, culturally evolved, environmental conditions" (p. 9). Feldman emphasized that prodigies do not exhibit extraordinary performance across a wide range of activities; rather, they are "the most precociously specialized specialists that we know about" (p. 10). In a later publication (1991) Morelock and Feldman used the curiously self-contradictory term "omnibus prodigy" to describe one of the six children who displayed remarkable achievement in several fields, and whose performance on an undefined IQ test exceeded the measurement capacities of the instrument: however, in general, Feldman's prodigies differ significantly from the exceptionally gifted subjects reported by Terman, Hollingworth, Silverman, Janos and Gross—children of extraordinarily high IQ whose generalized intellectual capacities, coupled with specific abilities, seem to permit unusually high levels of achievement in several fields of performance. Feldman discussed the influence of peer relationships, motivation and family support on the development of the prodigy's talent; not surprisingly, however, he did not examine the psychological correlates of extreme intellectual precocity.

Of the studies reported above, only those of Terman and Hollingworth followed the exceptionally gifted students from an early age and recorded their academic, social and emotional progress through childhood and adolescence. Hollingworth's untimely death in 1939 (her 1942 text was published posthumously) prevented her following her subject group into adulthood. There is an urgent need for further sustained observation of the academic, social and emotional development of children whose extraordinary intellectual abilities should qualify them to make significant contributions to the societies in which they live, provided that their youthful potential is permitted to flower into adult productivity.

Developmental Differences in Exceptionally Gifted Children

As discussed earlier, research on the childhood and adolescent development of the extremely gifted suggests that exceptionally and profoundly gifted children often experience considerable difficulty in finding and forming supportive academic and social relationships. There

seems little doubt that these difficulties are not caused by any reluctance to form friendships on the part of the exceptionally gifted child, but rather arise from the absence of a suitable peer group with whom to relate (Hollingworth, 1942; DeHaan & Havighurst, 1957; Janos, 1983). There are virtually no points of common interest between a 6-year-old with a mental age of 6, and a 6-year-old with a mental age of 12. Furthermore, even the moderately gifted child may lag two or three years behind his extremely gifted age-peer in terms of his academic and social development, his reading, play and leisure interests, his attitudes and values, and even his moral development and the way he views the world. In both childhood and adulthood, human relationships tend to be formed on the basis of commonalities of interests, beliefs and aptitudes; however, the most visible attributes of the extremely gifted are their differences from age-peers, and these differences can become evident from very early childhood.

Early Development of Speech and Movement

Extremely gifted children differ significantly from their age-peers in their intellectual, academic, social and emotional development and these differences generally become evident from their earliest years, with the precocious acquisition of speech, movement and reading. Studies of the early movement of moderately and highly gifted children report that these children learn to walk, on average, two to three months earlier than age-peers, while in general extremely gifted children show even more remarkable physical precocity (Terman, 1925; Witty, 1940; Kincaid, 1969). Theman and Witty reported on an American negro girl, "B", with an IQ of 200, who took several steps by herself at the age of 8 months "under the excitement of running after a dog" (1943, p. 168), while Silverman (1989) described a girl of 7 months who stood alone, climbed into chairs unassisted and went up and down stairs by herself. Four subjects in Gross's Australian study of children of IQ 160+ were able to sit up unsupported before the age of 5 months, and with only one exception (a boy with a temporary physical disability which required physiotherapy for the first 12 months of his life) the children in this study crawled, walked and ran at ages considerably younger than the population as a whole (Gross, 1993).

Precocity in speech among the extremely gifted is even more remarkable than precocity in movement. Intellectually gifted children are able to link words into meaning considerably earlier, and with much greater degrees of complexity, than their age-peers of average ability (Witty, 1940; Jersild, 1960; Barbe, 1964). Instances do, of course, exist, of extremely gifted children who have delayed their speech well into their second or third year (Robinson, 1987; Gross, 1993), but in general the exceptionally gifted display remarkably complex and advanced speech patterns. The case study literature on the extremely gifted is particularly rich in

examples of this (Langenbeck, 1915; Terman & Fenton, 1921; Goldberg, 1934). Hollingworth (1926) reported on "David" who was talking in sentences at the age of 11 months and who at the age of 8 months exclaimed, "Little boy!" when his shadow appeared on the wall. Several children in Gross's IQ 160+ sample spoke their first word before the age of 6 months, and many of the parents of this group reported that their children moved from single words to complete sentences without passing through the usual transition stages. By 7 months of age "Adam" was astonishing shop assistants by giving a running commentary on the grocery items as his mother wheeled him past the shelves in the supermarket trolley. "Ian" knew all the words of the song *My Grandfather's Clock* by the age of 23 months, and at 2 years 4 months announced to a family friend, "My father is a mathematician and my mother is a physiotherapist" (Gross, 1993).

The precocious development of speech and movement permits exceptionally gifted children to move around and explore for themselves several months earlier than their age-peers of average ability, while their very early speech enables them to express their ideas, seek information through questioning and interact verbally with their parents and other family members at an age when other children are only beginning to experiment with oral communication. Both early movement and early speech contribute significantly to these children's capacity to acquire and process information. Reading, a third and significant source of knowledge acquisition, also seems to develop at remarkably early ages in the exceptionally gifted.

Differences in Reading, Play and Leisure Interests

The precocious development of speech and movement in the extremely gifted means that the child's "difference" from age-peers is identifiable from an unusually early age, not only to his or her parents but to neighbors and other community members. However, it is with the early development of reading, accompanied by somewhat esoteric reading interests, that extremely gifted children begin to grow apart, academically and socially, from their age-peers.

One of the most powerful indicators of extreme giftedness is early reading. As indicated earlier, Terman found that one of the few variables on which his IQ 170+ sub-group differed from his moderately and highly gifted subjects was the very early age at which they learned to read. Almost 43% of Terman's subjects of IQ 170+ were reading at age 5, compared to 18.4% in the gifted group as a whole, while 13% of the 170+ group had learned to read before age 4 (Terman & Oden, 1947).

Hollingworth (1926) confirmed that it was early reading which most clearly differentiated between moderately and extremely gifted children. Of Hollingworth's 12 subjects of IQ 180, all read before school

entry, while four were reading at age 2, three at age 3 and three at age 4 (Hollingworth, 1942).

VanTassel-Baska (1983) studied 270 students aged 13 and 14 who had achieved within the 90th percentile on the Mathematics or Verbal subtests of the Scholastic Aptitude Test, and found that 80% of this group had read by age 5 and 55% by age 4. Of 31 Australian children of IQ 160+ reported by Gross and Start (1989), all but three had learned to read by their 5th birthday, while three were reading before age 2, seven before age 3, and eight before age 4.

These and other studies report that the considerable majority of extremely gifted children learn to read either with no assistance or with only minimal assistance from their parents. Terman reported that the assistance reluctantly given by some of the parents of his gifted group was given "only in response to urgent solicitations on the part of the child" (Terman, 1926, p. 272). The majority of extremely gifted children seem to be fascinated with reading from an early age (Terman, 1926; Burks, Jensen & Terman, 1930; Hollingworth, 1926, 1942).

Intrigued though he was by the precocity of reading development in his gifted subjects, Terman reported that the most striking contrast between the gifted and their age-peers of average ability was in the age at which different books were read. Books which were preferred by the average child of 11 or 12 were usually read with enjoyment by the moderately gifted child or 8 or 9.

Although Terman was interested in comparing his IQ 170+ subjects with the total group on their early reading development, he made no formal analysis of differences in their reading habits or interests. He did, however, undertake a series of case study analyses of seven gifted juvenile writers whom he identified in the course of his wider investigations (Burks, Jensen, & Terman, 1930). The mean IQ of this group was 165 with a range of 148–188. Although this group expressed wide and mature reading interests, they showed a particularly keen interest in books which would generally be considered "classics"; their favorite authors at the ages of 10 and 11 were Stevenson, Scott, Dickens, Tennyson, Swift and Bunyan, while one 7-year-old with a mental age of 13 named as his favorite reading Gibbons' *Decline and fall of the Roman empire!* These extremely precocious choices contrast vividly with the 3–4 year advancement in reading displayed by the gifted group as a whole.

A number of researchers who have made particular studies of the psychosocial development of the extremely gifted have noted their precocious interest in matters of morality and religion (Hollingworth, 1942; Janos, 1983; Gross, 1993). Hollingworth found that religious questioning and the search for a personal system of moral and ethical belief generally began when a child reached the mental age of 12 or 13. In the case of the extremely gifted, where there is a significant gap between chronological and mental age, this search can begin when the child is barely in elementary school. "In cases of children who test above 180 IQ observed by

the present writer a definite demand for a systematic philosophy of life and death developed when they were but 6 or 7 years old" (Hollingworth, 1942, p. 280).

It is natural that the social isolation which so often characterizes extremely gifted children (Sheldon, 1959; DeHaan & Havighurst, 1957; Janos, 1983), coupled with their hunger for reading and their quest for a personal morality, should lead them to seek out books and other materials which may offer an answer to the questions that besiege them. Many of the individual case studies in the first half of this century demonstrated how often extremely gifted children turned to the classics to fuel and satisfy their moral questioning. Zorbaugh, Boardman and Sheldon (1951) reported on Boyd, aged 8, with an IQ of 200, whose large personal library consisted mainly of the classics, science, history and biography. At the age of 8, Boyd won first prize in an essay competition open to the elementary school children of metropolitan New York. The title of his essay was: *The Meaning of the Life of Theodore Roosevelt in the Development of the American Idea*. Boyd took great pleasure in engaging his scientist father's distinguished dinner guests in discussions on the influence of religion on the development of civilization.

McElwee's "Seymour", reported in 1934 to have an IQ of 192, was an avid reader who enjoyed *Treasure island* at age 6 and by age 8 was reading Dickens's *Pickwick papers* and Scott's *Ivanhoe*. The present author has identified "Seymour" as the child later reported by Hollingworth as "Child G"; Hollingworth (1942) records that before being placed in a special fulltime class of other highly gifted children, "G" had been an isolate who preferred to be alone with his books to being in the company of other children. The particular books preferred by "Seymour" at this time were Lanier's edition of *Malory's Arthurian legends*, Abraham's *Scriptural history* and Kipling's *Jungle book*, all books which abound in questions of personal ethics.

Modern studies of extremely gifted children find that these young people, while showing less interest in the classics than did the children of 40 years ago, still prefer novels and non-fiction texts which are more usually selected by students 5–7 years their senior, and tend to seek out books which address social and ethical issues. Anastasia, of IQ 173, discovered with delight, at age 7½, Richard Adams's *Watership down* and before her 9th birthday was reading, with keen enjoyment, an English translation of *Les misérables* (Gross, 1993). The extremely gifted subjects of Gross's study display a strong interest in what Halstead (1988) has called "high fantasy"; adolescent or adult science fantasy novels which trace the moral or ethical growth of a group of key characters within the framework of a developing society or a new world. For children in younger age groups "high fantasy" encompasses C. S. Lewis's *Chronicles of Narnia*, the Madeleine L'Engle series which begins with *A wrinkle in time*, and Ursula LeGuin's *Earthsea trilogy*. For the older children it is characterized by books such as Ray Bradbury's *Martian chronicles*, the *Dune* series by

Frank Herbert and Steven Donaldson's *The chronicles of Thomas Covenant, an unbeliever*. The parallels between "high fantasy" and the classics of 19th-century literature, and the appeal of both genres to extremely gifted young people, have been discussed at length by Gross (1993).

The literature on the highly gifted suggests that the majority of extremely gifted students deliberately moderate or conceal their exceptional abilities in the regular classroom in attempts to win social acceptance by age-peers (Hollingworth, 1926, 1942; Pringle, 1970). Exceptionally gifted children who enter school already reading may deliberately stop reading within the first few weeks to conform to peer expectations, unless the teacher is alert enough to note their precocity and place them either with other advanced readers of their own age or with older children through a program of grade-advancement or subject acceleration (Gross, 1993). Indeed, extremely gifted young readers who are retained with age-peers of average ability have little incentive to display their advanced reading interests; where would Anastasia, described earlier, find another 7-year-old who would share her delight in the dry humor and social commentary of *Watership down*?

An additional barrier to normal socialization with age-peers may arise from the extremely gifted child's enjoyment of leisure activities which are completely outside the realms of interest or capability of the average child. McElwee's "Seymour", of IQ 192, was given a chemistry set at age 7½, and immediately tried to establish a chemistry club among the children of his neighborhood; to his chagrin he found not one child to share his interests (McElwee, 1934). "Betty Ford", the prodigiously gifted child author described by Terman and Fenton (1921), had written an anthology of over 200 stories and poems by the time she was seven. Hollingworth's "Child D" was, at age 7, typing, composing and selling a regular playground newspaper (Hollingworth, 1942). At age 6, Australian math prodigy Terence Tao wrote a computer program to produce Fibonacci numbers (Gross, 1986), and at age 12 his spare-time occupations included translating Douglas Adams' *The hitchhiker's guide to the galaxy* into Latin (Gross & Start, 1989). It is quite unrealistic to expect that children such as these would be able to establish productive social relationships with age-peers who were still at developmental stages which they themselves passed through several years earlier.

Even the play interests of the extremely gifted may establish barriers between them and their age-peers. The majority of the children of IQ 180+ studied by Hollingworth had conspicuous difficulties with play in early childhood. These children were unpopular with their age-peers because "they always wanted to organize the play into some complicated pattern with some remote and definite climax as the goal" (Hollingworth, 1931, p. 9). Children of 6 years old are not generally responsive to the promise of delayed gratification and are unlikely to be drawn into sustained, complex games

which lead to remote goals. Furthermore, children of average intellectual ability characteristically resent the attempts of the gifted child to reorganize their play. It can be exceedingly frustrating for a 5-year-old of average ability, to whom the ritual of a game may not be distinguishable from the game itself, to have a gifted classmate insist on restructuring the rules and conditions of play. The intention of the gifted child may be to remove illogicalities from the play, or alter the rules to introduce new and greater challenges; however, for the average child, whose vision is narrower, the very fabric of the game is being destroyed.

Generally, whereas the play of young elementary school children of average ability involves predominantly simple sensorimotor activity, gifted children prefer games of intellectual skill where new ideas and strategies can be developed and trialed (Terman, 1926; Hollingworth, 1931). In his study of 561 children scoring at or above IQ 150, Kincaid (1969) noted that the favorite activities of these children included discussions, visits to museums, puzzles and listening to foreign language records. Hollingworth's subjects of IQ 180+ frequently reported a liking for bridge, chess and other competitive board games (Hollingworth, 1942).

Gifted girls tend to be less interested in doll-play than are their age-peers of average intelligence. Hollingworth related that when she asked a 7-year-old girl of IQ 170 why she did not care to play with dolls, the girl replied "They aren't real. The doll that is supposed to be a baby doll is twice as big as the one that is made like a mother doll" (Hollingworth, 1931, p. 10). The rejection of doll-play can be a considerable hindrance to socialization; for young girls role-play with dolls may play a major part in establishing the parameters of relationships. For the extremely gifted child, however, the search for logic and structure may supercede the desire for social intercourse.

The Search for Identity and Intimacy

Someone has said that genius is necessarily solitary, since the population is so sparse at the highest levels of mental ability. However, adult genius is mobile and can seek out its own kind. It is in the case of extraordinarily high IQ that the social problem is most acute. If the IQ is 180, the intellectual level at six is almost on a par with the average 11-year-old and at 10 or 11 is not far from that of the average high school graduate. . . . The inevitable result is that the child of IQ 180 has one of the most difficult problems of social adjustment that any human being is ever called upon to meet (Burks, Jensen, & Terman, 1930, p. 264).

Earlier in this chapter a brief review of the literature on the psychosocial development of the extremely gifted established the difficulties that arise when the differences between extremely gifted children and their age-peers so far outweigh the similarities as to hinder the formation of productive social relationships. Hollingworth

identified an IQ of 160 as being the “danger point” beyond which the gifted child is particularly at risk for social rejection by age-peers, and noted that the problems of social isolation seemed particularly acute between the ages of 4 and 9 (Hollingworth, 1931).

It cannot be sufficiently emphasized, however, that the problems of social isolation, peer rejection, loneliness and alienation which afflict many extremely gifted children arise *not* out of their exceptional intellectual abilities but *as a result* of society’s response to them (Selig, 1959; Janos, 1983; Gross, 1993). These problems arise when the school, the education system or the community refuses to create for the extremely gifted child a peer group based not on the accident of chronological age but on a commonality of abilities, interests and values. There is no doubt that, whatever interventions are made for exceptionally gifted young people in school, they will live as adults in a world where the vast majority of people they will encounter will find it difficult to relate to their remarkable intellectual capacities, their atypical interests, and their different values and perceptions. This does not mean, however, that schools may absolve themselves from the requirement to make the extremely gifted child’s passage through childhood as trouble-free as possible. A child who receives affection and approval from other children is learning and practicing the skills that will assist him or her to form sound relationships in adulthood. A child who is consistently rejected by age-peers has little opportunity to practice these skills.

There exists, of course, a minority of profoundly gifted persons whose isolation, in adulthood, is self-elected rather than imposed. Einstein (1940), in a philosophical treatise, wrote, “I live in that solitude which is painful in youth, but delicious in the years of maturity.” Later, he outlined his feeling of detachment from society.

My passionate sense of social justice and social responsibility has always contrasted oddly with my pronounced freedom from the need for contact with other human beings and human communities. I “gang my own gait” and have never belonged to my country, my home, my friends or even my immediate family, with my whole heart; in the face of all these ties I have never lost an obstinate sense of detachment, of the need for solitude—a feeling which increases with the years. One is sharply conscious, yet without regret, of the limits to the possibility of mutual understanding and sympathy with one’s fellow creatures. Such a person no doubt loses something in the way of geniality and light-heartedness; on the other hand, he is largely independent of the opinions, habits and judgments of his fellows, and avoids the temptation to take his stand on such insecure foundations (Einstein, 1940, p. 3).

Einstein, however, was writing with the self-awareness of maturity. Few children can take such a dispassionate or even welcoming view of their isolation from social companionship. The majority of children actively seek

membership of social groups and will do much to achieve it. As discussed earlier, the high incidence of deliberate scholastic underachievement for peer acceptance among highly gifted youth is well documented.

The achievement of a sense of personal identity and the attainment of intimacy—a relationship of equals which provides mutual support, concern and valuing—have long been accepted as necessary correlates to the development of a secure self-concept (Foster, 1983; Steinberg, 1985). One aspect of identity-achievement is the process of finding a niche in the society or community which one wishes to enter. Of equal importance is a realistic appreciation of one’s own strengths or goals. For the extremely gifted child or adolescent, with the capacity for outstanding performance in many fields, the process of identity achievement can be unusually complex. There may be too many choices to make; too many fields which could be entered with the probability of success.

Terman and Oden noted this conflict of choices in a number of their gifted cohort. In their 1947 survey of the gifted group in adulthood, they found a considerable number of men who seemed to have no genuine commitment to any particular vocation and whose employment record indicated that they were drifters. Terman and Oden rated the men of the gifted group on occupational achievement and then compared the 150 most successful men with the 150 least successful. Among the most successful group, 75% said that their choice of occupation had been deliberately planned; however, only 31% of the least successful group reported that they had deliberately chosen the occupations in which they found themselves.

In the last fifteen years, educators and psychologists have become increasingly aware of the influence of supportive intimate relationships on the attainment of human potential. Sears (1977), reviewing the life experience of the children in Terman’s sample, noted that these men’s perceptions regarding whether their lives had been satisfying or not were strongly related to the quality of the intimate relationships they had enjoyed.

Adults and children alike are more likely to achieve intimate and supportive relationships with peers than with people with whom they have little in common. Adults tend to seek out the companionship of people with like values and interests. In childhood relationships, this translates into a seeking after other children at similar developmental stages. It has often been noted that gifted children tend to seek out, for companionship, either older children or children of their own age who are at similar stages of intellectual development (Hollingworth, 1931; Tannenbaum, 1983), while O’Shea (1960) noted that in several child studies conducted over several years no variable correlated more highly with friendship choice than mental age, and that this stood considerably above any other factor.

Extremely gifted children, however, have very little chance of finding intellectual companionship in the

regular class situation. In the absence of a peer group of children who share their abilities, interests and values, they have to try to forge some links to the group of age-peers with whom they have been placed. This places gifted students in a forced-choice dilemma (Gross, 1989b). If they are to be accepted as members of the child or adolescent peer culture, which values conformity even more than does the adult culture, they must moderate their standards of achievement, conceal, to some extent at least, their intellectual interests, and conform to a value system that may be seriously at variance with their own levels of affective or moral development, to retain the approval of the group into which they seek to be accepted. If, however, it is more important to the extremely gifted child to achieve his or her intellectual potential, then the supportive warmth of intimacy and the sense of group and individual identity must be sacrificed to the drive for excellence and achievement. In the child or adolescent of average ability the drives towards intimacy and achievement are compatible, indeed complementary. The gifted, however, are one of the few remaining groups in our society who are compelled, by the restraints of the educative and social system within which they must operate, to choose which of two basic psychosocial drives should be fulfilled.

George Bernard Shaw, who suffered severe social isolation in youth, sought partial escape by burying himself in the great literature of the past. Shaw talked of his search for identity and intimacy as:

... complicated by a deeper strangeness which has made me all my life a sojourner on this planet rather than a native of it. Whether it be that I was born mad or a little too sane, my kingdom was not of this world; I was at home only in the realm of my imagination, and at ease only with the mighty dead. . . . Therefore I had to become an actor and create for myself a fantastic personality fit and apt for dealing with men, and adaptable to the various parts I had to play as author, journalist, orator, politician, committee man, man of the world, and so forth (Shaw, 1952, p. 106).

Shaw, the dramatist with a dazzling array of masks behind which he concealed the absence of any true sense of identity, and Einstein, removing himself gently but firmly from the obligations of social intercourse, represent two extremes in the avoidance of intimacy. Yet they illustrate what can befall the extremely gifted individual who has not succeeded, in youth, in establishing social ties and a sense of belonging.

The School's Response to the Extremely Gifted Child

As was discussed earlier in this chapter, educators working with the intellectually gifted have traditionally assumed that identification strategies, curricular interventions and program structures designed to serve moderately gifted students would also meet the needs

of the extremely gifted. It is most important that we repudiate these misconceptions. The necessity of avoiding flawed identification procedures, particularly the use of inappropriate instrumentation which produces ceiling effects for the extremely gifted, has already been discussed. It is necessary, however, to emphasize that program structures which center on short-term grouping and in-class enrichment, while these may be of some benefit to bright and moderately gifted students, do little to address either the academic or social needs of the extremely gifted.

Researchers who have made a special study of the intellectual and emotional needs of exceptionally and profoundly gifted students have emphasized that, if these children are to avoid severe psychosocial disturbance arising from salience and social isolation, some form of on-going ability grouping is imperative (Hollingworth, 1942; DeHaan & Havighurst, 1957; Silverman, 1989).

After many years of studying and serving the extremely gifted, Hollingworth became convinced that these children should be permitted access, on a full-time basis, to other students at similar stages of intellectual, social and emotional development. She believed that the heterogeneous classroom was a restrictive and often repressive environment for highly or extremely gifted children, and she became a staunch and persuasive advocate of the establishment of full-time self-contained classes for children of exceptional intellectual potential (Hollingworth, 1926, 1942; Hollingworth & Cobb, 1928). Hollingworth reported on "Child C", a boy of IQ 190, who was consistently rejected by other children until he was transferred to a special class for highly gifted children where the median IQ was 164. In this class he was able, for the first time, to make social contacts with other children who shared his ability and interests, and within a short time he was one of the most popular and respected class members (Hollingworth, 1942).

It is now generally recognized that an appropriate curriculum for the gifted must contain elements both of enrichment and acceleration (Hollingworth, 1942; Daurio, 1979; Gagné, 1986; VanTassel-Baska, 1989), enhanced by other provisions such as individual study, grouping and mentorships. This is doubly necessary for the very highly gifted. Teachers are prone to discourage acceleration on the grounds that the child's social and emotional development may be jeopardized; research, however, finds no evidence to support the notion that socio-emotional problems arise through well-designed and monitored acceleration programs (Jones & Southern, 1991).

For extremely gifted children some form of acceleration is essential if they are to find significant numbers of students of their own mental age with whom they can form healthy and productive social relationships. This can be done by allowing the child early entrance to school, grade-skipping, subject acceleration, early college entrance, concurrent enrolment whereby high school students take college courses for both high school

and college credit, or summer residential programs in which highly gifted high school students can take advanced courses for later college credit. The findings, since the early 1970s, of the Study of Mathematically Precocious Youth provide powerful arguments for the intellectual and social benefits of academic acceleration for highly gifted youth (Brody & Stanley, 1991; Benbow, 1991). For extremely gifted students it may be necessary to use a combination of several of the accelerative procedures outlined above. Terman and Oden (1947), in their follow-up research on the young adults in Terman's gifted group, argued forcefully that for extremely gifted children the more conservative accelerative procedures such as a single grade-skip were not sufficient; they advised radical acceleration through several grade-skips spaced appropriately through the student's school career. Gross (1992a, 1993) found that for children of IQ 160+ a token grade-skip of one year, even when supplemented with in-class enrichment or pull-out, was no more effective, either academically or socially, than retention in the regular classroom with age-peers.

It is essential, however, that radical acceleration (grade advancement by three or more years), like other forms of acceleration, should be supplemented with well-structured ability grouping and relevant enrichment. Even with radical acceleration, the mental ages of extremely gifted children will still be considerably higher than the average student of the classes they will enter, and additional educational adaptations will be necessary to ensure that they are, indeed, provided with academic challenge and intellectual peers (Gross, 1992a).

The importance of motivation to the optimization of human potential is widely acknowledged in the research literature on talent development (Galton 1869; Bloom, 1985; Gagné, 1991). Bloom's study of over 120 adults who achieved excellence in cognitive, artistic and athletic fields identified three characteristics as critical to success: (a) an unusual willingness to undertake a remarkably high workload in order to achieve at a high level; (b) a determination to achieve the highest standard of which one is capable; and (c) the ability to learn new techniques, ideas or processes in the talent field more rapidly than the average (Bloom, 1985). It is notable that the first two characteristics are motivational.

It is important, however, that as educators we take note of the research which suggests that the development of achievement motivation is strongly linked to experienced success, encouragement, and positive self-esteem. Bloom (1985) claimed that all three traits listed above were considerably linked to early socializing and training; indeed he reported that the willingness to strive for higher levels of achievement was not strongly evident in his subjects until after the age of eight. It appeared to "manifest itself" after several years of instruction in the child's field of talent, when the child had already received both praise for previous success and some degree of specialized assistance or tutoring.

By contrast, where extremely gifted students are given little encouragement or assistance to persevere with the development of their high abilities, where they feel themselves compelled to moderate their achievements for peer or teacher acceptance, and where school offers only a curriculum designed to cater for average or moderately gifted students, the motivation to achieve either remains dormant or diminishes significantly after the first few years of school (Hollingworth, 1926, 1931, 1942; Foster, 1983; Silverman, 1883; Gross, 1992a, 1993). Gross's Australian study found that extremely gifted students who were retained full-time with age-peers, or who were accelerated by only one year, displayed disturbingly low levels of motivation and social self-esteem, were more likely to report social rejection by their classmates, and stated that, far from striving for success, they frequently concealed their abilities in attempts to gain acceptance by age-peers and teachers (Gross, 1992a). Furthermore, schools which required that students display high levels of interest or task commitment before they could be admitted to gifted programs, tended to view these extremely gifted students' apathy and lack of motivation as indications that they had "leveled out" and were no longer gifted (Gross, 1993). It is important that in gifted education motivation should be viewed as a program goal rather than a criterion for program entry (Feldhusen & Hoover, 1986).

Conclusion

Early studies of exceptionally gifted individuals tended to focus on the youth and young adulthood of men and women (but mainly men!) who had developed as what Tannenbaum (1983) would term "exemplary producers" and who, accordingly, excited national or international admiration and curiosity. These studies were uniformly retrospective, written in the subject's late adulthood or even posthumously. In general, they centered on the eugenic, economic and environmental factors which were seen to have influenced the individual's rise to prominence. The few studies of extremely gifted children which were undertaken before the beginning of this century were narrative rather than analytical and focused on the child's prodigious achievements rather than on his or her personality or upbringing. Only with the advent of psychometric testing did researchers adopt a more analytical perspective in the assessment and reporting of precocious intellectual development.

Even during the second half of this century, research on extreme intellectual precocity in children has mainly comprised individual case studies or group studies of relatively short duration. There is an urgent need for further longitudinal research, such as that of Terman and Hollingworth, on the intellectual, academic, social and emotional development of extremely gifted young people, following them through their childhood and young adulthood, and conducted in current time rather than retrospectively.

Educators must become aware that procedures commonly used to identify and assess the intellectual and academic abilities of moderately gifted students may be of little value in the assessment of very high levels of intellectual capacity. Psychologists and school counselors must select instrumentation appropriate to the task in hand. Similarly, curricular interventions and program structures developed in response to the needs of the moderately gifted may be quite inappropriate for use with exceptionally or profoundly gifted children. It is essential that researchers use appropriate and consistent terminology to convey to practitioners some of the operational meaning of high scores on tests of aptitude and achievement (Stanley, 1991).

Extremely gifted young people may differ quite radically from their moderately gifted age peers not only in their cognitive development but in their affective growth, their moral development, their play and recreational interests, their atypical reading interests, their friendship choices, their attitudes and values, and in the way they view the world. These differences may have become obvious, from the very early years, not only to the gifted child himself or herself, but to other children, teachers and community members.

These young people are seriously at risk for social isolation and peer rejection unless the education system actively works to create for them a peer group based not on the the accident of chronological age but rather on a commonality of abilities, interests and developmental levels. Exceptionally gifted children retained with age-peers generally experience extreme difficulty in establishing positive social relationships with their classmates and display disturbingly low levels of motivation and social self-esteem. By contrast, similarly gifted children who have been radically accelerated display higher levels of motivation, report that the pressure to underachieve for peer acceptance has significantly diminished or disappeared completely, and believe that they are now more appropriately placed, both academically and socially.

As educators we should recognize that extremely gifted children differ in many ways from their moderately gifted age-peers. If we are to meet these students' academic and social needs, we have to make a differentiated response.

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Leadership Education for the Gifted

DOROTHY A. SISK

Lamar University, Beaumont, Texas, U.S.A.

Introduction

Today's global society is facing tremendous challenges and these challenges come at a time when there is a crucial need for leadership. Yet many people are reluctant to seek leadership. Futurist Barker (1992) in *Futures Edge* states that we do live in both a time of global crisis and global opportunity for leadership. The challenge for educators is to develop and encourage leadership, particularly in children and youth as a special type of giftedness.

Rapid social change in many countries serves to discourage leadership, particularly in eastern Europe, Africa and South America. In these pluralistic and heterogeneous populations, conflicts of values and goals are magnified. This situation makes it extremely difficult to unify followers and to identify leadership. In addition, large bureaucratic organizations and legalistic norms in the Western world discourage leadership, along with mass media's instant retrieval and dissemination of information. Many leaders or potential leaders are just not willing to be exposed publicly. And more important, great goals and rallying points are often difficult to identify in a global society. As society increasingly turns outward, it becomes more difficult for leaders and potential leaders to hear their inner voices. Many individuals are unwilling to stand "for" something that creates enemies or breaks down existing social or political alliances.

In this chapter, the need for leadership education for all people will be explored, but particularly for gifted students, a fundamentally different interactive model and approach to leadership development will be suggested. This approach focuses on developing self leadership and building specific strategies such as productive thinking, feeling and behavioral strategies to influence ourselves and others. From this point of view, self leadership through modeling will be examined, with the focus on a leadership program (Texas Governor's Honors Program) as an example of how to develop leadership in adolescent gifted students. An individual leader who represents interactive leadership, General Dwight D. Eisenhower, former president of the United States and founder of the Citizen Ambassador Program will be discussed. The program of People to People

International for several years developing personal leadership in teachers and administrators by planning and conducting leadership seminars in Russia, Hungary, China and Vietnam will be described. Through people to people contact, personal leadership is encouraged and supported by the Citizen Ambassador Program as envisioned by former President Eisenhower.

Need for Leadership

In the late 1980s when Sisk and Shallcross (1987) were undertaking the research that ultimately led to the book *Leadership: Making things happen*, the evidence that people were the critical ingredient in successful organizations was overwhelming (Johnson, 1972; Bolton, 1979; Nixon, 1982; Davis, 1983; Hickman & Silva, 1984; Drucker, 1985; Parnes, 1985). Eventually, this research led to identifying these people as creative leaders. Sisk and Shallcross discussed the importance of a number of characteristics that help individuals maintain and develop leadership such as decentralizing authority to encourage and allow autonomy and entrepreneurship. Kanter (1989) states that this decentralization involves risk taking and risk seeking. Leadership is the critical factor in shaping excellent organizations whether one is talking about education, political or business organizations. This belief in the individual is expressed in the words of Lao Tzu who said:

A leader is best when people barely know he exists . . . when his work is done, his aim fulfilled, they will say: we did it ourselves.

Traditional Concept of Leadership

When most people are asked to define leadership, they usually identify situations in which one person influences another and consequently they define leadership as the ability to influence others. In examining the research literature on leadership for possible working definitions, one finds almost as many definitions of leadership as there are persons writing about the concept of leadership. Definitions include:

"Leadership is the process of influencing the activities of an individual or a group in efforts toward goal achievement" (Hersey & Blanchard, 1969).

"Leadership is the privilege to have the responsibility to direct the actions of others in carrying out the purposes of the organization, at varying levels of authority and with accountability for both successful and failed endeavors" (Roberts, 1985).

"Leadership is the capacity and the will to rally men and women to a common purpose and the character which inspires confidence" (Manske, 1987).

"Leadership is leaders inducing followers to act for certain goals that represent the values and the motivations, the wants and needs, the aspirations and expectations of both leaders and followers" (Phillips, 1972).

"I use the term facilitator to identify the leader who draws out, reinforces and thus facilitates the creative learning, development and problem solving of the people with whom he or she is working" (Parnes, 1985).

Gallagher (1985) states that in the end leadership comes down to the exercise of influence of power. Still another common definition is that leaders are charismatic or heroic individuals. This definition is often referred to as the Great Man Theory. At a leadership conference of 350 doctoral students at Nova University in Fort Lauderdale, Florida, the students defined a leader as one who possesses vision and dynamic personal attraction to generate total organizational change. Their definition of a leader embodies power, authority and charisma. If this definition or concept is used, one can easily identify historical figures who possess all three characteristics such as Alexander the Great, Caesar, Napoleon, Catherine the Great, George Washington, Winston Churchill, Dwight D. Eisenhower and Indira Gandhi. More recently Bishop Tutu, Anwar Sadat, Margaret Thatcher, George Bush and Lee Iacocca who was able to turn around the Chrysler corporation in the United States can be identified. According to Bennis (1989) these are leaders who were made, not born, and made more by themselves than by any external means.

Yet Sisk and Shallcross came across points of view that caused them to grapple with the notion of leadership as helping others lead themselves. True leadership is actualized by individuals who assist others by leading them to lead themselves. This concept of leadership was demonstrated in a three-week residential program for 200 adolescent gifted youth at Lamar University in Beaumont, Texas. The gifted students work with counselors and teachers to identify and to demonstrate leadership in themselves and others. They learn to demonstrate what Harman (1989) calls thinking beyond yourself. In evening seminars, they interact with speakers who represent living examples of initiative and self leadership—e.g., a venture capitalist and a recipient of the prestigious Horatio Alger award. The speakers share how they encourage individual initiative and autonomy. The philosophy of the award winner is getting

the right people in the right place and encouraging them to use their own inventiveness to accomplish the task at hand. The venture capitalist identified determination as a key ingredient in successful leaders. This characteristic was chronicled in a national study conducted in the United States in which top artists, scholars and athletes indicated that their success resulted more from determination and practice than from natural, inborn talent. The Cox et al. (1985) study on MacArthur Fellows found that they were provided with opportunities to develop and exercise their capabilities, particularly through the support of their parents and families. When potential leaders are denied this opportunity, then they and society are robbed of their contribution.

Most people have heard the expression, "Give a man a fish, and he will be fed for a day; teach a man to fish, and he will be fed for a lifetime." Manz and Sims (1989) in *Superleadership* paraphrase this expression by saying that "the followers of a strong, charismatic leader will know where to go as long as their way is lit; that their path will always be lit if taught to lead themselves and that they will illuminate new paths of amazing growth and opportunity that might never have otherwise been seen."

There is no question that the world has become very complicated and that it is changing at an unprecedented rate. Unfortunately, many institutions, schools, churches and private industries have not kept up with these changes. However, if educators approach today with the belief that there is an opportunity for change and that advancement centers on the meaningful mobilization of individual effort and innovative behavior, then leadership can be developed that will have immense benefit for more people. Harman (1989) highlights this potential benefit by suggesting that leaders use their work for self development by aiming for both maximum results and personal progress.

Gallagher (1985) reminds us that it is difficult to observe student leaders or leadership as a product, because students have so little time to exercise it. Hopefully, by examining leadership and noting specific behaviors that can be taught, teachers and administrators will respond to the challenge and need for leadership development as a special type of giftedness.

Leadership was included in the 1972 United States federal definition of giftedness. Marland (1972) pointed out that if democratic education meant "appropriate educational opportunities to benefit students and society, then the offering of differential educational provisions was essential." Marland further stated that special programming for the gifted was needed for the benefit and survival of democracy.

Almost a decade prior to the Marland report, Torrance observed that the survival of civilization depended on the creative imagination of future generations and stated that democracies collapse when they fail to use intelligent, imaginative methods for solving problems. If students in today's schools are to become tomorrow's leader, educators must make leadership

training available. Society cannot nor will not survive without intelligent, imaginative leadership. Leadership training for gifted students can provide leaders who have both the intellectual and creative potential to lead.

Leadership Definition

Specifically leadership in this chapter will be defined as one who leads others to lead themselves. The leader designs and implements a system that allows and teaches others to be self leaders. As Manske (1987) puts it, effective leaders bring out the best in people by stimulating them to achieve what they thought was impossible. This approach consists of building an extensive set of behaviors, all intended to provide behavioral and cognitive skills and cues. An interactive model depicts the definition. The *Interactive Creative Leadership Model* (Sisk, 1992) is presented in Figure 1.

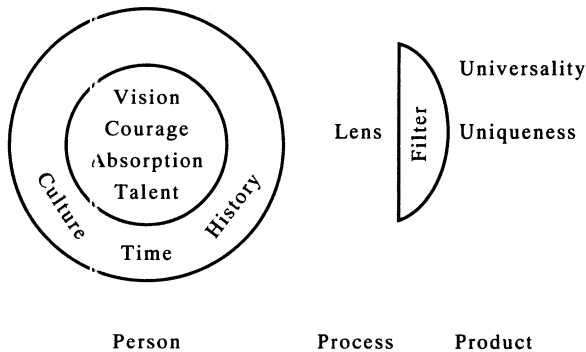


FIGURE 1. A creative leadership model.

This model takes into consideration the classic person, process and product concept of creativity described by Maslow (1959) and expands on the interaction of the three components. The person is viewed as interacting in both culture and time. Hickman and Silva (1984) state that individuals possess a personal history from which they operate. Culture and time make up the outward nature of the individual, whereas, the inward nature of the individual or inner voice includes the essence of self and creative leadership. Creative leadership can be expressed by four attributes. First, there is *vision* to see things as they are, but to also see things as they can be. Vision includes the idea of helping others to build and to share a common vision. Kanter (1989) states that no lasting achievement is possible without vision. Second, there is *courage* to risk-take and to risk-see in order to carry out creative leadership. Third, there is *absorption* or the ability to shut out the world and the petty day-to-day routines and cares. The creative leader becomes truly absorbed in the creative act.

And fourth, there is *talent* or the self recognition and appreciation of one's talent to become a creative leader in multiple fields, including art, science, mathematics and other areas. These four factors—*vision*, *absorption*, *courage* and *talent recognition*—interact within one's time, history and culture to impact and to empower personal creative leadership.

Process is depicted in the model as the lens or filter through which an individual approaches the creative leadership. This process includes productive thinking and feeling, specifically the skills of focusing (Kanter, 1989), coaching (Robbins, 1986), empowering (Kanter, 1989), encouraging (Johnson, 1972), reinforcement (Johnson, 1972), and modeling, (Robbins, 1986). The employment of these skills leads to the development of shared visions and goals and the building of commitment and motivation to yield increased performance and quality products. It also includes what Harmon (1989) calls managing the mission.

In defining the product aspect of the model, creative leadership results in products that embody the characteristics of creativity, innovation and entrepreneurship. Whiting and Soloman (1989) observe that one does not have to look further than the daily newspaper or popular periodical to find ample evidence of creative products such as the unique structure of a giant waterlily in Amazonia supplying the design inspiration of many of our modern highrise buildings or a trash burning plant in the United States that burns 240 tons of municipal waste daily and the steam it generates is piped to another plant that makes the paper used by the United States government to print currency.

Still another way to depict the interactive concept of leadership and its dynamic interweaving of person, process and product is to conceptualize the creative act as a cognitive-emotional loop. An infinity sign captures the full flow of the creative act, as it represents the ongoing process that begins and ends and then begins and ends again as leaders empower themselves and in turn empower others. This cognitive-emotional loop is depicted in Figure 2.

To understand and use this proposed concept of interactive leadership, particularly in a school setting, educators must shift their paradigm from the traditional view of leadership as power and influence to a more realistic view as illustrated in *Leadership: A Special Type of Giftedness* by Sisk and Rosselli (1987) illustrated below.

TABLE 1
Leadership Power and Influence

<i>Traditional View</i>	<i>Realistic View</i>
Control	Getting things done
Zero sum game	Everybody wins
Giving away power diminishes it	Giving away power increases it
Finite resource	Infinite resources
Conflict suppressed	Conflict managed

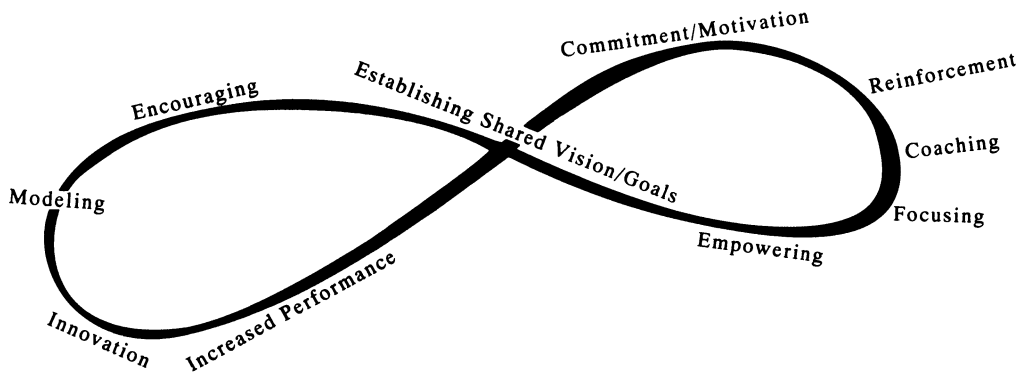


FIGURE 2. The cognitive-emotional loop.

The realistic view of power suggests the development and use of a new set of skills or competencies. These new competencies include six productive thinking and feeling behavioral strategies:

- (1) Setting goals.
- (2) Responding to the future.
- (3) Developing a success syntax.
- (4) Gaining self knowledge.
- (5) Becoming interpersonally competent.
- (6) Coping with value differences and conflicts.

Each of these productive thinking and feeling behavioral strategies are discussed separately below.

Setting Goals

The first productive thinking and feeling behavioral strategy is setting goals an important ingredient for successful leadership. In his autobiography, Iacocca (1984) talks about the importance of goals and he asks: What are your objectives for the next 90 days? What are your plans, your priorities, your hopes? And how do you intend to go about achieving them? What is your goal-setting strategy?

One goal-setting strategy that is employed in the adolescent gifted students leadership institute (The Texas Governor's Honors Program) is to set goals by asking the individual gifted students to list ten goals and prioritize the top three. Then they are asked to participate in the following visualization:

Close your eyes and relax. See yourself in your favorite restaurant. See the pictures on the wall, smell the rich odors of food, hear the bustle of waiters and the interaction of people chatting and laughing. See two acquaintances that often have lunch with you. Hear one ask about you. Then hear the other individual say, "Didn't you know, she/he had an accident and died last week." Feel the shock of this information and sit quietly knowing it is not true. Breathe deeply and at the count of three, 1-2-3, open your eyes and make a list of ten

goals that you would now list if you knew you had only six months to live.

After listing these ten goals, students are asked to prioritize them, and examine both lists and select three goals from both lists.

When this activity is used with groups of teachers, counselors and gifted students, we find considerable similarity in their responses. Most individuals begin to identify broad general life goals that reach far beyond their initial goals. One final goal that is often listed is "to make a difference." This exercise helps individuals identify more clearly what they want, and as they discuss these "wants" in small groups, most people also include desires that are possibilities. However, often these desires or possibilities are hampered by beliefs or blinders that they really aren't sure they can accomplish the goal.

Hickman and Silva (1984) in their book *Creating Excellence* list six common blinders that must be removed to expedite setting goals. These include:

- (1) Resistance to and avoidance of change.
- (2) Reliance on rules and conformance.
- (3) Fear and self doubt.
- (4) Over-reliance on logic and precision.
- (5) Black and white thinking.
- (6) Over-reliance on practicality and efficiency.

Resistance to Avoidance of Change

Many people resist rocking the boat with change. They cling to the status quo for a perceived feeling of safeness and either consciously or unconsciously reject new insights. Barker (1992) calls this phenomenon "paradigm paralysis" and Hickman and Silva (1984) state that this lack of insight causes stagnation. As leaders or potential leaders, we must learn to anticipate and embrace change and the future, or as Drucker (1985) states, we must venture to take on an innovating task.

Reliance on Rules and Conformance

Many people emphasize conformance over performance by policing adherence to rules, policies, procedures, programs and structures. Such people demand strict obedience to policy. Yet we know that innovation and creativity start from the outside and often go directly against policy. Kanter (1989) states that across the nation companies are attempting to unravel red tape, cut out unnecessary hierarchy and set up new ventures in their midst that resemble small companies. Great change comes from the outside. Staying with what has always been done keeps people and organizations at the status quo level. Heller (1989) states that what exists under the heading "we've always done things this way" should be radically reformed or at least re-examined. Leaders are not only risk-takers, but risk-seekers.

Fear and Self Doubt

Many participants in the Center for Creativity Innovation and Leadership at Lamar University report that they are paralyzed by insecurity and a lack of confidence. Both of these asserts of being may arise from negative conditioning in schools or at home, and out of this experience can emerge a fear of criticism. Kanter (1981) states that fear and self doubt leads individuals to cling to a safe point of view that has served them well in the past.

Overreliance on Logic and Precision

When we pay more attention to mechanics than results, we are relying on logic and precision and robbing ourselves of creativity. Many leaders expect problems and solutions to fit securely into neat packages. Freewheeling and open ended discussions can be highly threatening, as they were to this administrator. Yet with the use of these strategies, new insights can emerge and productivity of students can be increased.

Black and White Thinking

Many people don't understand that simplicity can emerge from complexity. In fact, one effective technique used by creative leaders to stimulate personal productivity is to work on simultaneous projects, thus yielding a sense of complexity. As they work on the various projects, certain similarities begin to emerge and a simplistic generalization can be identified.

Leaders and potential leaders need to resist approaches and be aware of reducing their options to safe over-simplified solutions. This is particularly important for young potential student leaders, for it is out of a growing maturity coupled with experience that students learn to

change previously black and white judgments to varying shades of gray.

Overreliance on Practicality and Efficiency

Some leaders report that they refuse to waste time on what they think are outlandish alternatives and ideas. They tell us that since they shoulder the practical responsibility for running an organization, they try to avoid all but the most pragmatic solutions to problems. This emphasis on practicality and efficiency can eliminate the consideration of creative solutions or alternatives.

Responding to the Future

A second productive thinking and feeling behavioral strategy responding to the future addresses this issue. According to Manske (1987), outstanding leaders are future oriented. They love to dream about what could be and to involve others in their dreams.

In the last twenty years, Western society has passed through turbulent changes—changes that many people thought impossible. These changes can be described as times when the fundamental rules or the basic ways of doing things have been dramatically altered. What was right and appropriate in the early 1960s is now in many cases highly inappropriate and wrong for the 1990s. What was clearly out of line in the 1960s may be acceptable today. Dramatic change is all around.

Barker (1992) has identified a list of fundamental changes in technology and society. The study of such changes can help gifted students focus toward a positive futures focused approach. The list of changes in technology and society includes:

- introduction of environmentalism;
- terrorism as an everyday activity;
- loss of the United States as the leading manufacturer;
- the emergence of information as a key resource;
- cohabitation as an acceptable substitute for marriage;
- common use of satellite communication;
- disappearance of the idea that continual growth is automatically good;
- vast amount of data exchanged worldwide via computers;
- fiber optics;
- energy conservation;
- Japan as a producer of the highest quality products;
- cellular phones;
- faxing;
- superconductivity at warmer temperatures;
- greenhouse effect;
- biotechnology.

A primary goal in helping gifted students respond positively to the future is to develop a perspective that is future focused. By examining the past, gifted students begin to understand the present and by understanding the

present they are able to speculate on future possibilities and options to make more informed decisions. By examining predictions or trends such as in the list above, gifted students become more aware of the future. By contemplating alternative possibilities and options, these potential leaders of leaders develop more flexibility and different points of view. By contemplating the future, they begin to develop a future focused image, or an image of themselves in the future. This image represents a powerful motivator and a shaper of future actions and behavior.

In a rapidly changing society, everyone is faced with many options and possible roles, and with the knowledge explosion, today's facts often become tomorrow's misinformation. To help deal with this knowledge explosion, Sisk and Whaley (1987) discuss six processes and perspectives that the study of futures lends itself:

- analysis/synthesis of information;
- flexibility of thought and attitudes;
- creativity and creative approaches to problem solving;
- ability to make decisions from incomplete information;
- research and integration of information from a variety of diverse sources;
- sense of empowerment to shape rather than merely react to the world.

An individual who responds to the future demonstrates foresight. Characteristics of foresight include being a talented observer and being sensitive to changes in the environment. The development of foresight involves identifying and understanding major trends and issues shaping the world. In addition, an individual with foresight is a capable problem solver, able to piece together seemingly unrelated events/situations and able to recognize complex patterns.

The city of tomorrow is an activity designed to help gifted students simulate respond to the future. This simulation is particularly useful with adolescents and pre-adolescent gifted students.

Futures Simulation

Name of the game: "A City of Tomorrow"

Statement of the problem:

You are one of a group of people selected to reside in a planned city of tomorrow.

Objectives of the game:

To develop an awareness of the importance of building community; social and economic order; interdependence; recognition of the importance of natural and human resources; and the importance of planning.

Scenario:

In planning your community, you will make decisions about rights and responsibilities.

Decide:

- (1) What will you take with you?
- (2) What arrangements are to be made for people to come to your community? (i.e., immigration) Will just anyone come?
- (3) How will your leaders be chosen, elected?

(4) What about rights?

(5) What about health laws? Law/government, education?

(6) What about a monetary system?

(7) How much money will go to various services?

Your first task:

(1) What can each person in your group contribute?

What profession or job can you handle?

(2) What resources will you need?

Characters and their goals:

City Council—made up of the following members.

The Council has conducted a study of the locations that are available in the proposed area. You will present information to the group that is meeting re: Who will get the most land, prime property, farming areas, waterfront property, and where will the schools be located. The Council consists of:

(a) *Law Enforcement Officer*—eight years' experience in a small town.

(b) *Construction Engineer*—one of the major builders planned communities.

(c) *Private Citizen*—lives in proposed area; anxious about impact of such an ambitious enterprise.

(d) *Educator*—experience in elementary/secondary/college.

(e) *Doctor*—twenty years' experience, interested in setting up a medical center to service the area.

(f) *Professional Person*—enthusiastic about bringing a business to the area; willing to go into partnership with others (banker, store owner, lawyer—only one in a group).

(g) *Public Service Person*—already has a connection in the area, has been involved in a study of the most efficient way to service the area.

Point in time:

The time is the present, and the meeting starts immediately.

Resources:

(1) Map of the area.

(2) Human resources: experience/knowledge of members in your group. Note you need to consider if you do something, then what will be the consequence?

Will your community be self-contained or will you import services and products?

Will you need to import steel, autos, machines? (You make the decision.)

Will you need to have something to sell as an economic base?

You must be energy efficient. How will you do this?

Rules and their administration:

(1) The task of your group is to create the framework for the City of Tomorrow, and to prepare your basic plan. (Elect a Chairman and Spokesperson for your group.)

(2) After your group has identified the resources in your group, plan what you need to bring in. Prioritize what you will work on first, second and third.

(3) You will have to set up your advertising and send your spokesperson to each of the other groups to enable

you to bring in the necessary resources, both human and natural.

Note: you may advertise regarding what you have and what you need!

(4) You will have 45 minutes to circulate and finalize your plans.

Evaluation and feedback:

(1) Fifteen minutes for debriefing.

(2) Examine how decisions were made; ask how participants felt about the decision.

(3) The leader can reinforce positive social attitudes that were observed/also can arrange for other experiences for information-gathering to aid in better understanding.

(4) Analogies can be drawn from both present and past situations and from observations.

Starting questions for the group:

(1) What resources do you have?

(2) What resources don't you have?

(3) What resources do you need to get?

(4) How are you going to do it?

Note: remember that you have no housing, utilities, schools, and additional resources are needed as well!

Changes in technology and society make a difference in everyone's lives and in the rules by which people live. These changes in the rules create new trends or dramatically alter trends already in place. Being able to anticipate these changes and respond to the future is one of the important behavior altering techniques involved in becoming a productive thinker and creative leader. Responding to the future in simulation activities such as *City of Tomorrow* helps gifted students experiment with new roles and experience problem solving in a relatively non-threatening environment. Futures studies provides gifted students with a relevant milieu to practice skills and abilities that are emphasized in gifted education. These skills and abilities include an emphasis on higher level cognitive processes, inquiry and problem solving. In addition, futures studies involves students in interdisciplinary thinking. As they learn to forecast and to make decisions based on learning more about different value systems, they explore a variety of disciplines. Also, there is an emphasis on group dynamics and a broad concern for humanity. Nixon (1982) states that this concern or great cause that grips a leader may be one of creating something or of preserving something for humanity. As future oriented thinkers, gifted students learn to care about all of humanity, not only their generation, but generations of the future.

An exemplary lesson reported by Sisk and Rosselli (1987) that includes higher level thinking, questioning, skills, group dynamics and futures self awareness is listed below.

Exemplary Lesson Plan Responding to the Future

Characteristics of gifted students addressed by the lesson:

Serious, critical, creative problem solvers, decision makers and flexible in thought and action.

Key concepts:

Change and the future, loyalty, the extended family.

Procedural lesson plan:

Self awareness activity

Establish purpose of lesson relative to the importance of developing leadership potential. Discuss the statement, "A leader is one who is able to recognize, accept, and deal with change."

Higher Level Thinking/Questioning

Ask students to assess their ability to adjust to changes by rating feelings about the following situations. Rate a situation "10" if it causes strong feelings and a "1" if it would not bother them at all. Emotions and feelings between the extremes are assigned a number between 2 and 9.

Situations:

(1) The teacher changes your seat in the classroom.

(2) You must transfer to another school.

(3) An older relative comes to live with your family.

(4) The older relative takes your bedroom.

(5) Your Mom pursues a career after 15 years of being a full-time Mom.

(6) Your parents divorce or remarry.

(7) Your family is moving to the Middle East for four years and you have to go.

(8) Your parents announce they are expecting a baby.

Higher Level Questioning/Thinking

After the students rate themselves, ask them to discuss their feelings about the situations.

(1) Which situations evoked the strongest feelings?

(2) Which situations evoked minimal responses, positive or negative?

(3) How well do you deal with change? A high score on these questions indicates that you are not doing very well, a low score indicates that you are ready to deal with change.

60-80—inflexible, compromises leadership potential.

40-60—average, should try to improve

20-40—very adaptable, smooth sailing ahead.

1-20—incredible.

Group Dynamics

Ask students to form small groups and give each group a challenging question to encourage thinking creatively about change and the future. Allow them 10-15 minutes to compile a group answer and report to the class. Give feedback and encourage reactions from other groups.

(1) Ask students if they had difficulty coming to an agreement on their answers?

(2) How did they arrive at their decisions?

(3) Did anyone feel left out?

(4) Did your group function effectively?

Questions for the small group activity are as follows:

(1) If you were an insurance salesman and wanted to write a futuristic policy that would cover your classmates with protection for the twenty-first century, what coverage would you offer in your policy?

(2) What do you need most to provide yourself with a happy successful future? What does the world need most for a happy future?

(3) If you ruled the world, what would be your ten commandments?

(4) If aliens from outer space were considering the destruction of the planet, what would you show them to convince them that we were worth being spared?

(5) If you wanted to make this world better in the future, what would you eliminate, create, diminish, and enlarge? (Four different things.)

(6) What single most important thing from your lifetime, would you consider leaving for your grandchildren?

Futures Simulation

Have the class pretend that they are the sole survivors of a terrible famine and widespread epidemic. They have traveled by starship to start a new society on another planet inhabited only by lower animals and plant life. What kind of society will they create? Plan for your political, economic and social structure of your new society.

Higher Level Thinking/Questioning

Have the total group evaluate their new society on the basis of five criteria which they must establish. The class will also evaluate their performance as group members in the small group activity, concentrating on the use of creative leadership.

A third important productive thinking and feeling behavioral strategy of leadership is that of developing a success syntax.

Developing a Success Syntax

Successful leaders report that their leadership has been enhanced by finding someone who is doing what they want to do and following that persons' actions, or syntax of behaviors. The syntax of any creative production is knowing when to do what and in what order. The task for the potential leader and leader is to find the combination that opens their vast vault of ideas and in turn opens other people's vaults as well. In *Unlimited Power* Robbins (1986) provides an example from athletics of how to create a strategy or syntax of success. He states that if one wants to model an expert skier, the individual first watches carefully what his/her

technique is (visual). As one watches, he/she moves his/her body in the same motions (kinesthetic—external) until these motions begin to feel like a part of one's self (kinesthetic—internal). Next one makes an internal picture of the expert skiing (visual) and this creates a new visual internal image, this time a disassociated image of skiing (visual). This process is similar to watching a movie of one's self modeling the other person as precisely as possible. Next the person steps inside the picture and, in an associated way, experience how it feels to perform the same action precisely like the athlete (kinesthetic). The technique may be repeated as often as it takes for the individual to feel completely comfortable doing it.

By experiencing this type of modeling, gifted students can provide themselves with a specific strategy that can help them move and perform at optimal levels. Modeling and utilizing the strategy of syntax of success is used in many creative fields such as art and music as well as athletics. Potential leaders in these fields are often apprenticed to work side by side with masters to learn their techniques and craft.

Gaining Self Knowledge

The fourth important productive thinking and feeling behavioral strategy of leadership is gaining self knowledge to become self directed and independent. According to Bennis (1989), becoming a leader is synonymous with becoming one's self. To help gifted students gain self knowledge, strategies such as journal writing, independent study and synectics are helpful. Teachers can start by asking gifted students to explore questions like: If you could look in a mirror and see yourself in 30 years, what would you like to see? This activity can be followed by other activities designed to help gifted students develop self knowledge.

Davis (1983) suggests many of these divergent thinking activities in his book *Creativity is Forever*. He reiterates the importance of these types of activities by stating that there is very little in the education of students or in one's personal development that is as critical as strengthening the abilities of creative futures problem solving.

Activities to Gain Self Knowledge

These activities (Sisk & Rosselli, 1987) are designed to help gifted students become more aware of their strengths and capabilities for leadership, to form a concept of themselves and be aware of how others perceive them.

(1) Look at these pictures of people. (The pictures should include different kinds of photos of people doing things and photos of people's emotions.) Pick out at least five that attract you. Share these with the rest of the class. Tell why you picked these pictures. What do

the pictures tell about you? Do they tell what you like? Are these pictures like you? Do they make you feel a certain way?

(2) Look at your classmates and list words that could be used to describe them, such as happy, quiet, tall, artistic, handsome, funny, etc. Look at all the words and decide if there are words that describe you that no one would have known. Are there things about you that we don't know?

(3) Stand in the middle of the room and move to the side of the room that describes you best.

- are you more like a flower or a rock?
- are you more like a cloud or a rainbow?
- are you more like a nail or a hammer?
- are you more like a book or a picture?
- are you more like a bunny or a horse?
- are you more like red or blue?

(4) Everyone has dreams, some during the night and some during the day. Draw a picture of what you dream about at night. Now draw a picture of what you would like to dream about at night. Then draw a picture of what you "daydream" about. Then draw a picture of you in the future. Show your picture to someone next to you and have them try to guess which is which.

(5) Think of an animal. Use different words to describe this animal. Do you think you are like this animal in any way? Try putting the words, "I am. . ." in front of some of these words. Do any of the combinations describe you?

(6) What do you do each day that is uniquely you? Do you put your toys in a special place? Do you pick out what you are going to wear to school? Do you eat your breakfast in a special way or order? Sometime today do one thing that is uniquely you and tell us about it tomorrow.

(7) Here is a paper that has three circles on it. The first circle says, "Things that I do well." The second circle says, "Things I like to do." The third circle says, "Things that are OK." Cut out and glue pictures or words to fill each circle. Do you need a bigger circle for any of the three? Which circle was the easiest to fill in? Did any of the circles have the same items?

(8) Here are some pictures of objects. See how many different ways you can group these pictures together without saying a word. If one of you see a combination you will have to move your classmates together. The rest of us will clap every time we see a grouping that we can understand. (The teacher watches for the students who feel comfortable in moving the other students around when they think of an idea as an indicator of leadership.)

(9) These activities can be followed by some active types of games like Follow the Leader, Simon Says, and Untangling Games that allow different students to assume leadership roles. In addition, the teacher can introduce leadership roles in the classroom. For example, one student can make sure all the chairs are pushed in or hand out the crayons and collect them. During these activities, students can be reinforced for

their communication skills, organizing skills, motivating skills and ability to assume leadership.

(10) Group projects that require many different tasks, like a class play, can be used to develop self awareness and leadership. These types of activities also require everyone working toward a mutual goal.

Becoming Interpersonally Competent

One of the important aspects of utilizing self knowledge is to become interpersonally competent. This fifth productive thinking and feeling behavioral strategy of leadership involves being aware of oneself in supporting, informing, evaluating, planning, initiating and controlling group behavior. Kanter (1989) labels this behavior synergy, the magical mix of activities that are stronger and more profitable together than they would be separately. Gifted students particularly enjoy group activities because of their strong drive for responsibility, vigor, persistence, venturesomeness and originality in problem solving. Six group leadership functions are depicted below.

Key leadership functions:

(a) *Planning*

- seeking all available information;
- defining group task, purpose or goal;
- making a workable plan (creating a decision-making framework).

(b) *Initiating*

- briefing group on the aims and the plan;
- explaining why the aim or plan is necessary;
- allocating tasks to group members;
- setting group standards.

(c) *Controlling*

- maintaining group standards;
- influencing tempo;
- ensuring all actions are taken towards objectives;
- keeping discussion relevant;
- prodding group to action/decision.

(d) *Supporting*

- expressing acceptance of persons and their contribution;
- encouraging group/individuals
- creating team spirit;
- relieving tension with humor;
- reconciling disagreements or getting others to explore reasons for disagreements.

(e) *Informing*

- clarifying task and plan;
- providing new information to the group, i.e., keeping them "in the picture";
- receiving information from group;
- summarizing suggestions and ideas coherently.

(f) *Evaluating*

- checking feasibility of an idea;
- testing the consequences of proposed solutions;
- evaluating group performance;
- helping the group to evaluate its own performance against standards.

It is helpful for gifted students to examine the various leadership functions and to evaluate themselves as strong, medium or weak in each of the functions. An important lesson for gifted students to learn is that there is no royal road to knowledge and skill in group behavior. Johnson (1972) states that group skill competence is built by experiencing as many and as diverse groups as possible.

There are a number of common behaviors in group environments that may be exhibited by group members that can be disruptive or harmful to the group. Hopefully, not all of them will be present in any one group. In fact, maybe none of them will be apparent in some groups. However, a leader or potential leader should be prepared to handle these situations if they occur. Below are some examples of disruptive behaviors and suggested ways of dealing with each that were developed by Rosselli (1989) for use in the leadership program conducted by the Center for Creativity, Innovation and Leadership at the University of South Florida.

CAN'T GET GROUP STARTED

There is a lot of fooling around and people are wandering around. Gently remind them that it's their group and that they are wasting time and ask, "Can we get started?"

GROUP IS QUIET OR UNRESPONSIVE

A quiet period in the group is not always something negative; however, if it lasts for an extended period of time and becomes uncomfortable, then it may be a good idea to directly address the situation by saying something like, "The group seems quiet now." (Wait for a response; if none, then ask "Why do you think we're being so quiet?")

LACK OF SERIOUSNESS

This can be a problem if it occurs at the wrong time. Try acknowledging the problem and getting feedback from the group by saying, "Some of us don't appear to be taking this seriously. What seems to be the problem?"

CHAOS; EVERYONE IS TALKING AT ONCE

Simply remind the group of the ground rules by saying something like, "Let's remember our ground rules and listen while others are talking. We all have something important to say, but if we're all talking at once we may miss something."

SIDE CONVERSATIONS

This can be a real problem as it not only disrupts the group, but can also cause a group to lose focus. To handle this situation, you could say, "There are some

side conversations going on and we're losing focus. Let's stay on target." If the conversations continue, it may be a good idea to speak directly to the members during the group. If at all possible, however, try talking to them outside of the group and sit between them at the next group meeting.

GROUP IS OFF THE SUBJECT

If the discussion has veered off the topic, but is serving a purpose, you may want to let it go or go with the flow. However, if the group is totally off track and the discussion is not serving a worthwhile purpose, you could try saying, "This is interesting, but we've gotten off the subject. Can we get back on track?"

CLIQUE'S FORMING WITHIN THE GROUP

Talk to the members involved individually outside of the group. Let them know that it's great that they are getting to know that person or persons in the group and encourage them to get to know others. Provide more activities in the group that will help them to mingle more and get to know others better.

An effective activity that is illustrative of getting a group started is: First Impressions. This activity is particularly useful with gifted students aged 13 and above.

First Impressions

Objective: (Getting to Know Each Other, Experiencing Low Risk)

Materials Needed: Paper and pencils

Outline of Activity

After the group has introduced themselves, each participant makes a list of the other group members. They then write a short description of their first impression of each member. The sheets should be kept confidential (maybe they can even be given to a staff member). And at the last meeting, the participants can read over their list to see how their first impressions differ from their lasting impressions.

Goal

Participants learn the value of saying "You can't judge a book by its cover," and that if you give yourself the chance to get to know someone, you may find you really like them, and share something in common with them, or at least understand them better.

How to Process

The idea of unconditional acceptance can be pointed out by asking such questions as:

- whose first impressions varies from how they now

view other members of the group? Why do you think that happened?

- do you think this is something that happens often?
- what may be some consequences if people always went by their first impressions?

A second activity for helping adolescent and pre-adolescent students feel cohesive is the following activity:

Scary

Objective: (Getting to Know Each Other, Experiencing Low Risk)

Outline of Activity

The group sits in a circle. The leader asks the question, "What's the scariest thing about being here?" Each participant will then share what that is for him/her. Then what's scariest for him/her with the group.

Goal

This activity helps to get anxieties out in the open so that they can be dealt with. It encourages members of the group to see that everyone has anxieties about being in the group. It also helps to build trust and cohesion in the group.

How to Process

In the group discuss the fact that everyone is scared in a new situation; but that this group is a place where people can share and get support.

Coping With Value Difference and Conflict

The sixth productive thinking and feeling behavioral strategy of leadership is coping with value difference and conflict. Contrary to popular opinion, value differences and controversy do not always have to be negative. Some positive outcomes of controversy include:

- motivation
- perspective thinking
- cognitive reasoning
- mastery (retention of material)
- creativity
- problem solving
- cohesion.

When there is conflict, individuals become motivated to solve the problem or motivated to maintain the problem. During a controversy, there are opportunities to take a different perspective or to see the problem from another point of view. It also is a time to use cognitive reasoning and to rise above emotional responses. To solve the problem, we may need to master new material. In addition, controversy can bring individuals together and they can become cohesive.

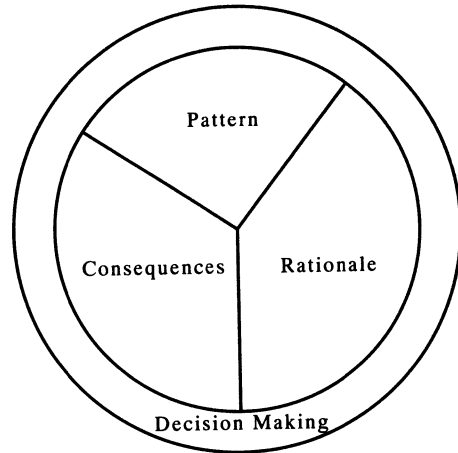


FIGURE 3. A model for action decision making for conflict resolution.

A model that has proven helpful to gifted students is the model for action/decision making for conflict resolution.

A Model for Action Decision Making for Conflict Resolution

Using this model to resolve conflict, gifted students can try to ascertain the rationale of the individuals involved in the conflict. While noting their rationale, the students can also watch for a pattern of behavior, or belief systems, and action. By noticing the consequences of this pattern of behavior, they can then try to predict how the people in conflict will make decisions. It is equally helpful for gifted students to learn to be aware of their own rationale, pattern of behaviors, feelings, thinking, action and their consequences.

Conflict can be defined as a difference or polarity between one's wishes and the wishes of others. This polarity exists between present needs and future capabilities. The conflict that gifted students are most familiar with is the conflict between their animal nature and their social ethics or between what they are and what they want to be. Another conflict that gifted students sometimes identify is between their easy habits and their creative urges. Manz and Sims (1989) state that leaders demonstrate a commitment and enthusiasm to bring things about and to overcome controversy and conflict. One way to overcome conflict and controversy is to initiate negotiation.

There are five types of problems that commonly create negative psychological dynamics in negotiating controversy. They include:

- (1) strong emotions;
- (2) misperceptions or stereotypes;
- (3) lack of legitimatizing the problem;
- (4) lack of trust;
- (5) poor communication.

When one is emotionally involved in a conflict or controversy, it is almost impossible to respond in a rational manner. For this reason, it is helpful to provide “cool down time” before negotiations are attempted. Misperceptions or stereotypes such as “women are the weaker sex” can blind a point of view in a conflict. Getting correct information to the members engaged in a conflict is essential to initiating productive negotiation.

The last three types of problems of negotiation often operate together. It is difficult to resolve conflict if there is poor communication and or a lack of trust. Bolton (1979) states that there are three key qualities that foster improved communication: genuineness, accepting others and empathy. When people are guarded and experience poor communication, a lack of trust can be reinforced. Additionally, when people are guarded, it is difficult to openly examine the issues in a conflict. Both sides must view the problem as a real conflict, for if one person does not see the situation as a conflict, then the problem is not legitimized.

To be successful in conflict resolution, there are a number of useful communication techniques. They include:

- restatement
- paraphrase
- active listening
- summarization
- expansion
- ordering
- grouping
- structuring
- separation or fractionality
- generalization.

Examples of these communication techniques used in a conflict between a gifted fifteen-year-old girl and her mother are as follows.

Restatement: An example of restatement is; “Let me see if I heard what you were saying, you would like more free time and less responsibility with your younger brothers and sisters?” Restatement mirrors for the adolescent and provides the mother an opportunity to check for accuracy and adequacy of listening.

Paraphrase: Paraphrasing is similar to restatement, but the statement is offered in ones own words. Bolton (1979) adds that paraphrasing must contain the essence of the other’s content. “You are interested in being held less responsible for your brothers and sisters and you want more time for yourself?”

Active listening: Active listening involves listening for agreement, disagreement, inaccuracy of information, application and creative adaptation. It is what Harman (1989) calls learning to listen with an inner ear to what people are really saying.

“You want more time to yourself which is essentially what I want too” (agreement).

“. . .or that business about time is a point of disagreement, I think you have too much free time as it is” (disagreement).

“You were away for the last two weekends, doesn’t that equate with free time” (inaccuracy of information).

“. . .free time—that’s a good idea, I’d like to see us draw up a contract, so much work could equal so much free time” (adaptation).

“Let’s think of all the ways the family might enjoy free time together” (creative adaptation).

Summarization: When one summarizes, points are listed for the individual such as 1, 2, and 3.

An example is:

“Well I hear you talking about problems at school, problems with your family, problems dealing mainly with free time and too much responsibility.”

Expansion: Expansion provides an opportunity for building on a point, and perhaps to introduce new facts or to educate. An example is:

“Free time can be construed as scheduled activities that you are involved in, like sports or it can also include time to daydream or be alone. Are there other ways that we can think about the need for free time or how it can be defined?”

Ordering, grouping and structuring: Ordering is simply saying “Let’s talk about free time first and responsibility second” or in grouping one might say; “Let’s group the two together, they appear to go hand in hand.” In structuring, one breaks the discussion down into time slots or outlines how to go about discussing the issue: “I would like to see us list all the free time you have and then let’s do the same thing for responsibility” (structuring).

Separation or fractionalizing: In separation or fractionalizing, one deliberately separate the issues: “Let’s deal with free time first and then talk about responsibility” (separation).

Generalization: In the use of generalization, the conflict is pulled together. By generalizing, one might synthesize the conflict by saying: “It seems to me that we are really talking about having some more independence, is that right?”

Negotiation Strategies

There are hundreds of negotiation strategies that can be taught to gifted students. It is helpful to ask the students to identify personal or school conflicts and then introduce two or three negotiation strategies at one time. Each student then selects a conflict that can be shared with a small group. In groups of three, each student explains the details of their conflict to enable another student to role play the second person involved in the conflict. The third student acts as a mediator and notes the progress of conflict resolution and the use of specific negotiation strategies. Gifted students can usually identify a problem, role play the conflict and come to a resolution in about 45 minutes of interaction. Some negotiation strategies follow.

Wave a red flag: In this negotiation strategy, certain behavior is considered detrimental, similar to the

manner in which a railroad conductor warns of danger by waving a red flag.

Straw man: This negotiation strategy involves giving up something that one really does not value or want.

Build a bridge: This negotiation strategy involves listening to the other person's argument until one hears something with which he/she agrees and then builds a verbal bridge. An example is:

The individual student who is observing the role play between the two in conflict and attempting conflict resolution can periodically stop the interaction. At this time, the third student can mediate by identifying common perceptions held by the two members in conflict. This interaction has to be done carefully, for it disrupts the flow of communication. At the end of the role play, the student who is mediating can assess whether his or her perceptions were accurate or inaccurate by asking for feedback from the two in conflict. In addition, there should be a discussion and assessment of whether the perceptions were hindering or furthering a productive, substantive, procedural or emotional agreement.

Gifted students enjoy learning about negotiation and conflict resolution. Learning to function as a mediator or a positive member in a conflict situation helps gifted students learn to accept expression of feelings and to learn useful communication techniques.

To establish a positive emotional climate, it is important for gifted students to learn how to translate value laden or judgmental language into less emotionally charged terms and to affirm clear descriptions or statements. Johnson (1972) suggests the use of non-verbal conflict exercises to begin to develop positive climates. One simple exercise is called *thumb wrestling* in which the students lock fingers with their thumbs up. They tap their fingers together three times and then each student tries to pin the other's thumb, so that the other cannot move. As a mediator, gifted students learn to be able to prevent interruptions or verbal attacks and to encourage the participants in conflict to focus on the problem and not on each other.

Often gifted students—our potential leaders—have difficulty identifying and interacting with their chronological peers. If a major goal of gifted educators is to develop leadership, it becomes essential to educate gifted students to effectively negotiate conflict and controversy, especially in interpersonal relationships with peers. Many of the techniques and strategies discussed in this chapter were planned, developed and initiated in the Texas Governor's Honor Program. A brief description of this program follows.

Texas Governor's Honors Program

In 1976, the Texas Education Agency established the State Office of Gifted and Talented Education. Since then, Texas has experienced a great deal of growth in identifying and meeting the needs of gifted and

talented students. All districts in the state are under a 1992 mandate to provide appropriate programs for gifted students from kindergarten through high school. Consequently, there is an acute need for teacher training in gifted education. The Texas Legislature has supported the education of gifted students in several ways including providing funds for the Texas Governor's Honors Program (TGHP) which not only provide a service for adolescent gifted students, but provide a hands-on site for teacher training in gifted education.

Lamar University has conducted the Texas Governor's Honors Program from 1989 to 1992. The Program is a three-week residential summer program for gifted adolescents, conducted under the auspices of the Texas Education Agency and funded by the Texas Legislature and matching grants from private and public sources.

The gifted students represent each of the 31 state senatorial districts in Texas and apply to the program indicating their academic achievement through PSAT scores, standardized test data, class ranking, and grades. In addition, they provide teacher references and complete open-ended essay questions on the topic of leadership. Participating students have been enrolled in state approved honors or gifted courses, Advanced Placement courses, and/or have demonstrated outstanding ability in achievement and leadership.

The major purpose of the Program is to recognize outstanding high potential and achievement in secondary gifted students. A second purpose is to provide a rich training opportunity in a model setting for the students, university faculty and teachers. The theme "Leadership in a Multi-Cultural Society" provides the opportunity to examine trends and issues such as those identified by Barker (1992), through a variety of disciplines: math, social studies, the social sciences, the humanities, physical sciences, communication, and the arts.

The program goals provide:

- in-depth instruction in content areas with an emphasis on leadership;
- an opportunity for the development of a better understanding of the political process and the problems facing citizens in a global society;
- an opportunity for the development of critical/creative thinking skills and problem solving abilities;
- an opportunity for interaction with one another and to develop an understanding of responsibilities to each other;
- an opportunity for secondary school teachers to demonstrate and experience strategies that are most appropriate for gifted students and
- a model for local school districts that want to plan and develop appropriate school programs for adolescent gifted students.

As gifted students study and experience leadership in a multi-cultural society using the model of interactive leadership, they not only learn about leadership but they also learn about themselves. Because they are deeply involved with their own history and way of life, it is often difficult for gifted students to step

back and analyze their own situation. To analyze leadership styles, there needs to be a certain amount of detachment. This detachment can be provided by in-depth academic and social experiences that encourage the gifted students to become knowledgeable about other cultures in our global society. Texas Governor's Honors Program students study the Hispanic, Indian, African-American and Asian cultures that represent the multi-cultural demographics of Texas.

University faculty, secondary teachers, and counselors attend a weekend training seminar prior to the opening session of the program, concentrating on developing teaching strategies that are responsive to adolescent gifted students' learning needs. Twenty graduate students function as counselors along with 30 former Program students who serve as junior counselors. These counselors assist with day-to-day operations and serve as mentors for the gifted students. Each Texas Governor's Honors Program student is assigned to a "family" consisting of ten students and a counselor.

The curriculum of the TGHP is designed to provide in-depth instruction in interdisciplinary content areas and to link content to skill development, problem-solving behavior and attitudes, all with an emphasis on leadership development. The curriculum is planned to provide qualitatively different curriculum and experiences.

Emphasis in TGHP is placed on the development of personal leadership skills and engaging the gifted students in practical research on problems and issues. One of the key components of the Texas Governor's Honors Program is providing an opportunity to discuss world issues in small seminars with content experts including Lamar faculty, community, state, national and international leaders.

Courses include Russian, Chinese, group dynamics, futures, communication processes, problem solving, number sense, great documents in history, rocks and stars, international trade and finance, artificial intelligence, robotics, great moments in history, expository writing, environmental studies, Japan-Manism, international negotiation and peace conflict, rhetoric, calculators, psychology of persuasion, women in the nineteenth century and theater/drama production.

The Program's philosophy asserts that the mind, body and spirit must be nourished to create leadership development, the gifted students are given opportunities to explore activities that provide multiple avenues for academic stimulation, relaxation and socialization. Activity courses include swimming, dance/movement, volleyball, aerobics, melodrama, drawing, table tennis, art appreciation, fun with clay, track, video production and jazz ensemble.

Weekend field trips and evening seminars with speakers extend the gifted student's awareness of societal, political, environmental, and economic issues. Evening seminars utilize guest speakers.

Examples of multicultural seminars include a Buddhist priest who explained the impact of religion and

immigration on leadership in the Asian community in Texas, and professors from the Indian community who discussed the issue of foreign students studying in the United States and dealing with the problem of whether to stay here or to return to their home land. Panels of Hispanic and African-American leaders shared the unique problems and issues from their perspective and engaged the students in reflecting on the changing demographics of Texas.

A highlight of the Texas Governor's Honors Program is a visit to Spindletop-Gladys City, a boomtown and the site of one of the first oil wells in southeast Texas. This visit provides an opportunity to trace the social and economic impact of the oil industry on the state of Texas.

Texas reflects a vast array of geographical, social, economic, ethnic, and cultural differences. The Texas Governor's Honors Program students represent rural, suburban, urban, and inner-city areas and attend school districts with populations from under 200 to 100,000. Many of the students come from areas where gifted students are the norm, while others come from districts where gifted students are considered the "odd man out." In addition, many of the TGHP students have traveled widely and participated in other student summer institutes or workshops, while for some students, the Texas Governor's Honors Program represents their first time away from home.

Former student participants and staff indicate that the Texas Governor's Honors Program has created a major positive impact on their lives. Students report that the long-term effects of the program will be evident in their more positive attitude toward learning and their enhanced leadership skills that impact their school and community.

Educationally, not only do the gifted students receive extensive college preparation by being exposed to in-depth knowledge in a variety of subject areas, but they develop and practice leadership skills through small group activities. Each student is encouraged to plan and develop a leadership project to be carried out in his/her home school. Two students are selected to attend the Texas Governor's Honors Program the following year to conduct an evening seminar called Futures Edge Leadership. An award is given to these students by the Texas Association for Gifted Students and they are honored at the annual state association meeting.

Working with the students at the Texas Governor's Honors Program is one way of experiencing leadership in the making, particularly as the students learn to use a variety of strategies demonstrated by their teachers and seminar leaders. Still another way these students learn about leadership is by examining the lives of people who demonstrate leadership. Dwight D. Eisenhower provides an example of interactive leadership.

President Eisenhower was an active and influential leader who was content to lead through others. He was convinced that people-to-people contact can help ease

the lack of trust and misunderstanding in the world and for this reason worked to establish the People to People Citizen Ambassador Program. Eisenhower was content to give credit to others and his Presidency was similar to his military leadership in that he quickly and effectively enabled others to lead themselves and then to lead others. General Eisenhower serves as a fine example of interactive leadership. He developed his own leadership and then developed it in others.

In Summary

This chapter introduced a model for interactive leadership and suggested that the systematic development of specific productive behavioral and feeling strategies can implement leadership development in the education of gifted students.

An example of a program using the interactive leadership model to develop interactive leadership with gifted adolescents (Texas Governor's Honors Program) was discussed. Last, an individual who represents an example of interactive leadership was discussed, former President Dwight D. Eisenhower.

William Corrigan of the College of Education at Texas A & M University has described leadership training as a powerful vehicle that can meet the call for excellence not only in today's youth, but in teachers and administrators as well. Corrigan believes that leadership development can assist schools in becoming the center of success that is needed to move education from rhetoric to practice. By assisting gifted students to become doers, to take charge and to take action, the emerging gifts to the world from such leadership action can barely be imagined.

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Identifying and Nurturing Gifted, Very Young Children

NANCY M. ROBINSON

University of Washington, Seattle, Washington, U.S.A.

Despite widespread curiosity about the nature of precocious development, and the possibility of identifying, conserving, and promoting giftedness in the very young, there is surprisingly little solid research with gifted children prior to school entry, an age range in most countries that is represented by birth through five years. This chapter will describe, first, the rationale for conducting research with young, gifted children; second, some general questions about the development of young, gifted children concerning which reliable data have been accumulated; and third, the evidence available about family and group environments that may promote advanced development. Actually, a large proportion of the existing literature about young, gifted children is devoted to reports of programs designed to meet the special needs of this group, but because such reports cannot be termed "research" by any but the most generous criteria, this final section of the review will perforce be selective.

It is, indeed, unfortunate that so little research has been devoted to young children with precocious development (Gallagher, 1988; Karnes, 1983; Horowitz, in press). Even among the "gifted community," there is little research with very young children. The "mainstream" international research community in developmental psychology has paid even less attention to this era of giftedness, despite the fact that, for a number of years, infancy and the preschool years were the primary focus of developmental research. From a number of theoretical outlooks, not the least of them Freud's and Piaget's, the early years have been viewed as critically formative for the individual pattern of subsequent intellectual, social, and emotional development. Yet, in general, the emphasis in research on young children has been on central trends rather than on individual differences, so that "outliers" whose development is significantly advanced are "troublesome noise" rather than objects of interest in themselves. A second emphasis in the mainstream of developmental psychological literature, increasingly for the past 25 years, has been on children at risk for impaired development and poor school performance. Because of these competing agendas, in the standard journals on developmental psychology, many issues go by without a single article dealing specifically with precocious development, to say nothing of such development in the very young.

The Mandate to Study Very Young, Gifted Children

There are significant scientific questions upon which the study of early precocity can shed light. By studying children whose development is, in some ways, or in many ways advanced, questions such as the following can be addressed:

(1) How early do distinctive differential patterns of ability appear?

(2) What are the driving forces behind early talents? What else is different about these children, in their own personal resources or in their environments?

(3) Are there a few, restricted, paths to or mechanisms associated with precocity, or many? Do early readers, for example, all exhibit excellent visual memory, or advanced auditory memory, or are they highly analytic sounders-out of new words, or skilled contextual guessers? Or any or all of the above?

(4) How stable are early patterns of precocity? Issues of continuity in development imply some persistence of functions or processes over time (Uzgiris, 1989). Uzgiris uses the term *constancy* to refer to "unchanging behavioral patterns or some underlying elements producing those behavior patterns" (p. 125), while using the term *stability* to refer to regularity in the rate of progress within a group of individuals over time, with those who have attained the highest level of development continuing to progress fastest. Other authors have used somewhat different terms. There may be different manifestations of the same underlying function at different ages, or what Kagan (1971) has called *heterotypic* continuity (e.g., the highly verbal toddler may combine words early; the highly verbal adolescent may write outstanding prose). Stability and/or predictability can, therefore, take many forms. By following children with distinctive characteristics, it may be easier to discern the overall weave of the fabric of development.

(5) What can we learn retrospectively from the early childhoods of those who later demonstrate remarkable accomplishments?

(6) Are some conditions of early childhood more propitious than others for optimizing development? Do parents of precocious children behave differently than other parents? Are some patterns of early parent-child interaction particularly effective or formative? What, if anything, do the children do to elicit such differences?

(7) What about those critical motivational concomitants of high achievement in adults—persistence, commitment, high standards for one's own performance? Can those be traced to the early years as well?

(8) Are there learning situations that promote optimal development? Do these settings simply supply first-rate support for any child, or are there particular aspects that are best suited to support and promote the development of the precocious child?

In addition to their scientific value, such questions are also of significant value to society. Nurturing talent should be among any nation's highest priorities; nurtured talents can, in the long run, not only impact the children's own lives, but the welfare of everyone. The more we know about the early lives of gifted young children, the more we will know how to conserve this precious resource—and the more we will know about how to encourage the wholesome development of all children.

Finally, these questions may have real value for the quality of life for the gifted children themselves. Not all our questions have to do with these children's long-range futures. There are cogent questions to be answered for the here and now. As adults, we want to assure every child the right to a happy, healthy childhood, but children who are out of step with their peers may be denied that right.

Early Development of Young Gifted Children

The succeeding sections will not supply answers to all these questions—certainly, not definitive answers. The base of solid, well designed research is simply too sparse to permit such conclusions. Some questions about early development can, however, be examined with the goal of uncovering both the means of identifying early precocity and the conditions that appear to foster its emergence and preservation.

Retrospective Studies of the Early Lives of High Achievers

Since the studies by Cox (1926) in the 1920s, and indeed, since the nineteenth-century studies by Galton (1869), a number of investigators (e.g., Albert, 1980; Goertzel, Goertzel, & Goertzel, 1970; McCurdy, 1960; Ochse, 1990; Radford, 1990; West, 1960) have attempted to assemble the fractionated information available about the very early lives of people who later became eminent. Most of these individuals grew up in environments characterized by warm affection and intense cultural and scholarly stimulation, both formal and informal. There are, however, a significant number of contrasting histories of persons who grew up in relatively abusive circumstances and/or experienced significant losses such as premature parental death (Albert, 1980; Goertzel et al., 1970; Ochse, 1990). Few people of eminence

studied by Cox (1926) or McCurdy (1960) had attended common school, public or private, prior to entering a university—a finding disturbing for the possibility that, by educating children *en masse*, potential “geniuses” may be dampened and even lost. Indeed, many of these individuals who would later be such highly creative achievers had been profoundly lonely children who were isolated from playmates by family plan and/or by paucity of siblings (Ochse, 1990; West, 1960).

A more recent study of the early lives of eminent achievers is that by Bloom (1985) and his colleagues at the University of Chicago. They did not, interestingly, uncover abuse or early isolation from peers seen by earlier investigators, although many of these world-class achievers did devote themselves single-mindedly to their talent beginning in middle childhood, their out-of-school companions becoming restricted to adults and other children with the same interests. The sample studied by Bloom included approximately 25 world-class young adult representatives in each of six skill groups: swimmers, tennis players, pianists, sculptors, mathematicians, and research neurologists. Young adults were chosen in order that their parents and teachers might also be interviewed. The report, which was written essentially for a lay audience and therefore lacks many of the details necessary for careful review, is provocative for both the commonalities and differences found across groups. The specific talents of the mathematicians and neurologists were, for example, not apparent in early childhood, although these future achievers were clearly very bright, curious, and energetic in their pursuit of knowledge. The sculptors' interests in three-dimensional forms emerged mainly after they entered college, when this medium first became available to them. In contrast, the long-term interests of the athletes and musicians emerged much earlier, and were often consistent with those of their families. The general picture is of gentle, warm, playful nurturance during the early years, often through family activities and instruction by teachers or coaches who were not particularly “high powered.” It was not until middle childhood that the children were introduced to disciplined study with expert teachers, or that their own deep and passionate commitment emerged, to be supported by nearly equal commitment on the part of their parents.

Prodigies

Prodigies are children who are distinguished by the emergence, usually during the middle years of childhood, of performance that is not only *promising* (as is that of other gifted children), but *impressive by adult standards* (see, e.g., Feldman, 1986; Radford, 1990). Few of the children can, then, rightfully be called “prodigies” during the earliest years of childhood, and for this reason, their nature and existence will only be touched on here.

Except for the few prodigies whose talents are

multiple (and whom Feldman (1986) termed "omnibus prodigies"), most prodigies have narrowly focused talents which may, if unattended, simply wither away. Only if the talent is discovered, encouraged, and valued (Feldman, 1986; Simonton, 1988) will it flourish long enough to develop, and even then, its owner may lose interest and go on to other activities in which his or her talent is less impressive, as, for example, did one of Feldman's chess prodigies, who switched to baseball, at which he was not prodigious. Other child prodigies later fail to undergo the painful and often disturbing reorganization and metamorphosis needed to proceed from the clever and technically proficient child to the truly gifted and mature adult (Bamberger, 1986; Mill, 1924).

Even during early childhood, some prodigies can be found, although most should more precisely be known as "pre-prodigies," since their talents are generally a few years from fruition. Yet, there are reports of adult-level performance in quite young children, such as the (perhaps apocryphal) story of the young Gauss, who, before age 3, corrected a mistake in the weekly payroll on which his father was working (Radford, 1990). There is, moreover, an interesting subset of children who are amazingly talented pianists, most of them blind and/or otherwise handicapped (Miller, 1991), although certainly, like Mozart, there are occasional young prodigies who are not at all handicapped. Gross (in press) also describes the impressive early development of three Australian children whose IQs she calculated as over 200. And the drawings of monkeys sketched by the young Chinese artist, Yani (Ho, 1989; Zhensun & Low, 1991), beginning at age 2 years, have delighted many audiences since they were first shown abroad in 1989.

To be sure, the phenomenon of true prodigiousness in very early childhood is so rare that few exemplars can be studied *in vivo* by any single investigator. Yet, the verified reports of precocity of almost unbelievable degree make it mandatory that scientists and educators be willing to entertain, at least, parental reports of improbable advancement during infancy and early childhood. Each such history needs, of course, to be checked, but the fact that such "off scale" talent can exist should give pause to those unbelievers who "know what children are like," and who refuse, therefore, to respond flexibly to the needs of real children whose talents exceed those of average aggregates by degrees that are moderate to astonishing.

Early Signs of Precocity

Developmental advancement may be more or less obvious or easy to recognize. There are some indications that, even in the newborn era, some signs may be seen. There are numerous anecdotal accounts by parents of unusual alertness in babies who are later seen as gifted, although one must take into account the heightened alertness of normal babies in the first few hours of life

(and simultaneous hypervigilance in their parents). High newborn cry counts (Abrams, 1982b), rapidity of visual habituation during the first few months (Abrams, 1982b; Fagan, 1985; Rose, Slater, & Perry, 1986), advanced visual memory as shown by preference for the novel over the familiar (Fagan & McGrath, 1981), and early attention and information processing (Bornstein, 1989) may precede advanced cognitive development later on. Correlations of early measures with later verbal intelligence appear to be stronger than those with later performance measures. Indeed, in a summary (Lewis & Louis, 1991) of abilities and skills mentioned by authors who have studied young gifted children both formally and informally, early attention, memory, and advanced language development were mentioned more frequently than any others.

Although, as a group, gifted infants and preschool children tend to be healthy and strong (e.g., Barbe, 1955; Terman, 1926), this superiority may be an artifact of biased sampling procedures and advantages of background (Roedell, Jackson, & Robinson, 1980). Motor skills in the early years do not appear particularly advanced in young children with verbal precocity (Robinson, Dale, & Landesman, 1990), nor do parents of children advanced in any of several cognitive areas report earlier attainment of milestones such as walking (unpublished study by Krinsky, Jackson & Robinson, 1977, cited by Roedell et al., 1980). One interesting study in Toronto (Leithwood, 1971), however, found a relationship within a group of sixty 4-year-old children (mean IQ = 125) between Stanford-Binet IQ and ability to perform complex gymnastic motor tasks but no significant relationship between IQ and performance on simple motor tasks. Motor tasks that require cognitive organization may, then, also tap cognitive abilities.

Although most of the research with gifted children has focused on school-age children, that body of knowledge points clearly to the tendency for gifted children to exhibit more advanced personal maturity than others of the same age (Janos & Robinson, 1985; Robinson & Noble, 1991). In play interests, social cognition, choice of friends, moral judgment, and other respects, these children tend to resemble older children. For example, Klene (1988), who surveyed parents of gifted children ages 5-13, found an age shift, with the fears reported by parents of younger gifted children resembling those expected at a later age. Young gifted children are also described as having more energy, persistence, and vigor (Carter, 1958; Miles, 1954; Terman, 1926), and enthusiasm (Hunt & Randhawa, 1980).

Roedell et al. (1980) summarized carefully the evidence about gifted preschool children's personality and emotional maturity, including reports of several studies in the preschool at the University of Washington. They concluded that, with the exception of advanced social cognition (e.g., ideas about ways in which children might solve hypothetical social conflicts, self-assessment of their own social status, concepts of friendship), the actual social behavior, temperament, and personality

characteristics of young gifted children are broadly varied and not particularly different from the range exhibited by children of average intelligence. Furthermore, they found, children's ability to reason verbally about social situations was not related to the way they actually handled such situations on the playground. Similarly, Kitano (1985), observing gifted children in a specialized preschool, reported that they behaved similarly to unselected preschoolers in many ways, although they demonstrated advanced knowledge and thinking abilities, creativity, and social maturity; Kitano also found, however, that the gifted children were more competitive, independent, and persistent in task completion.

All these authors did, however, like Abroms (1982a), report anecdotes suggesting that discrepancies between mental ages of children and their playmates do create occasions for conflict and disappointment, such as the bright child who kept making appointments with playmates who had no concept of time. Abroms and Gollin (1980) also reported, in contrast with Roedell et al. (1980), that the gifted preschoolers they observed showed more cooperative play, more complex play patterns, and more sophisticated play activities than expected, as well as both greater cooperation and greater risk-taking in their play. Similarly, Barnett and Fiscella (1985) saw higher levels of physical, social, and cognitive play styles in gifted children than in the nongifted group. And yet, even when gifted young children do act in a mature fashion for a time, fatigue and/or boredom may take its toll in crankiness and deterioration of effort more than with older children (Kanevsky, in press).

The discrepancy between cognitive capacity and actual social-emotional behavior, even when children are psychosocially somewhat advanced, creates problems for parents and teachers, who may expect behavioral maturity to match mental maturity. Indeed, the children themselves may be frustrated by their inability to meet their own high expectations, standards, and goals. It is important to remember, however, in judging "adjustment," that the problem is often not "poor adjustment" but a discrepancy between high ability and more average emotional control. Indeed, the overwhelming evidence, for all but the very brightest children, is that social and emotional adjustment from the very early years to adolescence, is generally more positive for gifted than for nongifted children (Janos & Robinson, 1985; Lehman & Erdwins, 1981; Robinson & Noble, 1991; Roedell, 1989; Terman, 1926).

Parental Identification

Can parents be relied upon to identify advancement in their own children? Numerous investigators have reported that, especially when they are given behavioral criteria or checklists by which to judge, the very young

children "volunteered" by parents for special studies or educational opportunities are, on the whole, significantly advanced (Ari & Rich, in press; Hanson, 1984; Klein, in press; Louis & Lewis, 1992; Robinson & Robinson, in press; Silverman, Chitwood, & Waters, 1986).

During the early years (perhaps throughout childhood), parents tend to do best at identifying precocious children in domains in which there are distinctive milestones and normative expectations, as there are for the emergence of language and reading. Parents are, for example, quite good at identifying toddlers with broad vocabularies and complex sentence structure (Robinson et al., 1990) and better at identifying preschoolers who reason well mathematically and read early than those who exhibit precocious spatial reasoning and memory, areas in which adults typically do not possess such informal timetables (Robinson & Robinson, in press). In a longitudinal study undertaken by Robinson, Roedell, and Jackson (Robinson & Robinson, in press), about half the 550 children "volunteered" by their parents actually attained initial IQs, at ages 2-5 years, of 132 or higher (20 times the rate in the general population). Even among those children whose IQs were lower, many showed genuine precocity in specific areas such as math or puzzles.

Behavior checklists are available to help spot young children with advanced development (Karnes & associates, 1978; Lewis & Louis, 1991; Shwedel & Stoneburner, 1983; Silverman et al., 1986), but few of the checklists have been carefully validated. The most frequent report is of excellence in memory, both immediate and long-term. In addition, long attention span, extensive vocabulary, preference for older playmates, and personal maturity are prominent. Klein (in press) lists the following characteristics of the gifted children for whom application was being made to the special program at Bar-Ilan University's Early Childhood Center: precocity in early language development; superior memory; a highly inquisitive attitude; an appetite for learning; pleasure in drawing, imaginary games, and building with Lego; liking to listen to stories and to play with them; good spatial orientation; early number skills; a store of memorized information; and alertness to unexpected changes.

Louis and Lewis (1992) queried parents of youngsters (mean age = 33 months) who brought them to a specialized clinic for gifted children about their beliefs as to essential elements of "giftedness." Parents who cited exceptional memory, imagination, and abstract thinking had children with higher IQs (mean = 149) than those who mentioned specialized sets of knowledge or skills, such as knowledge of body parts, the alphabet, and/or numbers (mean IQ = 118). Interestingly, Silverman et al. (1986) report that, of children nominated by their parents but scoring below the mean IQ (132) of their group, a large proportion had histories of ear infections that may have impacted language development.

Prospective Studies Using Psychometric Measures

The availability of recently standardized, valid, and appropriate psychometric measures useful during infancy and the preschool years varies considerably from one country to another. In the United States, there is no dearth of such measures, but in many other countries, because of cultural and practical differences, the situation is quite different. For example, in Scandinavia, children at risk for learning impairment and/or lowered school performance are offered services without the need for establishing eligibility through test scores, so testing is seen as much less useful than in the United States, where eligibility requirements do include testing, even for very young children. Added to these cultural differences are the considerable expense in professional time and fiscal investment required to develop measures that are culturally appropriate and standardized on local populations.

Furthermore, as secular conditions change, measures must be updated to reflect changes in children's knowledge and skills. For example, the 1972 standardization of the Stanford-Binet yielded much "tougher" norms for young children than the did 1960 version (Terman & Merrill, 1960, 1973), reflecting rapid changes in the United States in the availability of early education and educational tools such as toys and books, the inauguration of Sesame Street and similar programs, and other secular differences in the intervening years. A 4-year-old who earned a Stanford-Binet MA of 6-1 would have attained an IQ of 149 in 1960 but an IQ of only 138 in 1972. Even without such short-term upheavals, the general world-wide trend is toward steadily higher performance on intellectual measures for both children and adults (Flynn, 1987). Using outdated norms during an era in life when children's abilities and skills are changing very rapidly can lead to significantly exaggerated expectations.

Even with the best psychometric measures, however, early test scores tend to be unstable, and high test scores are, individually, even more unstable than average or low test scores (McCall, Appelbaum, & Hogarty, 1973). When investigators have followed preschool children identified solely by their exceptionally high test scores (e.g., Shapiro et al., 1989; Willerman & Fiedler, 1974), the results have not been encouraging. The children's earlier infant performance on the Bayley Scales had not been particularly advanced, and their subsequent test scores have tended to decrease. It is important, however, to note that these subjects were not identified by real-life indices but by test scores alone.

Not only do groups of children who were identified by their parents as advanced tend to attain high test scores, those children's scores tend to *remain* high over time, even though individual scores may vary up or down. Such findings suggest that, on average, advanced ability tends to maintain its rapid pace of development. This evidence substantiates the notion that early giftedness, or rapid development, also *predicts* the subsequent rate

of development, and is not simply a product of being ahead at the beginning (Anderson, 1940; Humphreys & Davey, 1988), rather like a soccer or football team that makes so many goals early in the game that in later periods it may lag behind its opponents and still win.

Evidence for the Emergence of Specific Abilities

When investigators have singled out specific domains and have used multiple measures within that domain, they have been able to identify precocity within some domains that are not simply evidence of across-the-board advancement, but evidence for the emergence of specific differentiated abilities. The strategy here has been to pick domains in which skills are just emerging, where precocity is distinctive to adult observers and somewhat unusual but not rare, and in which reliable assessment tools are available. Two such salient skill areas are language and reading, each of which constitutes an enormously powerful tool that opens direct pathways to more knowledge and engages the willing cooperation of parents and teachers.

One example of such research was conducted in our own University of Washington laboratory, a 5-year study of 25 toddlers who exhibited precocity in breadth and/or complexity of expressive language at age 20 months (Crain-Thoreson & Dale, 1992, under review; Robinson et al., 1990). Verbal precocity did indeed emerge as a coherent domain, observable and measurable across situations and over time. The children attained generally elevated initial Bayley and Stanford-Binet scores, but they were farther ahead in language than in other areas, and not advanced at all in some areas such as spatial reasoning and motor skills. Their verbal memory was, however, outstanding. Spontaneous language samples examined at 20, 24, and 30 months revealed that the children were using a variety of mechanisms to acquire language. Some were more social and imitative while others were more analytic; some acquired phrases and sentences while others constructed new sentences from separate components; some were willing to take greater risks in expressing themselves (and made more mistakes) than others, who were more cautious. As a group, over a five-year period they remained distinctively ahead in language, though not quite so dramatically, but they were *not* early readers. Once they began reading, however, all but one earned quickly and apparently effortlessly.

Early readers can, however, be found with relative ease (Jackson, in press), and there has been much more extensive research with early readers than with early talkers. It is clear that not all bright children read early and not all very early readers are remarkably bright; indeed, a rare condition of *hyperlexia* (in retarded, usually autistic, young children who have learned to decode written words despite impaired language skills) demonstrates the lack of linear correspondence between intelligence and reading skills (Healy, 1982). On aver-

age, however, children discovered to be competent readers before entering kindergarten do tend to attain high IQs, trending toward a mean of about 130 (Jackson, in press).

Jackson's (in press) review of the literature on early readers demonstrates that early readers are not distinguished by a single style of acquisition or skill, and some are able to read despite relative deficits. Most do, however, prefer to read prose quickly—reading rapidly to get the gist of the story even though they may miss words here and there—although they use different attack skills when reading isolated words. Over the school years, early readers tend to retain their advantage over their classmates in reading skills, though less dramatically, and they generally do well in school. Unless they are given appropriate reading instruction, however, the early school grades, when their classmates are being taught to read, may constitute not only a period of decelerating growth of skills, but of profound discouragement with the educational enterprise itself.

Cognitive Studies

Remarkably few investigators have examined the processes by which young, intellectually gifted children actually learn and solve problems. Even fewer are the research designs that disentangle the effects of mental age (MA) and chronological age (CA), comparing younger gifted children with older children of the same mental ability although there are some exceptions (e.g., Kanevsky, in press; Lempers, Block, Scott, & Draper, 1987; Planche, 1985; Shigaki & Wolf, 1982). Young gifted children learn faster, reason with advanced logic, and generalize more readily than not-so-bright children of their CA; this is hardly an unexpected finding. What we need to know is how their learning, understanding, and managing of the cognitive tasks resembles or differs from other children of comparable MA. Because of the richness of critical shifts seen in most children between ages 4 and 6 or 7, preschool children with mental ages in this range should be able to shed considerable light on the underlying processes involved.

Lempers et al. (1987), for example, compared 24 very bright preschoolers with both a CA-matched and an MA-matched group on a spatial projective task, a cognitive perspective-taking task, and an affective perspective-taking task. The bright, young children resembled their mental-age mates in performance, supporting the notion that giftedness does indeed mean accelerated development. Planche (1985), in France, using the MA-match design, found task comprehension and various aspects of information-processing in bright preschoolers actually to exceed the skills shown by somewhat older children of average IQ. Using CA norms rather than MA-matched controls, Zha (1984), similarly found advancement in analogical reasoning in very bright Chinese preschoolers.

Several studies in the Piagetian mode were reported

in the 1970s (see Spitz, 1985; Tannenbaum, in press), and even Piaget himself is quoted by Spitz as having described bright children as able to problem-solve at a level above that expected from their CA. Tasks during the sensorimotor period have not been highly correlated with overall development (Smolak, 1982). Taking as the criterion the attainment of concrete operations such as conservation of number and continuous quantity, the evidence points to moderate advancement by preschool gifted children—4-year-olds tend not to succeed (Brown, 1973; Moore, Nelson-Piercy, Abel, & Frye, 1984) possibly because of limited experience (Spitz, 1985), while 5-year-olds do (DeVries, 1974; Little, 1972). Furthermore, once young gifted children catch on to the idea, they grasp and generalize the process with great rapidity and efficiency.

Piagetian measures and standard intelligence measures tend, not surprisingly, to be positively correlated (Kaufman, 1971; Zigler & Trickett, 1978). Spitz (1985) has made the case for taking both chronological age (CA) and IQ (and consequently, mental age (MA)) into account when predicting performance on cognitive tasks, with IQ, he maintains, "at least twice as valuable for making predictions of performance on Piagetian tasks than is knowing only the CA, even with unexceptional children" (p. 120). Indeed, there are some kinds of problems that are more difficult for mentally retarded children and easier for gifted children than their MA's would predict, problems largely calling upon logic and conceptual analysis.

Recently, investigators have tended to shift from standardized test-like situations to a more dynamic assessment of a child's ability to learn and transfer a problem-solving strategy to new problems. Based on the concept of the *zone of proximal development* proposed by Vygotsky (1978) and elaborated by Feuerstein (1979, 1980), this more flexible method interprets the degree of help needed by the subject as an index of ability.

Research on the metacognitive strategies of preschool gifted children has yielded intriguing results, suggesting that young, gifted children are more accurate observers of their own behavior, more effective problem-solvers, and utilizers of a greater variety of learning strategies than other children (Moss, 1990, in press; Moss & Strayer, 1990). For example, these children are precociously aware of what they do and do not know, like the exceptionally self-aware 24-month-old who was asked to copy a complex block pattern on the Stanford-Binet, Fourth Edition and, before attempting the task, said, "I don't think I know how to do that."

Kanevsky (in press; Kanevsky & Rapagna, 1990), at McGill and Simon Fraser Universities in Canada has used the MA-CA match design in a detailed study of the problem-solving strategies of average-IQ and very high-IQ children ages 4-5 and 7-8. The children were required to solve the Tower of Hanoi problem, and two variations of it, and were given help as needed, following the dynamic assessment model. Detailed information was recorded not only about the children's errors,

successes, and speed, but also their questions and comments. Although their level of performance was like that of the average-IQ older children, in many respects the younger high-IQ children resembled the older high-IQ children. They preferred to ask for help when they felt they needed it, not when it was offered; they commented more frequently on the similarities among the games; they understood the essential nature of the task and took on the challenge with relish, with the thrill of the chase (or what Czikszenmihalyi (1982) terms “flow”) so that once they had the idea, they tried to make the task more challenging, do it faster or with fewer moves, and so on. Kanevsky also noticed, however, that the younger children tired more easily, possibly because the task made such demands on them, and when they did, the brighter young children tended to lose both their interest and their advantage, behaving more like their average agemates.

Studies like Kanevsky's (in press) point to the desirability of extending metacognitive investigations to this younger population. Kanevsky reported evidence of metacognitive maturity: her younger, high-IQ children not only understood game rules more rapidly than did older children of average ability, but learned from their mistakes, were able to see errors as learning opportunities rather than failures, and monitored the difficulty level of the tasks to push themselves to an optimal level of challenge—that is, until they grew tired and cranky.

Summary: Characteristics and Needs of Gifted Children

After a brief review of biographical studies of eminent persons and of prodigies, this section turned to an examination of the characteristics of young, gifted children. The discussion focused on those aspects of gifted children that are most relevant to their special needs, rather than the needs they share in common with others of their age. In many ways, of course, children who are preschoolers not only resemble their agemates but live, learn, and play in the same environments. These environments may or may not be sensitive to the individual differences among children in general, and in particular, may be unresponsive to the verbal, conceptual, and personal maturity of young gifted children, as well as to the discrepancies within a given child—for none of these children is, in truth, precisely “prototypic.”

Gifted children are at least as varied among themselves as are children of average intelligence (McGuffog et al., 1987). In focusing on ways that gifted children, as a group, differ from other children, it is easy to forget that fact. Their styles of acquiring knowledge and skills, their areas of relative strength or precocity, their personal styles in dealing with children and adults, their motor skills, energy levels, emotional maturity, and life experiences, make each child unique.

And yet, as we have seen, preschool gifted children as a group do have characteristics that warrant attention. Among these children, most, for example

(1) excel at activities weighted with cognitive components, such as acquiring and remembering information, understanding social situations, thinking about future events, or performing complex (as opposed to simple) motor skills;

(2) show excellence in memory, a long attention span, a wide vocabulary and advanced complexity of conversation, talent for imaginative play, as well as a preference for older playmates and mature concepts of friendship;

(3) demonstrate precocity in specific skills such as reading or mathematical reasoning, although they may have attained and continue to use these skills in differing ways;

(4) display advanced logic and metacognitive skills, so that they are effective managers of their own learning;

(5) relish and enhance problem-solving challenges; and

(6) yet, do not always display their advanced understandings in everyday behavior and, indeed, may regress precipitously into “age-appropriate” crankiness and noncompliance when stressed.

Parenting the Young, Gifted Child

For all children, but particularly for infants and preschool children, parents play a pre-eminent role in the child's life. Parents of gifted children are both contributors to their child's advancement and responders to their child's behavior—a complex interplay of mutual cause and effect that cannot ever really be sorted out. When parents of such children behave differently from other parents, should one attribute the children's giftedness to those differences, or should one assume that the parents are responding differently because their children are different? Obviously, the answer is that both are true, and trying to disentangle them is usually fruitless.

As noted previously, retrospective studies of the early lives of individuals who later made significant contributions to European and American history, revealed not only a rich cultural background but, in a surprising proportion, rather painful childhoods. Contemporaneous studies of the families of gifted young children do not, however, reveal such patterns. Perhaps the difference is a secular one; these are, after all, different times. Bloom (1985) does not characterize the childhoods of his world-class achieving subjects as painful, although, for the athletes and musicians, single-mindedness characterizes them from middle-childhood onward, and substantial sacrifices were made by everyone in the family. Perhaps none of Bloom's subjects (all anonymous, but all “world-class” achievers) will be classed by historians as having made memorable creative contributions or having achieved the degree of eminence

of the individuals studied by Cox (1926) and others. It is a certainty that most gifted children will not become either prodigies or eminent, and the research examining the nature of parenting young, gifted children clearly studies a different group than that of the retrospective studies. Despite the backdrop of increasing evidence of child abuse in at least Western countries, most gifted young children who have been studied (and many have not) apparently are growing up in warm and nurturing environments, many of which are child-centered and finely tuned to their needs.

Before discussing further the research on this issue—which has been devoted almost entirely to parental behavior, ignoring the child's side of the equation—one should acknowledge recent contributions to understanding the extent and effects of nonshared environments by behavioral geneticists (e.g., Lerner & Lerner, 1983; Plomin & Daniels, 1987; Scarr & Carter-Saltzman, 1982). Differences among children growing up in the same family demonstrate the extent to which children become potent determiners of the differences in their environments—for example, by their curiosity and experimentation, their temperament and perseverance, their recruitment of assistance and resources from adults—which in turn impact the children's development. If you ask more questions, you get more answers, even if your parents respond to a constant proportion of the questions you ask, as Falender (1973) demonstrated for experimental children in the Milwaukee Project directed by Heber.

At all ages, intellectually gifted individuals are seen as more curious, experimenting, exploring, and risk-taking than others (Carter, 1958; Cooperative Research Group on Supernormal Children, 1981; Miles, 1954; Hunt & Randhawa, 1980; Terman, 1926). What is interesting in this regard is the predictive value of these characteristics in terms of subsequent IQ changes and school achievement. Those whose IQs rise during the school years are more active and energetic in the early years than those whose IQs decline (Sontag, Baker, & Nelson, 1958). In a study of preschool children's adjustment, intelligence, and achievement, preschoolers who showed curiosity and assertiveness subsequently obtained higher first and second grade scores than did those who, as preschoolers, showed withdrawal, lack of interest, and failure to elicit cooperation of peers (Kohn & Rosman, 1972). Furthermore, in a longitudinal study of children of middle-class and migrant-worker families, the children who, as preschoolers, had shown a relative preference for adult as opposed to peer interaction, showed higher academic achievement when seen again in third grade (Harper & Huie, 1987). Children clearly contribute to their own development through their styles of interaction and their use of adult resources.

In our study of language-precocious toddlers (Robinson et al., 1990), mothers were asked what they thought to be the source of their children's verbal advancement. Most acknowledged a significant contribution from the child, but almost everyone responded initially, "I talk

almost constantly to my child; I always have." As investigators, we remained skeptical, however, suspecting that, had their infants not been attentive or responsive when their mothers talked, the mothers would have ceased talking to them, just as mothers of prematures, so eager at first to elicit responses from their babies, eventually extinguish those efforts when the babies turn away from what, for them, is overstimulation (Barnard, Bee, & Hammond, 1984). We found, in fact, that verbally precocious children who attended with most interest when their mothers read them a story at age 24 months tended to be the ones who, by age 4½ years, had learned most about the printed word (Crain-Thoreson & Dale, 1992).

Family Background

Since Terman's (1926) studies, it has been recognized that, in the homes of gifted young children, parental educational level is higher, the number of books is greater, and the number of learning opportunities is expanded, in comparison with the homes of nongifted children. As we have seen, biographers of eminent persons have repeatedly documented the high degree of resources and stimulation of the homes in which they grew up (e.g., Bloom, 1985; Cox, 1926; Galton, 1869; Goertzel et al., 1978; McCurdy, 1960). Children with higher quality early day care more often later turn up in school programs for gifted children (Field, 1991); students enrolled in special programs tend to come from homes with high incomes. But these advantages may be no different for these children than for others growing up in the same socioeconomic circumstances. One needs to be much more specific about the kinds of proximal child-environment interactions that make a difference. Indeed, if Terman's study were to be undertaken today, there would surely be a much more energetic effort to include gifted children growing up in life circumstances different from the middle- to upper-class families whose children attended the schools in which Terman searched for his gifted subjects, as well as efforts to examine the specific interactions in the home that differ between gifted and nongifted children of different ethnic groups.

Parenting and Cognitive Development

Responsive, stimulating parenting of the normal infant, toddler, and preschooler (Clarke-Stewart, 1973) in a general sense no doubt underlies effective parenting of the gifted youngster as well. In studies of nongifted children, increases in verbal IQs have been found directly related to the amount of time parents spend playing with their preschoolers (Falbo & Cooper, 1980), for example. And yet, within this framework, correlative studies of parents and children, which can suggest but not prove a causative relationship, point to specific kinds of interaction that facilitate advanced cognitive

development. For example, does an early preference for reading readiness toys over fantasy toys in children who will be early readers (Thomas, 1984) reflect the influence of the child or of the environment?

In conjunction with the research on metacognition mentioned in a previous section, Moss (1990, in press; Moss & Strayer, 1990) and her colleagues at the University of Quebec at Montreal have demonstrated not only that gifted preschoolers are more effective problem-solvers and utilize more metacognitive strategies, but that to a significant degree, they pick up cues from their mothers. In Moss's studies with her colleagues, the mothers encouraged such strategies by structuring problems while letting the children derive their own solutions, in contrast with mothers of average children, who provided more direct solutions and talked more about the child's nontask behavior. In earlier studies of the antecedents of school success (e.g., Bee, Van Egeren, Streissguth, Nyman, & Leckie, 1969; Hess & Shipman, 1969), a difference of the same nature had been noted between middle- and lower-class mothers.

But not all parents of gifted children use similar strategies. Fowler (1981), studying highly precocious children described two parenting styles, both of them characterized by flexibility, abundant interaction, and child centeredness. One style involved a deliberate, systematic instructional approach, which was structured and rather demanding, but included a significant amount of play. The second strategy was more responsive and incidental, but not less stimulating or child-centered. Both sets of parents were "tuned in," poised to introduce new concepts when the children were ready.

Effective parenting of gifted children takes time as well as skill at activities that promote development (Chamrad & Robinson, 1986). Terman (1926) found that telling stories and reading to the children were reported with high frequency and much more often than attempts to teach the children to read. Early readers' parents *may* provide more reading instruction (some find that they do but others find that they do not (Jackson, in press)). Interestingly, the one mother of a language-precocious toddler in our sample who, with the nanny, had deliberately "taught" language, had a little boy with a broad vocabulary but less language complexity than others in the group. In the intriguing study on toy preferences cited earlier, Thomas (1984) found that fathers of early readers worked, on average, 10 fewer hours a week than fathers of non-readers. Thomas's study implies both that parenting takes time and that fathers are probably as important as mothers in the process.

Similarly, in an exploration of parenting practices in families with a gifted or a nongifted preschool child, Karnes, Shwedel, and Steinberg (1984) reported that the two groups varied in several respects, including time spent in critical activities. In that study, parents of the gifted group spent three times as long per day reading to their children (21 vs 7 minutes). The two groups of children spent equal time watching television

(1.5 hours per day) but the gifted group experienced much greater parental involvement in play such as block building, making up rhymes or nonsense songs, and going to museums and on nature walks. The mothers of gifted children more often reported consciously promoting language development, broadening their children's experience, and encouraging freedom.

Parents of gifted children, then, are likely to promote cognitive development by skilled and dedicated teaching—not pushing their children or engaging in inappropriate didactics (e.g., Doman, 1964), but sensitively guiding and participating in their children's exploration of the world, and "scaffolding" their problem-solving by providing structure, open-ended questions, cues for solutions (if needed), and broadly supporting the children's active processing. Responsive, sensitive parenting seems to be what counts.

Parenting and Personality Development

Motivation and other personal characteristics are at least as important as high ability in determining ultimate achievement in gifted people, and their roots undoubtedly lie in the early years. In most respects, parenting psychologically healthy gifted children is much like parenting any other children, but there are some specific issues, such as achievement motivation, self-esteem, and perfectionism, that appear particularly relevant to parenting the gifted child.

Achievement Motivation

The motivation to master and achieve (or what Renzulli (1978) calls "task commitment") is an essential ingredient of eventual achievement, with precursors observable in early childhood (Freeburg & Payne, 1967; Geppert & Kuster, 1983). Theories regarding the development of achievement motivation (Dweck & Elliott, 1983; McClelland, Atkinson, Clark, & Lowell, 1953) support the finding that parents who encourage independence expose their young children to situations that allow them to master challenges autonomously (Trudewind, 1982). Children with a desire to achieve have mothers who valued early independence (Winterbottom, 1958); Terman (1926) also observed that the parents of the most successful men in his study had encouraged initiative and independence. Karnes et al. (1984) found that parents of gifted preschoolers were more likely to report wanting their child to assume greater independence, though self-care (i.e., dressing) was the only area in which they were much more likely to give their child responsibility than were mothers of nongifted preschoolers.

Bloom (1985), after closely analyzing factors underlying the extraordinary attainment of "world-class" achievers, described the parents during the early years as child-centered, involving their children informally in areas of family interest and shared activity until the

children developed their own commitments. Bloom also described these parents as instilling the "value of achievement" in their children—self-discipline, the importance of doing one's best, and the satisfaction of accomplishment.

Self-Esteem

Very little is known about the affective development of the gifted preschooler, although most of the evidence points to at least as healthy adjustment, on average, as that of nongifted children. Self-esteem is very difficult to measure reliably during the preschool years, but school-age gifted children have generally been found to exhibit higher self-esteem than nongifted children (Janos & Robinson, 1985; Robinson & Noble, 1991). Parents of gifted children are rightly concerned about the dangers of their children being overly successful in peer situations, coming to see themselves as somehow ordained to attain goals easily, to be best or fastest at learning, but at the same time ill-prepared to deal with real challenges.

Young gifted children frequently become frustrated by the disparity between the projects they can conceptualize, and their ability to carry them out. Wise parents, while wanting their children to feel strong, valued, and competent, also expose their children to appropriate situations that help them to develop positive regard for their own ability to handle the new and the challenging as opposed to being "best" with little effort.

Perfectionism

Young gifted children have been identified frequently in case studies as perfectionistic—self-critical, setting very high standards for their own performance, and monitoring their attainment according to what others think (Strang, 1951; Whitmore, 1980). What is good and necessary for ultimate high achievement—that is, setting high and demanding (but not unattainable) goals for oneself—can be either a positive or a negative force in a person's life. Studies of high achievers over and over point to the high standards such people hold for their own performance, at least in the areas on which their work focuses. A delight in mastering more difficult, challenging tasks may well be the secret of success. Even in young infants, pleasure in test-taking can sometimes be more predictive of later high ability than actual test scores (Birns & Golden, 1972).

Bloom (1985) reported that most parents of high achievers were not only adherents to the work ethic but also set high standards for themselves and their children, expecting nothing less than one's best. Such expectations can obviously go too far. Indeed, Hewitt and Flett (1990) of the University of Ottawa and York University, whose work with adult perfectionists is far more extensive than any other body of work exploring

this issue, find that the depressive features so often associated with perfectionism are really the product not of setting one's own demanding goals but of feeling unable to measure up to the standards of others.

Creativity and Risk-Taking

"Creativity" plays a role in many definitions of giftedness (e.g., Renzulli, 1978), although conceptions of creativity vary widely (Sternberg, 1988). All little children are "creative" in the sense that they see the world in fresh, or divergent, ways, but there are individual differences in the cautiousness with which they approach problems versus their willingness to take risks in attempting solutions. The essence of being willing to take some risks is that one will make mistakes; not every "creative" endeavor is successful.

Very few studies of creativity, original thinking, or cognitive risk-taking in young children have been undertaken. In one of the few exceptions, Moore and Sawyers (1987), followed at ages 6–8 years children who, when seen at age 4, had shown differing degrees of original thinking, which was distinct from an estimate of IQ (Moran, Milgram, Sawyers, & Fu, 1983). This measure also related to imaginative play in a subgroup of gifted children observed in preschool (Moran, Sawyers, Fu, & Milgram, 1984). Moore and Sawyers (1987) found moderate stability in their tasks of original thinking ($r = .54$) (e.g., naming things that are round, interpreting three-dimensional shapes, giving uses for a box), suggesting that originality in problem-solving may indeed be predictable and related to real-life behavior. Crain-Thoreson and Dale (under review) found in the language of verbally precocious 2-year-olds that those were more courageous about using pronouns made more errors than other children, but they also got more pronouns right.

As Lovecky (1992) points out, negative criticism can be destructive of such spirit. What one wants a child to maintain is "... to work for the joy of playing with ideas, and the inherent satisfaction of trying something new, rather than working for praise" (p. 20). She suggests that focusing on what does and what does not work about an idea, teaches that each attempt can be seen as leading in the future to another. This, she points out, is the method used by the artist Yani's father, who was also her art teacher (Zensun & Low, 1991).

Summary

In contrast with the historical data about eminent persons alluded to in the first part of this chapter, these studies of parenting practices in the families of gifted, young children reveal support on a macro- as well as a micro-level. Most of the families who have become involved with research facilities apparently devote time as well as skill to parenting their young

children. Although the contribution of the children to the parent-child interplay must be acknowledged, it is clear that these parents, who tend to be well educated themselves, support the cognitive (and metacognitive), motivational, and affective development of their children in skilled and sensitive ways. They may not, however, be representative of all families of gifted children. We must remain cautious.

Nurturant Group Environments for Young, Gifted Children

Most gifted preschool children attend the same preschools that other children do, some of which are better equipped to deal with their special needs than others. In countries providing publicly supported preschool systems, such as those found in the socialist countries, Scandinavia, or France, the curriculum is seldom differentiated for the individual child (Robinson, Robinson, Darling, & Holm, 1979). In countries in which preschool education is mostly a matter of family choice and financing, more options are generally provided, and variations especially suitable for gifted children are more likely to emerge. One "mainstream" model preferred by a number of families of gifted young children in a number of countries is the Montessori model, which uses a series of relatively structured tasks through which children are encouraged to progress at their own pace, using the teacher as a resource.

Special Preschool Models for the Gifted Preschool Child

With regard to the provision of special options for preschool gifted children, a number of curricular models exist. These efforts tend to provide differentiated approaches to early childhood education that are downward adaptations of programs devised for older gifted children (see below). At the preschool level, however, there is almost without exception an emphasis on the social milieu, playmates who are capable of responding to the child with advanced ideas, and a social climate conducive to integrating social behavior with social understandings.

Examples of preschool programming for gifted children can be found in many countries, including Australia (Gross & Kirsten, 1987), Brazil (Salgado-Gama, 1991), Germany (Klauer, 1990), Israel, Sri Lanka, Indonesia, Portugal, Norway, and Sweden (Klein, in press), and the United States (Karnes, 1983), among others. Most of these services have been provided in traditional preschool kinds of environments, but some have provided alternatives, such as summer or Saturday classes (Feilthusen & Koopmans-Dayton, 1987), group programs, or individualized sessions (Klein, in press).

Because of space limitations, we will not describe the specialized characteristics of each curriculum model, most of which are downward extensions of models developed for use at the common school level. Despite their differing conceptual frameworks, each of these models aims to provide appropriate content and teaching methods to match the rapid developmental pace and the differential needs of gifted children.

Among the models are Guilford's Structure of Intellect, Renzulli's Enrichment Triad model, Gardner's theory of multiple intelligences, Bloom's Taxonomy, the Vigotsky-Feuerstein model of mediated learning, various acceleration models providing academic instruction to children with precocious academic skills, various models of social content enrichment without much acceleration—and all combinations of these efforts! (see Karnes, 1983; Salgado-Gama, 1991; Seefeldt, 1987, for reviews).

Because, in most countries in which specialized preschools have been developed, there is not a standard preschool curriculum, it is difficult to say that these preschool models are "adaptations." They are, rather, attempts to achieve an appropriate match with the advanced cognitive and social skills of the gifted preschool child, while at the same time matching in a wholesome way the children's propensities for movement and action, their preference for hands-on activities, their shorter attention span, and their relatively less mature fine motor skills than their mental-ages mates. Rather than achieving advancement in specific skill areas, most of the programs are directed at enhancing generalized thinking strategies and understandings, exciting curiosity and a love of learning, providing playmates who share understandings, and enabling children to use their creative imaginations by taking risks and focusing their efforts on challenging tasks, more challenging than they would be likely to meet in other environments. Roedell and Robinson (1977) indicate some of the ways to achieve this goal of adapting even an academic-like lesson to fit this group:

by breaking lessons into short units, by varying locations of work within a lesson, by giving visual demonstrations whenever possible, by presenting activities in a game-like format, and by providing attractive materials so that each child has something to hold and manipulate during the lesson (p. 12).

Each of the models has its backers and its critics and, like the proponents of models for older children, what is deemed "appropriate" for the education of young gifted students by one group of educators may not be deemed "appropriate" by another. It is extremely difficult to track a given model, moreover, because they tend to evolve over time and to appear and then disappear unpredictably as their funding ends and/or the interests of the investigators change.

Some models do establish continuity, however. Among the best known and most elaborately described programs are, as we have said, the three developed by

Karnes and her associates at the University of Illinois (Karnes, 1983). These programs represent models for middle-class, for handicapped, and for economically disadvantaged gifted children. They take careful account of nine areas of talent that young children may show (science, intellectual, reading, creative, art, leadership, psychomotor, mathematics, and music), especially in the programs for handicapped and at-risk groups, but simultaneously are directed at developing self esteem, interpersonal skills, task-persistence, and risk taking.

The Hollingworth Preschool at Teachers College, Columbia University, is child-centered and offers a more eclectic, "developmentally appropriate" curriculum designed to nurture each child's own pattern of strength while facilitating the development of higher-order thinking skills (Wright & Coulianos, 1991).

Project Spectrum, represents a collaboration between Project Zero, a research group at the Harvard Graduate School of Education co-directed by Howard Gardner and David Perkins, and the Eliot-Pearson Department of Child Study at Tufts University, directed by David Feldman. This project, which is applicable to but not specifically designed for gifted children, combines Gardner's theory of multiple intelligences and Feldman's theory of development in non-universal domains to identify and promote distinct patterns of development in each child (Krechevsky & Gardner, 1991).

Quite another method is described by Klein (in press) in an individual approach to educating gifted young children. This effort involves individual sessions between child and teacher, the "more intelligent, sensitive child (MISC) program." This program uses mediated learning strategies developed for use with retarded learners (Feuerstein, 1980) to guide the gifted child's development and sometimes deals with dyads of children (e.g., a gifted and a retarded child) to guide the development of social skills and insights as well.

In the field of early education, one finds the same sorts of controversies that plague educational efforts with older, gifted children. There is concern about "stressing" young children (Ari & Rich, in press) as well as concern that they will be insufficiently stimulated (Gross, in press). Some authors emphasize the children's needs for challenge (Roedell & Robinson, 1977), reasoning, as does Spitz (1985), that the "best ballpark estimate" of the cognitive tasks for which a child is ready can be derived from some combination of CA and MA (IQ). On the other hand, other educators are less focused upon cognitive challenge and may even state a willingness to sacrifice educational progress for the sake of social integration with others who are less bright and/or less fortunate (Ari & Rich, in press). There is fear of children's growing up too fast (Colangelo & Fleuridas, 1986) and fear, even among those who decry "the hurried child" that their rapid pace of development will be retarded if unattended (Elkind, 1988). The debate between acceleration and enrichment is present at this level as well. This is, in short, a field very difficult to characterize.

Selection

Most of the preschools for gifted children, as opposed to programs for kindergarten and older children, do not rely on psychometric tests, because, as discussed earlier in the chapter, such test results tend for individuals to be relatively unreliable in bright young children. Educators are further concerned that parents will place undue weight on such scores and be disappointed if their children's scores are lower in the future. Although some programs do use standardized tests of general intelligence, most educators use parent and teacher questionnaires and checklists to select children. Some instruments, like the parent questionnaire developed by the Child Development Research Group at the University of Washington (first edition reprinted in Renzulli et al., 1981), are essentially oriented toward precocity in various cognitive realms, while others, such as those developed by Karnes and associates (1978) include a broader range of personal characteristics. As noted earlier in this chapter, precocious children are characterized as a group (with individual exceptions) by a broad range of descriptions. Local preschools have often used checklists they have created for themselves, and at this point there is no information to indicate that such measures are any more or less effective than published checklists or, for that matter, standardized tests of intelligence.

For any measure to be effective, it needs three characteristics: (1) Care must be taken to focus upon characteristics that fit the program and its goals. It makes no sense to select children who are high in "creative risk-taking" if they are to enter a highly academic program, or vice versa. Furthermore, it is important to distinguish between those characteristics that may define required assets (e.g., advanced cognitive skills) and those one hopes to encourage as a result of the program (e.g., "creativity" or social skills). (2) The measure must be reliable and valid in the sense that raters will agree in their descriptions of a child's behavior, and that the behaviors are relevant to maturity of development in the spheres of concern. (3) Local norms must be developed, to fit the nature of the applicant group.

Evaluation of Preschool Programs

Evaluation of innovative programs, including preschool programs for gifted children, is an integral part of the process of establishing, modifying, and validating the special effort (Borland, 1989; Shwedel, 1983). The same reservations exist about isolating gifted young children from their agemates as exist with regard to special programs for older gifted children (e.g., Ari & Rich, in press). It is incumbent upon their founders, then, not only to examine the outcomes of these innovative programs for the children enrolled, but to look at control groups of other bright children enrolled in

other programs, to see whether the advantages of the segregated program outweigh the disadvantages. Unfortunately, as we shall see, such studies have not occurred with the frequency required.

From the reports available, it is clear that teachers, parents, and children are all pleased with the high-quality programs provided, often in university settings, as experimental attempts to meet the special needs of gifted children. Despite the concerns of some, such as Colangelo and Fleuridas (1986) that gifted children may be expected to grow up too rapidly, this appears not to be the case. On the basis of "consumer satisfaction," there is no doubt that the programs are popular and well received, and that there is general optimism about their effects on the children. What is blatantly lacking in this literature, however, is research information substantiating the immediate or long-term impact on the cognitive, social, and/or emotional lives of the children. Almost without exception, the specialized programs have been devised in university settings by experienced early childhood educators, with clientele largely drawn from middle-class, educated families—the kind of combination that usually does, indeed, produce happy "customers." But do these specialized programs actually provide a more propitious setting for either the current quality of life or the ultimate development of gifted young children than do other high-quality, nonspecialized programs?

Karnes, who has for some time directed at the University of Illinois specialized programs for gifted, gifted-handicapped, and Project Head Start children (Karnes, 1983) has published studies of children in the programs. For example, Karnes and her associates (1983a) found short-term gains for 28 gifted and talented handicapped children in terms of self-esteem, purposiveness, creativity, and functioning in the area of talent; following previously enrolled children in elementary school, they (1983b) also found them performing at or above grade level academically. Hanninen (1984), too, studying two rural preschools for children who were advanced in development, found short-term gains in beginning academic skills and a measure of creativity. Neither of these evaluations involved comparison groups, however.

Contrasting data were gathered by Draper, Larsen, Harris, and Robinson (1992), who studied outcomes of preschool attendance on parent expectations, their praise, and the children's self-esteem in an economically advantaged group attending a university program. This study did use random assignment to comparison groups, in which some of the children attended the program and some did not, with added variation in whether parent education was included. Although the numbers are small, the outcome of the study is a "good lesson" to those who assume that all specialized preschool programs are beneficial. To the surprise of the investigators, preschool attendance tended to suppress parents' academic and social expectations for their children, their praise behavior, and the child's self-esteem. It is possible

to interpret these findings as both parents' and gifted children's becoming more "realistic" (as some studies of older gifted children in special programs have reported), thus representing, in fact, positive change, but such findings require some adjustment in naive expectations about program outcomes.

Only one long-term follow-up by Ehrlich (1984), attempted to discover whether children in the Astor Program for gifted children were better off if they had entered during the preschool-kindergarten years than if they had entered later. Early-entering children did seem to have more positive reactions and to remember more about their experience than later-entering children, but there was no control group and it may be that children identified earlier were different than those identified later in subtle ways.

Fowler (1992) has reported impressive cognitive skills in several groups of children who have, in day care or at home, been subjected to intensive language stimulation. A few of the subjects have been followed to adolescence. Many of Fowler's subjects were from disadvantaged homes. His outcomes outdistance those reported for a number of high-quality group programs (Lazar & Darlington, 1982) and are provocative, to say the least.

Considering the number of programs that have been described, however, this is a handful of efforts devoted to assessing outcomes, and very few evaluations have employed comparison groups. Despite the almost universal optimism of those who have been associated with these programs, one cannot at this point, in a realistic way, answer the important questions about short-term and long-term outcomes for gifted children afforded specialized preschool experiences. Dependable answers will not be obtained until we undertake studies in which gifted children are randomly assigned to specialized and nonspecialized environments, follow them carefully for some time, and replicate these studies over a variety of curricular approaches.

An Educational Alternative for Some: Early Entrance to School

Working from the assumption that children tend to learn best when they are appropriately challenged at a level for which they are ready, a number of investigators have examined the practice of admitting children to kindergarten or first grade on the basis of readiness rather than calendar birthdate alone. Despite strong prejudices on the part of many educators against such practices (Southern, Jones, & Fiscus, 1989) and a wealth of evidence that *unselected* children who are young for grade tend to do somewhat less well than their older classmates, early entrance to kindergarten for children who are *carefully selected* to assure readiness presents a viable alternative for many children (Robinson & Weimer, 1991).

The issues are far from simple in judging whether early entrance is an appropriate alternative for any given

child. Children's maturity in many areas is relevant—not only mental ability but fine and gross motor skills, reading readiness and interest, social-emotional maturity and adjustment, and so on. The availability of other viable alternatives is also an issue, as well as alternate plans should the move prove inauspicious. But many bright children are penalized for not having made friends with preschool classmates with whom they have little in common, thereby eliminating the chance to enter school, where they might find mental peers.

The evidence in favor of the excellent short-range and long-range adaptation of most children who enter kindergarten well prepared is strongly positive. In terms of social adjustment, participation in extracurricular activities, and academic achievement, the children tend to exceed the level of their older classmates (Robinson & Weimer, 1991).

Summary

As has been pointed out, the variety of preschool models is broad and impressive, but the data concerning their effectiveness is meager indeed. Case studies tend to be persuasive. Every professional in this field has seen bright preschool children who thrive in such environments, with rapid development and exuberance of spirit, children who in other learning contexts have been seen as "problems." The preschool curriculum model is probably less important than an ambience in which cognitive competence is understood and valued, and the support for the child's love of learning is a dominant concern.

But one must ask the hard questions and follow strong research designs. Specialized facilities have their own drawbacks and disadvantages against which we need to weigh the advantages they offer. Unless the benefits of programs are evaluated carefully, it will be difficult to continue to justify the programs to others, or to ourselves, as the best ways of meeting the needs of gifted young children—as convinced of their utility as we may be by our own observations.

Comment

Nurturing young gifted children is an enormous challenge for parents and educators, and a responsibility for society. At the same time, understanding their development will give us keys to understanding human variation that have been largely ignored in "mainstream" developmental psychology. Addressing the basic scientific questions with which this chapter began has the potential, then, for contributing to broadly to understanding all children, and specifically to giving gifted children the best start possible.

Many developmental questions have not even been considered in this chapter. Among these are, for example, those that touch on the interaction of advanced

development and the security of attachments, the degree to which high intelligence may help even very young children weather adversity (and, conversely, whether in the course of living ordinary lives they may be super-vulnerable to being overwhelmed by the implications of mortality and catastrophe), the possible associations of intelligence with self-regulation and moral reasoning, the effects of mental vs chronological age on social comparison processes or peer interaction patterns and demands, gender differences, and so on.

But these children are not to be ignored. They are too promising; they may be too poorly served by environments unmatched to their abilities and their needs where, as one gifted young woman reflected, "it was like living your life in a slow-motion movie." We must learn to understand, to parent, and to design environments in which gifted children can flourish.

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Suggested Further Reading

The most comprehensive treatment of issues of development in young, gifted children is to be found in

Klein, P. S. & Tannenbaum, A. (Eds.) (in press). *To be young and gifted.* Norwood, NJ: Ablex.

Other references of value that treat the topic broadly:

Bloom, B. S. (Ed.) (1985). *Developing talent in young people.* New York: Ballantine.

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Nurturing Social–Emotional Development of Gifted Children

JAMES T. WEBB

Wright State University, Dayton, Ohio, U.S.A.

Introduction

Historical Perspective

The notion of high intelligence being associated with emotional or social difficulties has been, in some ways, counter-intuitive. That is, a major and generally accepted key facet of the construct of “intelligence” is that intelligence includes problem-solving abilities in various areas, and these problem-solving abilities most often include such related areas as forethought, reasoning ability, ability to see cause–effect relations, attention to details, memory for relevant data, and a wide array of knowledge upon which the individual might draw (Sattler, 1988). To the extent that an individual possesses more of these cognitive qualities, it might seem that such an individual would then have fewer—not more—social and emotional problems. According to this logic, such individuals should be able to anticipate, avoid and/or solve more interpersonal problems than others, and should have more self-understanding.

Such assumptions and implications regarding the impact of intelligence on emotional and interpersonal functioning apparently are not always valid. Authors periodically have written of individuals who were highly able cognitively, but who demonstrated significant emotional or interpersonal deficits. Other authors (e.g., Kerr, 1985), however, have suggested that intelligence does seem related to interpersonal adaptiveness.

Historically, controversy has existed about the extent to which intellectually gifted children are prone to social and emotional problems. In the early 1900s, the prevailing notion within Western cultures was that intellectually gifted children were constitutionally more prone to insanity or to becoming social misfits. Early cognitive development was likely to result in similarly early atrophy, as was expressed in the then-popular saying of “Early ripe; early rot.” The classic Terman longitudinal studies of gifted children disproved this general notion, and found that the identified gifted children were, as a group, no more likely to experience social or emotional difficulties than were children in general (Terman, 1925; Terman & Oden, 1947). In fact, these children seemed to have fewer problems, although retrospective consideration suggested that Terman’s sample was

probably biased in ways that favored environmentally advantaged, teacher-favored children, many of whom received advice and guidance as they grew (Kerr, 1991; Webb, Meckstroth, & Tolan, 1982).

Even so, subsequent voices sometimes differed. Hollingworth (1926, 1942) agreed with Terman’s findings with regard to most gifted children, but noted that children of unusually high intelligence seemed more prone to certain types of problems. Using the then-new IQ tests, she concluded that there was an “optimum intelligence” range of about 120–145, in which range children generally had fewer social and emotional problems. However, children above that range, in her opinion, were more at risk for various personal and interpersonal difficulties.

In the 1940s and 1950s, little professional emphasis was placed on social or emotional problems of gifted children, although a few authors (Strang, 1951; Witty, 1940) wrote about the psychology of gifted students. In the 1960s and 1970s, a very few programs were begun to counsel and guide gifted students, usually programs that were affiliated with universities (Kerr, 1991), but few publications resulted concerning social–emotional needs.

In the 1980s, a surge of interest occurred in this topic. Webb, Meckstroth, and Tolan (1982) published *Guiding the gifted child*, a book which focused on social and emotional issues faced by gifted children and their families. Much of their work was based on limited amounts of research available at that time, and on the experiential evidence from numerous therapists, educators, parents and counselors. In the intervening years, new issues, perspectives, and substantial research have emerged. This chapter attempts to summarize these issues and perspectives.

Definitional Issues

During the twentieth century, studies of gifted children generally defined them primarily in terms of intelligence as measured on a standardized IQ test (Alvino, McDonnel, & Richert, 1981), thereby identifying academically gifted children. Talented children were more often considered as having one or two unusual

abilities—usually in areas such as music or art that were not considered part of the more traditional educational genre—and more often such children were described as “creative.” As a result, studies concerning the extent to which talented or creative children—as contrasted with academically gifted children—might be more prone to social or emotional problems are more often anecdotal and less well organized (Piiro, 1992).

In the last decade, particular attention has been given to reconceptualizing the concepts of “intelligence” and “giftedness,” as well as the methods used to identify such children. Prior to that time, educational and psychological practice almost exclusively identified gifted children in terms of intellectual ability and/or specific academic aptitude, despite the conceptual breadth of legislative or textbook definitions (Fox, 1981). In particular, “giftedness” was often treated as though it were synonymous with intelligence test scores and/or academic achievement test scores or educational achievements (Webb & Kleine, 1993).

Recent investigations have raised strong doubts as to the adequacy of current IQ tests to measure “intelligence,” because most assess convergent, culturally bound thinking rather than divergent, creative and innovative mental processes. Perhaps the most salient conceptualization is that of Gardner (1983) who posited the notion of “multiple intelligences” and delineated at least seven (linguistic, musical, logical-mathematical, spatial, bodily-kinesthetic, interpersonal, and intrapersonal). By doing so, he highlighted that intelligence and unusual achievement exists in areas other than the two or three (linguistic, logical-mathematical, spatial) which are traditionally measured by most intelligence and achievement tests currently used in educational and psychological settings.

Questioning whether intelligence is primarily a *g* (general) factor or a combination of *s* (specific) factors occurred far earlier in this century (Sattler, 1988); Gardner’s work is only the most recent and most oriented toward public understanding. With the emphasis on multiple intelligences, gifted, talented and creative children appear increasingly to have been considered jointly as essentially one group, where the constituents may vary greatly in the areas of high ability as well as the extent of those abilities.

Despite the refinement of these concepts, research to date on social and emotional difficulties generally has not made distinctions between these types of gifted individuals, even though several persons have expressed the opinion that more creative, “right-brained,” divergent thinking youngsters were more at risk for social problems, as well as perhaps emotional difficulties (e.g., Janos & Robinson, 1985; Piiro, 1992; Torrance, 1979).

In considering social and emotional needs of gifted children, it is therefore necessary to recognize that most of the research and observations concerning such needs revolves around gifted children who were considered gifted in more traditional ways. That is, the existing knowledge about possible social and emotional diffi-

culties is derived from children who showed unusual aptitude primarily in academic areas; children with high aptitude in other “intelligences” (to use Gardner’s term) generally have not been studied regarding social and emotional difficulties, nor has there been much study of highly able students who have been unwilling or unable to show their abilities academically. Thus, the present comments are generally limited in this regard.

What are the Social–Emotional Needs of Gifted Children?

Current Views

At the outset, it is important to recognize that publications concerning social–emotional needs of gifted children and their families can be grouped into two basic categories. One group of authors views gifted and talented children as being prone to problems and in need of special interventions to prevent or overcome their unique difficulties (e.g., Altman, 1983; Hayes & Sloat, 1989a; Delisle, 1986; Kaplan, 1983; Kaiser & Berndt, 1985; Silverman, 1991). The other group of authors (e.g., Colangelo & Brower, 1987; Scholwinski & Reynolds, 1985) views gifted children as generally being able to fare quite well on their own; gifted children with problems needing special interventions are seen as a relative minority (Dirkes, 1983; Janos & Robinson, 1985; Shore, Cornell, Robinson, & Ward, 1991).

These divergent views are not as contradictory as they might first appear. Those authors who find that gifted children are doing relatively well on their own usually have chosen students from academic programs specifically designed for gifted children. Such children, by the very nature of the selection process, are typically functioning well in school, which then generally implies also that they are not experiencing major social or emotional problems. Such selection procedures are likely to limit the representativeness of the sample of the gifted children being studied (Colangelo & Dettman, 1983) and would exclude gifted children who are academically underachieving because of social or emotional problems (Whitmore, 1980) and who are not being served educationally in special programs for gifted children. By contrast, those authors who find consistent problems among gifted children often rely on data gathered in clinical settings and from individual case studies where the population is self-selecting (Webb et al., 1982; Silverman, 1991). Likely there may be a sample bias as well in studies of such nature so as to prompt an over-estimate of the incidence of social and emotional difficulties.

It would appear that both views have at least partial validity. Gifted children who are able to function sufficiently in school settings such that they can be identified as such are likely also to be functioning generally well in other areas of life, and thus do not appear to be at major risk for developing social and emotional

problems, particularly if these children are also being served by some school program which is attempting to meet their needs. On the other hand, high potential gifted children who have not been identified and are not in school programs appear to be more at risk for certain social and emotional difficulties (e.g., Ballering & Koch, 1984). The latter group has received fewer empirical studies, however, probably because of the difficulties in locating subjects in ways that fit with accepted experimental designs, as well as because of the emphasis on considering children as gifted only when they overtly have achieved.

It should also be recognized, though, that there are exceptions to both groups. Some unidentified and unserved gifted children function quite well personally and socially; conversely, some gifted children in excellent school settings experience notable problems. The following discussion describes key dimensions that appear to relate to these exceptions, as well as to some of the more common reasons why gifted children are unable to function well enough to be identified and served.

Contextual Issues

A second major consideration involves the context within which the gifted child functions. Consideration of social and emotional functioning of gifted children cannot be considered without first considering the cultural aspects of giftedness. As Gardner (1983), Mistry and Rogoff (1985), Tannenbaum (1983) and others have pointed out, different cultures define giftedness in different ways, and different cognitive talents are valued in various cultures. In addition to the cultural attitudes that overtly define the human abilities being valued as "gifted," cultures likewise vary in the more covert attitudes that devalue gifted. It appears that most—perhaps all—cultures have ambivalence about certain individuals possessing unusually high cognitive abilities. Thus, not only must the gifted child's characteristics and needs be considered, but also the cultural context.

To a large degree, the needs of gifted children are the same as those of any other human, and generally these children go through the same developmental stages as other children, though they may reach these developmental stages at a younger age (Webb & Kleine, 1993). Similarly, gifted children face potentially limiting problems (as do other children) such as: poverty and low socioeconomic status, drugs, including alcohol, minority group status and chance (Kleine & Webb, 1992). To the extent that such needs and challenges are met by positive and supportive responses from their environment, social or emotional problems are less likely. However, social and emotional problems are more likely to the extent that the family or school meets these needs and challenges with hindrances such as harsh, inconsistent punishment, over-conformity to societal expectations, family disintegration, emotional problems by family members, perfectionism, or rewarding indiscriminately

the child's behaviors. Even so, there appear to be some social and emotional problems of gifted children that develop even when the environment, family and school personnel are supportive. In such cases the environment appears only to play a role in determining whether these difficulties become more or less resolved.

Endogenous vs Exogenous Problems

In keeping with this line of thought, a clear distinction must be made which specifically considers contextual aspects as distinct from internal personal characteristics of gifted children. It is helpful to separate social and emotional difficulties of gifted children and their families into two categories—exogenous and endogenous.

Exogenous problems are those that arise—or are caused—primarily because of the interaction of the child with the environmental setting (e.g., family or the cultural milieu). Endogenous problems are those that arise primarily from within the individual child essentially regardless of environment; that is, endogenous problems stem from the very characteristics of the gifted child. The endogenous-exogenous distinction has been used in psychology, but has not been used heretofore specifically with regard to the emotional functioning of the gifted child. Such a distinction, however, appears to have considerable merit in conceptualizing the social and emotional needs of gifted children.

Needs and Types of Problems Likely to Occur

One useful approach to understanding needs and potential problems is to examine those intellectual and personality attributes that characterize gifted children, and which often are considered to be strengths. However, as Clark (1992), Seago (1974) and others have noted, the very characteristics that may be strengths also may have potential problems associated with them. Some of the more common of such characteristics are shown in Table 1.

Even so, relatively few of these characteristics of gifted children inherently make such children more likely to experience social and emotional problems. Instead, whatever difficulties occur most often arise as exogenous problems from the interaction of these characteristics with the cultural settings, attitudes and value-milieu within which gifted children may find themselves.

Endogenous Problems

Nevertheless, some characteristics of gifted children do seem to increase the probability of social and emotional difficulties essentially regardless of the influence by the cultural milieu. Several of these characteristics are listed in Table 2.

TABLE 1
Possible Problems That May be Associated with Characteristic Strengths of Gifted Children

Acquires and retains information quickly.	Impatient with slowness of others; dislikes routine and drill; may resist mastering foundation skills; may make concepts unduly complex.
Inquisitive attitude, intellectual curiosity; intrinsic motivation; searching for significance.	Asks embarrassing questions; strong-willed; resists direction; seems excessive in interests; expects same of others.
Ability to conceptualize, abstract, synthesize; enjoys problem-solving and intellectual activity.	Rejects or omits details; resists practice or drill; questions teaching procedures.
Can see cause-effect relations.	Difficulty accepting the illogical—such as feelings, traditions, or matters to be taken on faith.
Love of truth, equity and fair play.	Difficulty in being practical; worry about humanitarian concerns.
Enjoys organizing things and people into structure and order; seeks to systematize.	Constructs complicated rules or systems; may be seen as bossy, rude or domineering.
Large vocabulary and facile verbal proficiency; broad information in advanced areas.	May use words to escape or avoid situations; becomes bored with school and age-peers; seen by others as a “know it all.”
Thinks critically; has high expectancies; is self-critical and evaluates others.	Critical or intolerant toward others; may become discouraged or depressed; perfectionistic.
Keen observer; willing to consider the unusual; open to new experiences.	Overly intense focus; occasional gullibility.
Creative and inventive; likes new ways of doing things.	May disrupt plans or reject what is already known; seen by others as different and out of step.
Intense concentration; long attention span in areas of interest; goal-directed behavior; persistence.	Resists interruption; neglects duties or people during period of focused interests; stubbornness.
Sensitivity, empathy for others; desire to be accepted by others.	Sensitivity to criticism or peer rejection; expects others to have similar values; need for success and recognition; may feel different and alienated.
High energy, alertness, eagerness; periods of intense efforts.	Frustration with inactivity; eagerness may disrupt others; schedules; needs continual stimulation; may be seen as hyperactive.
Independent; prefers individualized work; reliant on self.	May reject parent or peer input; non-conformity; may be unconventional.
Diverse interests and abilities; versatility.	May appear scattered and disorganized; frustrations over lack of time; others may expect continual competence.
Strong sense of humor.	Sees absurdities of situations; humor may not be understood by peers; may become “class clown” to gain attention.

Adapted from Clark (1992) and Seago (1974).

TABLE 2

Characteristics of Gifted Children Associated
with Endogenous Difficulties

-
- Drive to use one's abilities
 - Drive to understand, to search for consistency
 - Ability to see possibilities and alternatives
 - Emotional intensity (focus; intrinsic motivation)
 - Concern with social and moral issues (idealism)
 - Different rates or levels of physical and emotional development
-

Even the characteristics listed in Table 1 are seldom inherently problematic by themselves. More often it is combinations of these characteristics that lead to problematic behavior patterns. Some of the more common patterns from such interactions are as follows.

INTERNAL DYSSYNCHRONY

Motor skills, particularly fine-motor, often lag behind a child's cognitive conceptual abilities, particularly in pre-school gifted children (Page, 1983; Rogers, 1986; Sebring, 1983; Webb & Kleine, 1993). When the lag is substantial, and when it is combined with their intensity, the result is often emotional outbursts like temper tantrums. That is, the child may see in his "mind's eye" what he wants to do or construct or draw; however, his motor skills do not allow him to achieve his goal. The more intensely he tries, the more frustration he experiences, often resulting in an emotional outburst which may be viewed by others as immaturity.

Another kind of internal dyssynchrony is the lag of judgment or emotional maturity behind intellect (Roedell, 1980; Webb et al., 1982). Significant stress in the lives of gifted youngsters occurs when they attempt to deal with emotions or social or interpersonal concepts that are simply beyond their capacity (Hayes & Sloat, 1989b; Kerr, 1982, 1991). Many aspects of life cannot be "reasoned out" and can be understood only through the accumulation of experience (Webb & Kleine, 1993). Advanced reasoning abilities do not necessarily help in weighing emotions (Foster, 1985).

Internal dyssynchrony can likewise occur between the emotions and intellect of a gifted youngster, or within areas of emotions. Piechowski's (1991) descriptions of Dabrowski's theories appear to be most relevant. Dabrowski's concept of developmental potential not only includes talents, special abilities or intelligence in the more usual sense, but also includes five primary underlying components of psychic life. These five "forms of psychic overexcitability" are (1) psychomotor, (2) sensual, (3) intellectual, (4) imaginational, and (5) emotional, and it is these five components that give power or intensity to talent or abilities. It is also these five components that drive persons toward self-knowledge and self-actualization. Since gifted persons appear to have more intense overexcitabilities, they are more driven in these areas. However, Dabrowski

notes that the progress toward self-knowledge and self-actualization often involves times of intense emotional growth, turmoil and "positive disintegration" or "positive maladjustment" where acute self-examination and change are undertaken, and which constitute a necessary step in personal growth and development.

These endogenous aspects, however, do also have exogenous consequences. As Piechowski (1991) noted, the stronger one's overexcitabilities, the less welcome they are among peers and teachers. Further, overexcitabilities in some areas (e.g., sensual) may not be as welcomed by society as would other areas of overexcitability.

PEER RELATIONS

Although, as seen below, most peer relation problems are exogenous, there is at least one type of peer relation problem that is primarily endogenous. As pre-schoolers and in primary grades, gifted children (particularly highly gifted ones) repeatedly and intensely attempt to organize people and things, and in their search for consistency, emphasize "rules" which they attempt to apply to others. Often they invent games and then try to organize their playmates. Almost regardless of the setting, tensions are likely to arise between the gifted children and their peers (Webb et al., 1982).

PERFECTIONISM

The ability to see how one might perform, combined with emotional intensity, leads many gifted children to have unduly high expectations of themselves. The fervor of involvement in their activities combined with their unrealistic goals consumes great amounts of personal time and energy, often unproductively. Various authors (e.g., Clark, 1992; Hollingworth, 1926; Powell & Haden, 1984; Roeper, 1988; Takacs, 1986; Webb et al., 1982; Whitmore, 1985) have noted perfectionism to be frequently found among high ability children, with estimates that between 15-20% of highly able children may be significantly handicapped by perfectionism at some point during their academic careers. Some authors have suggested that anorexia is related to perfectionism, particularly among gifted adolescent girls. Though this may be true, the larger literature on anorexia also suggests an exogenous component, namely power struggles between the anorexic youngster and his or her parents.

AVOIDANCE OF RISK-TAKING

In the same way that gifted youngsters can see the possibilities, they also to the same extent can see the potential problems in undertaking those activities. Though the prevalence has not been estimated, authors generally agree that some of these children are unwilling to take such risks, and that the extent of this is related to self-concept problems (some part of self-concept problems is likely endogenous; but a

larger part is probably exogenous). The avoidance of risk-taking is often expressed in under-achievement (Whitmore, 1980), but may also be seen in obsessive indecision where the child perseverates in considering alternatives and outcomes to such a degree that taking an action is hindered. The avoidance of risk-taking is also likely when gifted youngsters initially encounter non-success, usually when going from high school to college, and find this experience to be devastating (Blackburn & Erickson, 1986).

EXCESSIVE SELF-CRITICISM

Being able to see possibilities and alternatives also can imply that youngsters not only may see idealistic images of what they might be, but simultaneously berate themselves because they can see how they are falling short of such an ideal (Adderholt-Elliott, 1989; Powell & Haden, 1984; Strang, 1951; Whitmore, 1980; Webb et al., 1982). The intensity, combined with the idealism, magnifies the amount of self-evaluation, often leading to excessive and inappropriate self-criticism. This pattern often is the foundation for one kind of depression that gifted children are likely to experience, where the depression is really anger and disappointment at oneself because of high self-expectancies (Kaiser & Berndt, 1985; Webb et al., 1982).

MULTIPOTENTIALITY

As most gifted children approach adolescence, they typically become aware that they have advanced capabilities in several areas. Many of these children enjoy tremendously this multipotentiality, and are involved in diverse activities to an almost frantic degree. While this is seldom a problem for the child, such level of activity may create problems for the family (as noted below). For the individual, however, problems may arise when decisions need to be made about career selection (Kerr, 1985). Since time is limited in any person's life, one cannot engage in all activities that one is interested in. By choosing one career path, other alternatives are essentially negated. The result can be decisional anxiety or existential depression (Webb et al., 1982). Kerr (1981, 1991) concluded that multipotentiality was the most frequent cause of gifted students' difficulties in career development.

EXISTENTIAL DEPRESSION

The intense idealism and multiple career concerns of older gifted children is not, they discover, widely shared by others their age. It is often this discovery and this idealism that prompts gifted children—especially highly gifted—to spend substantial amounts of personal time and energy searching for life's meaning as it relates to them. Career options, self-satisfaction, consistency

of beliefs and behaviors, persistence and real value to humanity—all become important concerns. The recognition that time and space limits the development of one's potential (i.e., one cannot be all that one could be simply because there is not enough time nor space) is combined with realization of the transiency of one's efforts (Hayes & Sloat, 1986b; Piechowski, 1991). The result often is that the gifted youngster feels angry at fate, questions the meaning and worth of life's existence, and experiences notable existential depression (Webb et al., 1982). Particularly is this likely if the youngster's cognitive developmental stage is still "dualistic," seeing the world in terms of absolutes of right and wrong or good and evil (Kerr, 1991), and thus the youngster is searching for absolutes about life.

HANDICAPPED GIFTED

Physical handicaps can likewise prompt endogenous social and emotional difficulties for gifted children. The child's intellect may be quite high, but because of motor difficulties such as cerebral palsy the potential cannot be expressed. Or the child may have a co-existing potential handicap such as significant visual or hearing impairment. Even the abilities of gifted children without visible physical handicaps are not uniform in ability areas. At the extreme, one can find a gifted child who is learning disabled in one or more areas.

A phenomenon often seen in such children is that they tend to under-estimate their cognitive abilities. Children who are gifted, but disabled, tend to evaluate themselves based more on what they are unable to do, rather than on their substantial abilities (Whitmore & Maker, 1985). Gifted children with physical and learning disability conditions of various kinds also often elicit exogenous responses from parents and professionals that can be handicapping to them.

Exogenous Problems

Although little clarifying research exists, it is this author's opinion that the majority of social and emotional problems experienced by gifted children are exogenous in origin. That is, the characteristics of gifted children exist in the context of the interaction of the child with the child's family, school setting, and/or culture in general, and these characteristics may, or may not, fit with that environmental context.

The lack of understanding or support for gifted children, and indeed the actual ambivalence or hostility, create significant problems for gifted children (Webb et al., 1982; Webb & Kleine, 1993). The different behaviors valued as gifted by different cultures or sub-cultures likewise may negatively influence certain talents while enhancing others (Mistry & Rogoff, 1985). Some of the more commonly occurring exogenous problem areas and patterns are as follows.

EDUCATIONAL CONFORMITY VS INDIVIDUALISM

The gifted child is, by definition, unusual as compared with the typical developmental template—at least in cognitive abilities—and requires different educational experiences (Kleine & Webb, 1992). Educational settings, however, are generally established to use task-expectancies based on age-norms, and the children are grouped by age for educational instruction. Thus, the cognitively gifted child is unlikely to fit the curriculum, depending on the rigidity of the age-groupings and on the presence or absence of flexibility in the instruction regarding individual differences among learners (Cox, Daniel, & Boston, 1985). The child, then, has a dilemma: “If I maximize my individual abilities and learn at the most appropriate pace for me, then I am likely to be seen as non-conformist. If I conform to the expectancies for the average child, then I am bored, dishonest with myself, and handicapping my future development.” Underachievement is most often the result.

Similarly, underachievement may result from school environments that are insufficiently challenging. Such schools may value good grades and performance, and the gifted children may feel positive about these schools. Careless, incomplete, disorganized, poor quality and procrastinated work may result, however, because the school environment has not taught the challenging process required for achievement (Rimm, 1991).

Probably the largest body of literature concerning gifted children (e.g., Feldhusen, 1985) concerns their educational needs, and what adaptations could or should be made to the “regular” curriculum in order to accommodate the gifted child’s needs. Except for self-contained programs or schools, these adaptations represent compromises as a part of societal ambivalence about gifted children. That is, the attitude exists that gifted children should develop their abilities, but that they also should fit in with others. Even in self-contained classes and schools which do not practice age-grouping, however, problems may occur depending on the extent of variations of levels and types of abilities, as well as the social concerns that may arise from certain combinations of chronological ages (e.g., adolescent and pre-adolescent children) being grouped together.

EXPECTANCIES BY OTHERS

Closely related to the dilemma of educational conformity vs individualism is the larger dimension of expectancies that others often have of gifted children. In fact, it is likely that the ambivalence about gifted children is simply a reflection of the ambivalence in expectations by society at large concerning education in general (Kleine & Webb, 1992; Webb & Kleine, 1993).

This issue of meeting the expectancies of others vs individualism is an enduring one in the life span of the gifted child, and is displayed in many arenas (Piechowski, 1991). This issue is seen at school, at home, with peers, and in society at large. Whitmore

(1979) listed nine behaviors that adults often find to be problems regarding gifted youngsters: not listening, dominating, tuning out, argumentativeness, refusal to comply with instructions, teasing or ridiculing, excessive competitiveness, desire to control others, and messiness with personal things and work. All of these imply some cultural or familial norm or tradition to which the child is expected to adhere.

However, gifted children—particularly the more creative ones—often are non-conformist. Whenever a person is non-conformist—that is, violates or challenges a tradition, ritual, role or expectancy—that person very often prompts discomfort in those around. The non-conformist is no longer predictable; the non-conformer is challenging the status quo (Webb et al., 1982). The more different (e.g., in creativity or intellect) the child is, the more likely that child is to be seen as non-conformist and thus more likely to experience criticism or rejection by others.

In some areas (e.g., sports) such non-conformity may be valued. However, in most modern societies there is an ambivalence about exceptionality in intellect or creativity. That is, on the one hand the societies value the products of such exceptional individuals, but on the other hand tend to pressure them to conform and feel uncomfortable with apparent lack of control over such individuals. Variations of the difficulties in conformity versus individualism may be found in several different areas.

PEER RELATIONS

Who is a peer for a gifted child? Often gifted children need several different peer groups because their interests are so varied. Because of their advanced levels of ability, often gifted children gravitate toward older children or adults in their search for peers (Webb et al., 1982). Or, if no suitable peers are immediately available, the gifted child may choose to find peers by reading books (Halsted, 1988), rather than engage in unsatisfactory boring interactions with those who happen to be around. However, to do so may be considered non-conformist by those around.

The pressures toward conformity vary within cultures as well as across cultures. For example, gifted girls, minority group children, certain religious group members, or the unusually creative child seem particularly likely to experience pressures toward conformity in peer relations (Colangelo & LaFrenz, 1981; Kerr, 1985; Piirto, 1992). Career decisions in particular are influenced by the role expectancies of those in the environment. To continually attempt to reconcile the conflict between fitting in and being an individual can be quite stressful.

DEPRESSION

Depression is usually being angry at oneself (primarily endogenous) or being angry at a situation over which

one has little or no control (primarily exogenous) (Webb et al., 1982). The two, however, are often related.

As noted earlier, the anger at oneself is generally endogenous. That is, the gifted child is able to perceive personal shortcomings equally as well as perceiving personal possibilities. In fact, however, the anger at oneself may also have an exogenous component. In some families a tradition exists of continual evaluation and criticism of performance—one's own and others. In such an environment, any natural propensity by the child to self-evaluate will likely be inflated. The possibility of clinical or sub-clinical depression will be increased in such situations, as well as academic underachievement. The characteristic most consistently found among underachieving children is such low self-esteem (Davis & Rimm, 1989; Fine & Pitts, 1980; Whitmore, 1980).

Exogenous depression may also stem from helpless anger at situations over which one feels no control (Abramson, Seligman, & Teasdale, 1978), and low self-esteem may be closely related to a poor sense of personal control over one's own life (Rimm, 1991). In general, when the environment (e.g., home, school, friends) is not supportive of one's needs, and one feels trapped, the result is typically depression. The educational misplacement of gifted children is likely to result in them being in situations which do not meet their needs, but over which they have little or no control. Similarly, if suitable peers are unavailable, the gifted youngster may feel as though he or she is in living in a world that is in slow motion.

FAMILY RELATIONS

Families are particularly influential in developing—or hindering—social and emotional competencies. Numerous authors have emphasized the obvious—namely that parents are extremely important (perhaps the most important) factors in enhancing—or diminishing—the development of achievement, creativity and eminence (Albert, 1978; Bloom, 1985; Dacey, 1989; Goertzel, Goertzel & Goertzel, 1978; Kleine & Webb, 1992; Little & Scott, 1990; Sanborn, 1979; Silverman, 1991). Family child-rearing patterns represent particular family traditions; however, cultural expectancies about child-rearing are expressed through the family as well. It is in the family, then, that several exogenous problems for gifted children may occur. Some of the more common are as follows.

POWER STRUGGLES

Most parents—particularly those with high aspirations—have definite ideas about the level of achievement or areas of competence that they view as being important for their child to attain. Intense parental aspirations, when combined with the intensity of the gifted child, can lead to major power struggles, with the resulting passive-aggressiveness by the youngster

being a major cause of underachievement (Rimm, 1991; Webb et al., 1982). Fathers in particular tend to perceive giftedness in terms of achievement (Silverman, 1986) and appear to be more likely to become involved in power struggles concerning achievement.

ENMESHMENT OR CONFLUENCE

As Miller (1981) noted, some parents of gifted children become emotionally enmeshed with their children in a different fashion. These parents narcissistically attempt to live out their own aspirations and wished-for achievements through their highly able child, and they become overly involved in the child's life. Instead of a power struggle, the child accedes to the parental over-involvement. This pattern can lead to the gifted child having a poorly differentiated sense of self-identity as distinct from that of the parent.

MISTAKING THE ABILITIES FOR THE CHILD

This problem often is embedded within the two problems noted above, and are part of the enmeshment or the power struggles. The child's unusual abilities may be what is emphasized by the parents—particularly fathers (Silverman, 1991), and the child's feelings or sense of person are denigrated. Such an over-emphasis on achievement within the family environment prompts the child toward perfectionism and superficial relations with other people, for the child, too, generally comes to internalize the emphasis on the importance of accomplishments rather than on the inherent worth as a person (Foster, 1985). To be sure, there are highly achieving persons who feel good about themselves, who are neither perfectionistic nor superficial. Such persons seem to have come from families which emphasized and modeled achievement, but balanced it with concerns for personal worth (Bloom, 1985; Cox, Daniel, & Boston, 1985; Mackinnon, 1962).

SIBLING RELATIONS

When one child in the family is labeled as gifted—and most often that is the first-born child (Boroson, 1973; Cornell, 1984; Sutton-Smith & Rosenberg, 1970), the other children in the family may view themselves as non-gifted. Gifted children often hold high status in the family (Cornell, 1983); parents often feel closer to and prouder of the child who is labeled gifted, sometimes generating adjustment problems in siblings not yet identified as gifted (Cornell, 1983, 1984, 1989; Grenier, 1985; Silverman, 1991). Despite the "either-or" thinking that siblings may engage in, there are indications that when one child in a family is gifted, the siblings are likely to be close in intelligence (Silverman, 1988). Thus, it becomes important to evaluate siblings to see if they, too, might warrant being considered as gifted. Otherwise, there is substantial likelihood of underachievement by the unlabeled, but equally bright, siblings (Webb et al., 1982).

Sibling rivalry seems more likely if the second-born child is labeled as gifted but the first-born is not (Tuttle, 1990). Whereas first-born children identified as gifted generally enjoyed a close sibling relationship, second-born children labeled as gifted experienced more problems in sibling relationships. However, as the difference in siblings' IQs increases, there is some indication that the competition among the siblings is less and the sibling relations more harmonious (Ballering & Koch, 1984).

PARENTAL UNDERSTANDING

Family problems do not occur because parents consciously decide to create difficulties for their gifted children. If problems occur, it is most often because the parents either (a) lack information about gifted children or lack support for appropriate parenting, or (b) are attempting to cope with their own unresolved problems (which may have to do with their own experiences with being gifted).

Despite conventional beliefs, parents often overlook or underplay signs of precocious intellectual development in their children (Ginsberg & Harrison, 1977; Rogers, 1986; Silverman, 1991; Webb et al., 1982). These parents—particularly fathers—often fail to recognize that their child is gifted (Dembinski & Mauser, 1978; Dickinson, 1970; Webb & DeVries, 1993), though they may recognize their child as different from other children (Webb et al., 1982). Most parents, particularly of younger children, attempt to apply guidelines and norms derived from children of average abilities or which emphasize minimally expected developmental criteria (Ross, 1964; Sebring, 1983; Webb & Kleine, 1992). Parental puzzlement and frustration often results.

Sometimes parents' own unresolved issues with giftedness contribute to family problems. Commonalities of heredity and environment usually (though not always) result in gifted children having gifted parents (Albert, 1978; Mackinnon, 1962; Silverman, 1991; Silverman & Kearney, 1989). However, most parents are unaware of how bright they are or how it affects their lives. The intensity, impatience, and high expectancies that characterize these parents, if not mediated by self-understanding, can create an environment of misery for those within the family.

CHANCE AND LOCATION FACTORS

As Tannenbaum (1983) noted, whether a child's unusual abilities become noticed, supported or valued often will depend on the time and place of the child's life. Cultural and familial support will likely be present if the child's unusual behaviors are ones that are valued at that time and place in history, but may well be thwarted in a different location or historical period. Such a lack of support can cause various social or emotional problems, or can exacerbate those problems noted previously.

Approaches to Preventing or Ameliorating Problems

Gifted children are not immune to problems simply because of their unusual abilities, though it does appear that their capabilities often allow them to experience fewer major social and emotional difficulties (Janos & Robinson, 1985). Ironically, though, the advanced ability to adapt or adjust may result, itself, in some problems such as underachievement or excessive conformity (Kerr, 1985).

Accurate statistics on the extent of social and emotional problems are lacking in large part because of the previously noted flaws in the identification of gifted children in studies of such areas, as well as because such studies generally have not controlled for the varying cultural/familial factors that lead to exogenous problems. Suffice it to say that, whether endogenous or exogenous, substantial numbers of gifted children do experience social and emotional problems at some point in their lives, and these problems can be significant ones. Further, problems of a gifted child usually affect the entire family.

Preventive Guidance Approaches

Instead of assuming that gifted children are afflicted with unique social or emotional pathology, it is more sensible to assume an approach that emphasizes enhancement of potential even when considering endogenous problems. The best and most effective approach, therefore, is one of preventive guidance.

INCLUDE PARENTS

It is important to recognize that parenting is more important than teaching in preventing or ameliorating social or emotional problems. Not that teaching is unimportant; it is just that parenting is more important since teaching—no matter how excellent or supportive—can seldom counteract inappropriate parenting. Supportive family environments, on the other hand, can most often counteract potential damage if a child has poor school experiences.

If preventive guidance approaches are to be successful, particular emphasis must be placed on helping parents to gain information. But surprisingly few efforts are made to include parents, and indeed parents are not infrequently the subject of many criticisms by educational professionals (Kleine & Webb, 1992). Some state associations for gifted exclude parents, or permit their participation only on a very limited basis, as though giving them more information or involving them jointly would be a detriment.

FOCUS ON PARENTS OF YOUNG CHILDREN

It is generally accepted that social and behavioral problems are best prevented if parents are involved when the children are young. In particular it is necessary

to help parents understand the characteristics of gifted children that may make these children seem different or difficult to parent. Such an approach would help achieve a better alignment of expectations between the home and the school, and would promote more consistency in approaches to the child. Currently, however, parents are not involved in most communities until the child is well into school. Since most gifted children are not identified as gifted until second or third grade, or even later (Webb et al., 1982), efforts to involve parents of gifted children typically do not occur until children reach these grades.

EDUCATE AND INVOLVE PEDIATRIC PROFESSIONALS

Extremely few efforts are made to assist young gifted children or their parents. Partly this is because of the difficulties in accurately identifying young gifted children (Webb & Kleine, 1993), but also partly it is because professionals (such as pediatricians and psychologists) who work with parents of young gifted children have received little relevant training about gifted children, and therefore are unable to provide much assistance to these parents (Kleine & Webb, 1992; Webb & Kleine, 1993). Clearly an emphasis is needed on helping the relevant caregivers, such as pediatricians, nurses, psychologists, day-care centers, etc., with regard to young gifted children and their parents, which further implies that these professionals should receive education about the characteristics of gifted children and implications for their adjustment (Hayden, 1985). Associations for parents and teachers of gifted children should make concentrated efforts to invite such other professionals to attend and participate in their state and local meetings, and in continuing education programs.

“USER-FRIENDLY” SCHOOLS

If parents are to become more appropriately involved with the schools (and this is even more important when the child has unusual cognitive abilities), then the schools must take a far more “user-friendly” and proactive stance toward parents of gifted children (Karnes & Marquardt, 1991a,b; Kleine & Webb, 1992). When gifted children come from an ethnic minority, such reaching out by educational professionals is even more necessary. Parents from groups which are disadvantaged are far less likely than other parents to become actively involved in their child’s school activities or to establish a partnership with school personnel. The societal disadvantages experienced by such families simultaneously put them more at risk for being unable to provide social and emotional support that the gifted child will need.

EDUCATIONAL FLEXIBILITY

From ages 6–18, the gifted child spends an extremely high proportion of his or her life in school. To the extent that the school curriculum is designed around,

and focused upon, the average or below average child, frustration for the gifted child and negative attitudes toward school are likely to occur. To the extent that the school incorporates flexibly paced educational options for gifted children based on the child’s individual needs, the frustration and negative attitudes are far less likely to occur.

Seven such flexibly paced educational options have been delineated as relatively easy ones to implement in most school settings (Cox, Daniel, & Boston, 1985). They are: early entrance; grade skipping; advanced level courses; compacted courses; continuous progress in the regular classroom; concurrent enrolment in advanced classes; and credit by examination. Mentorships have also been shown to allow flexible educational options that can prevent social and emotional problems (Reilly, 1992). Because gifted children are, by definition, exceptional, they require different educational experiences. If they do not receive such experiences, there may be clear emotional consequences as noted previously. The advantages of such flexible educational options primarily stem from their being based on competence and demonstrated ability, rather than on arbitrary age groupings.

PARENT DISCUSSION GROUPS

One particularly effective approach has been the establishment of guided discussion groups for parents of gifted children (Webb et al., 1982). These groups, which meet once each week for ten weeks, allow parents to develop a better understanding of the characteristics of their children as well as understanding of the cultural and educational milieu in which they and their children function.

Parents of gifted children typically have few opportunities to talk to other parents of gifted children. Through such groups, parents get opportunities to “swap parenting recipes” and child-rearing experiences with parents of other gifted children. These experiences help to normalize many behaviors and provide a sense of perspective, as well as to give many specific and concrete behavioral suggestions for parenting and educating gifted children. Whereas parents of other children often have informal opportunities to discuss child-rearing with other parents, it is far more exceptional for parents of gifted children to have such a resource. Most parents of gifted children report that parents of less able children have difficulty understanding the parenting experiences they describe because of the advanced levels and intensity of their gifted children.

BIBLIOTHERAPY

Parents of gifted children often are avid readers themselves, and turn to books for assistance in parenting and educational decisions. Unfortunately, books concerning gifted children are not particularly well represented in our public or school libraries, nor are they actively

marketed by the publishers. Fortunately, there are some books for parental guidance (e.g., Rimm, 1986, 1990; Walker, 1991; Webb et al., 1982) as well as for gifted children themselves (Galbraith, 1983, 1984; Halsted, 1988). Some books promote a sense of humor and perspective (e.g., Watts, 1989, 1992).

SUMMER CAMPS AND OTHER GROUP EXPERIENCES

One of the most notable benefits from a social and emotional viewpoint of summer camps, Saturday enrichment programs, Governor's Institutes, etc., is the feeling of having peers with whom one can relate, as well as having more appropriate curricular experiences (Feldhusen, 1991). The feeling of being accepted while being authentic is powerful. Such supplementary program services are able to fill in many missing educational and interpersonal experiences.

CAREER GUIDANCE

The multipotentiality of gifted youngsters virtually mandates that they receive career guidance. College planning must begin earlier than for most other youngsters (Berger, 1989; Reilly, 1990). Career and higher education guidance assume even greater importance if the gifted youngster is female or a minority group member (Kerr, 1991).

Advocacy Approaches

Perhaps some will question why advocacy approaches would be listed as a major avenue for addressing social and emotional needs of gifted children. Perhaps such inclusion will become more evident upon reflection.

CHANGING THE ENVIRONMENT

As noted previously, the largest proportion of social and emotional difficulties results from the cultural ambivalence or hostility toward gifted children, particularly if these children are creatively non-traditional. It becomes very important, then, to change societal attitudes through advocacy.

Enabling legislation is needed to allow educational systems to be more responsive to gifted children and their parents, and parents of gifted children need guidelines for pursuing due process and mediation (Karnes & Marquardt, 1991a,b). Changes in attitudes are needed to overcome the cultural ambivalence as well as to achieve more support and acceptance for gifted youngsters in developing their abilities.

ADVOCACY AS A ROLE MODEL

Advocacy, itself, provides a model of challenging traditions—the status quo. As George Bernard Shaw wrote: “The reasonable man adapts to the world around him.

The unreasonable man expects the world to adapt itself to him. Therefore all progress is made by unreasonable men.” Gifted children need—and will continue to need—role models who are “reasonably unreasonable” and who will continually advocate for excellence in various fields. Such role models help to prevent the “learned helplessness” or the cynical withdrawal and depression that otherwise might result. Minority gifted children need such advocacy in particular since often they are in a “double minority”—that is, gifted and Hispanic or gifted and African-American, etc.

Counseling and Psychotherapy Approaches

As noted previously, most counselors, psychologists and primary health care professionals have little, if any, training in assessing gifted children or in assisting such children and their families with emotional or interpersonal difficulties. In fact, some studies have indicated that these professionals have distinctly negative feelings toward gifted children (Shore et al., 1991), while others suggest that these professionals simply believe that “a bright mind will find its own way” (Webb et al., 1982). Further, most such professionals have been trained in a pathology model, rather than an enhancement of human potential model, and tend to focus only on clear dysfunctions compared with the norm rather than seeing the failure to reach potential might likewise be a dysfunction.

SERVICES UNDER A DIFFERENT LABEL

Many needs and problems of gifted children and adults are served by counselors, psychologists and psychiatrists, but the situations and problems are mislabeled or labeled in a fashion that is only partially accurate. That is, behaviors that are characteristic of gifted children or adults may be interpreted as being symptomatic of some other condition. For example, the seeing of numerous possibilities in situations would likely be classified as obsessive behavior. The intensity and daydreaming of a bored gifted youngster might be labeled as an attention deficit disorder. The existential depression might be labeled correctly, but not attributed to the person's brightness. Interpersonal withdrawal could be due to the felt lack of peers by a gifted youngster. The clownish classroom behavior of a gifted child who is educationally misplaced might be incorrectly diagnosed as an undersocialized conduct disorder behavior pattern.

ASSESSMENT APPROACHES

Sometimes formal psychological assessments are needed. This may be because of the need for a differential diagnosis, or it may be because the parents or school want a “second opinion.” It becomes particularly important for professionals doing such assessment to become educated about gifted children. For example, on projective personality tests gifted children often give

responses that might appear pathological, but really are simply a reflection of their vivid imagination combined with their intensity (Kleine & Webb, 1993). Unless mental health professionals are aware of this anomaly, many gifted children will be misdiagnosed as having severe emotional problems.

Out-of-level testing likewise may be needed since so many gifted children reach the ceiling on many subscales of most standardized tests of cognitive ability. This unusual assessment approach is the only current procedure which allows estimates of extremely high abilities. And gifted children show a great deal more intra-test scatter than do other children (Webb & Kleine, 1993). That is, there is substantially greater variability across abilities within a gifted child than among children of average or less ability level. Such variability can prompt inappropriate conclusions of learning disability or of other disorders.

TREATMENT APPROACHES

Treatment interventions generally are quite effective with gifted children and their families. Their conceptual quickness apparently allows them to more quickly grasp and apply therapeutic suggestions. Relationship and insight-oriented approaches appear particularly effective since they go along with the cognitive strengths of the gifted child. That is not to demean behavioral or strategic approaches; they, too, may be helpful. Particularly is there evidence, for example, that rational-emotive therapy approaches are effective in helping gifted youngsters learn to manage their "self-talk" that underlies their feelings of excessive stress, or of perfectionism or depression (Webb et al., 1982).

However, many gifted children have a particular need to feel understood and to have a relationship with the treating professional. In addition, most gifted children are searching for some cognitive framework through which they might understand, much in the way that the personality theorist Prescott Lecky (1945) stated that humans had an inborn drive to search for consistency.

Family therapy may also be advisable as well, for gifted children regularly have a keen impact on families. As one mother described, "Having a gifted child in the family doesn't change the family's life-style; it destroys it!" Family therapy is a particularly effective approach to issues of enmeshment or confluence, or where parents have "parentified" the gifted youngsters by giving them decision-power than is excessive.

Group therapy is often difficult with gifted youngsters in middle school because of their consuming concern with peer relations and peer evaluations, and is more effective with youngsters in elementary grades as well as those in high school. The issue of peer relations will be similar in these groups, but seems more overwhelming for youngsters in middle school grades. The high school students also often will have existential and career issues in addition.

Dual-diagnosed gifted children are a particular challenge—for example gifted and attention-deficit disorder. All of the usual problems of attention-deficit disorder exist, but are combined with the intensity and other characteristics of a gifted child. Often in such cases the knowledge concerning treatment of the pathology diagnosis must take precedence, but the treatment will move much more quickly and in unusual directions because of the mental agility of the child involved.

Conclusions

Despite the imprecision of the terms and concepts used to describe gifted, talented, creative children, current knowledge suggests that gifted children are at risk for certain kinds of social and emotional difficulties because of their personal characteristics. The larger risk for gifted children, however, appears to stem from contextual factors. Because of this, it appears important to distinguish between endogenous and exogenous causes for social and emotional problems of gifted children.

Preventive guidance approaches that involve parents appear to be the most important in nurturing the social and emotional needs of gifted children. Advocacy approaches are a key element as well both in prevention and in amelioration of problems for gifted children because they can impact upon the environmental context. Counseling and therapeutic approaches, including psychological assessment, are necessary, and substantially more efforts are needed in involving these and other health professionals.

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Nurturing the Moral Development of the Gifted

ORNELLA DENTICI ANDREANI AND ADRIANO PAGNIN

Istituto di Psicologia, Università di Pavia, Italy

Introduction

In the empirical and theoretical literature on the gifted, attention has focused primarily on thinking abilities or talents, and only in recent research has there been an increased interest in personality and social factors. The importance of moral development in gifted subjects is self-evident, because morality is at the intersection of cognition and action, and its positive development plays an important role in the equilibrium of individuals and society. Morality, in fact, is generally viewed as the set of basic guide lines for determining how decisions about action and how the resolution of conflicts among different interests/points of view are to be settled. Since morality concerns judgments about rightness of behavior, it is based on cognitive factors (analysis of behaviors and their consequences, discussion of normative assumptions) and is also guided by motivational and affective factors (motives for following assumptions in action, and capacity to act consequently). In this review, three sets of considerations on the development of morality are presented:

(1) moral behavior is based on specific cognitive abilities of rational analysis and discussion of actions concerning rights, duties and consequences (about life, affects, well-being of self and others);

(2) moral behavior has roots in affect/emotion and on control and integration of drives and needs (in terms of empathy, care for others, task commitment); and

(3) moral behavior needs to be nurtured by specific education which concerns both the cognitive and the emotional aspects.

Even if some psychologists (for instance, Aronfreed, 1968; Mischel & Mischel, 1976) view cognition as concerning only moral judgment (or verbal moral expressions, determined by cognitive factors), and affect and emotion concerning moral behavior, both are involved in judgment and in action, although with different weight. In fact, behavior is influenced by categorization of events and situations and by selection of relevant information, while moral judgment is partly pervaded by affective factors, emotional experience, attitudes, and values.

History of the Problem

In recent years a great deal of research has examined the development of moral judgment in general, based on the classical studies of Piaget (1932) and Kohlberg (1969). However, there has been little work which has examined the relationship between moral judgment and moral behavior, little research on intervention strategies for enhancing these relations, and practically no research on these issues with respect to giftedness. Research on the social development of the gifted has mostly examined topics such as adjustment, popularity, leadership, or problems in interacting with friends. Only a few studies are devoted to altruistic or prosocial behavior, or to moral development. Therefore, we are often obliged to infer the moral characteristics of the gifted from the most intelligent subjects in studies examining other topics, and only in those cases where separate data for such subjects are reported. Cognitive developmental studies of moral development have argued for the existence of a sequence of stages in judgment about the nature of rules (both in play and in interpersonal behavior), rightness of actions, and distributive and retributive justice. Piaget (1932) defined three such stages as egocentric, realistic-heteronomous and autonomous, stating that reciprocity, consideration of the intentions of agents, and reference to the functional aims of rules, are the discriminating features of autonomous morality. Piaget studied the development of concepts of "rule" and "law" by analyzing children's play behavior (especially social games, such as skittles or marbles), and by discussing game rules with the children themselves, to test their conceptions and the relationship between practice and conscious reflection on rules. He noted that children develop from egocentric behavior to respect for rules and, between 6-7 and 10-11, they became gradually aware that rules are not unchangeable, are not based on an absolute respect due to adults or to God, but may be modified through consensus in a reciprocal, cooperative perspective. Thus, they develop from a "moral realism" based on the respect for adults and authority to a "moral autonomy" based on cooperation

TABLE 1
Kohlberg's Moral Judgment Stages

Level and stage	Content of Stage		
	What is right	Reasons for doing right	Social perspective of stage
LEVEL I <i>Preconventional</i> Stage 1 — Heteronomous morality	To avoid breaking rules backed by punishment, obedience for its own sake, and avoiding physical damage to persons and property.	Avoidance of punishment and the superior power of authorities.	<i>Egocentric point of view.</i> Doesn't consider the interests of others or recognize that they differ from the actor's; doesn't relate two points of view. Actions are considered physically rather than in terms of psychological interests of others. Confusion of authority's perspective with one's own.
Stage 2 — Individualism, instrumental purpose, and exchange	Following rules only when it is to someone's immediate interest; acting to meet one's own interests and needs and letting others do the same. Right is also what's fair, what's an equal exchange, a deal, an agreement.	To serve one's own needs or interests in a world where you have to recognize that other people have their interests too.	<i>Concrete individualistic perspective.</i> Aware that everybody has his own interest to pursue and these conflict so that right is relative (in the concrete individualistic sense).
LEVEL II <i>Conventional</i> Stage 3 — Mutual interpersonal expectations, relationships, and interpersonal conformity	Living up to what is expected by people close to you or what people generally expect of people in your role as son, brother, friend, etc. "Being good" is important and means having good motives, showing concern about others. It also means keeping mutual relationships, such as trust, loyalty, respect and gratitude.	The need to be a good person in your own eyes and those of others. Your caring for others. Belief in the Golden Rule. Desire to maintain rules and authority which support stereotypical good behavior.	<i>Perspective of individual in relationships with other individuals.</i> Aware of shared feelings, agreements, and expectations which take primacy over individual interests. Relates points of view through the concrete Golden Rule, putting yourself in the other guy's shoes. Does not yet consider generalized system perspective.
Stage 4 — Social system and conscience	Fulfilling the actual duties to which you have agreed. Laws are to be upheld except in extreme cases where they conflict with other fixed social duties. Right is also contributing to society, the group, or institution.	To keep the institution going as a whole, to avoid the breakdown in the system "if anyone did it", or the imperative of conscience to meet one's defined obligations (easily confused with Stage 3 belief in rules and authority).	<i>Differentiates societal</i> point of view from interpersonal agreement or motives. Takes the point of view of the system that defines roles and rules. Considers individual relations in terms of place in the system.

TABLE 1 Continued

Level and stage	Content of Stage		
	What is right	Reasons for doing right	Social perspective of stage
LEVEL III <i>Postconventional or Principled</i> Stage 5 -- Social Contract or Utility and Individual Rights	Being aware that people hold a variety of values and opinions, that most values and rules are relative to your group. These relative rules should usually be upheld, however, in the interest of impartiality and because they are the social contract. Some nonrelative values and rights like <i>life and liberty</i> , however, must be upheld in any society and regardless of majority opinion.	A sense of obligation to law because of one's social contract to make and abide by laws for the welfare of all and for the protection all people's rights. A feeling of contractual commitment freely entered upon, to family, friendship, trust, and work obligations. Concern that laws and duties be based on rational calculation of overall utility, "the greatest good for the greatest number".	<i>Prior-to-society perspective.</i> Perspective of a rational individual aware of values and rights prior to social attachments and contracts. Integrates perspectives by formal mechanisms of agreement, contract, objective impartiality, and due process. Considers moral and legal points of view; recognizes that they sometimes conflict and finds it difficult to integrate them.
Stage 6 -- Universal ethical principles	Following self-chosen ethical principles. Particular laws or social agreements are usually valid because they rest on such principles. When laws violate these principles, one acts in accordance with the principle. Principles are universal principles of justice: the equality of human rights and respect for the dignity of human beings as individuals.	The belief as a rational person in the validity of universal moral principles and a sense of personal commitment to them.	Perspective of a moral point of view from which social arrangements derive. Perspective is that of any rational individual recognizing the nature of morality or the fact that persons are ends in themselves and must be treated as such.

From: Kohlberg, L. (1976). Moral stages and moralization: The cognitive-developmental. In T. Lickona (Ed.), *Moral development and behavior: Theory, research, and social issues* (pp. 34-35). New York: Holt, Rinehart & Winston.

and rational justification. In moral realism, moral law is reduced to behavior and its consequences, while in moral autonomy, the concern is primarily on intentions. The same transition can be seen in the conception of justice. Children pass from absolute respect of adults (and of power) to reciprocal and equalitarian conceptions, aimed at the preservation of social order.

Kohlberg (1969) searched for a more detailed succession of stages. By attributing a central role to the concept of social conventions and social rules, he differentiated six stages, grouped as follows. There are two pre-conventional stages, where a rule is a way of avoiding punishment or harm and a way to satisfy one's needs (in stage 2, even reciprocally). There are two conventional stages, where a rule is a way to feel good and to meet the expectations of the social group (stage 3), or expresses the priority of a general social point of view (stage 4). Finally, there are two postconventional

stages, where a rule expresses a more abstract point of view, referring to *meta*-rules to solve conflicts between specific different norms (stage 5), or to abstract general, absolute principles (stage 6).

In this approach, the sequence of stages is structured in the same developmental sequence as intelligence operations. Each new stage employs more differentiated, reversible and equilibrated operations and has a higher degree of generality and abstraction.

Kohlberg studied moral judgment and its development for several decades, using the method of dilemmas. This method was chosen because it did not rely on the adhesion to specific values, but required reasoning about values, whatever the opinion of the person. Kohlberg thought that moral development should concern freedom of choice, and was not simply the possession of what he called "a bag of virtues" (meaning common, socially conforming virtues). In dilemmas there is no

“right” answer, but the presence of conflicting needs or principles. Subjects are stimulated to reflect on motives for choosing one or another of the solutions to the dilemma.

In the original methodology dilemmas were proposed and discussed in long interviews, where a set of stimuli were presented with the aim of enhancing reflection. A famous dilemma used by Kohlberg is the one of Heinz who, while in a distant country (to avoid easy solutions, such as help from others or public assistance), is in a situation where he should steal an expensive drug if he wants to cure his sick wife. In the interview, many questions and alternative hypothetical circumstances follow the subject’s first answer concerning what Heinz should do (such as more serious consequences of Heinz’s actions; a different relation to the person to be helped, e.g., not wife, but a friend, an acquaintance, a stranger; and questions about the reasons for acting in one way or another, about the nature of obligation, and about what is considered as “right”). Dilemmas used by Kohlberg concerned obedience, loyalty to friends or parents, seriousness of cheating, etc. Kohlberg analyzed responses with the aim of finding specific characteristics of the stages and thereby identifying the level of reasoning of the subject. He used a complex system of scoring, which he refined for years, from a content-category scoring to a more complex “issue scoring”, to a standardized scoring for which he provided detailed criteria in a manual (the last official edition was published by Colby & Kohlberg in 1987).

The method of individual interview has been criticized as being too time-consuming, too difficult to standardize, and too easily affected by bias in scoring procedure. To avoid such difficulties, Rest (1974) proposed the D.I.T. (*Defining Issues Test*), a paper-and-pencil revision of the method. Dilemmas are followed by a set of sentences, each of which represents a prototypical response of a certain stage. Subjects are requested to state their agreement with each sentence, and then to order the most relevant sentences in order of importance. This method is less sensitive than Kohlberg’s interview method, because the subject does not produce the answers, but only chooses from among multiple-choice items. However, it permits the study of larger samples and provides numerical scoring, to which standard statistic procedures can be easily applied. Rest proposed a special score, the “P” score, as a synthetic index of moral development and uses it for studying differences among age and special groups. It is important to keep in mind that the procedures just outlined do not examine what people would do in a particular circumstance, but only what they think they might do. Of course the two things are related and we shall examine this relationship below. Subjects themselves realize that they would not always do what they should. For instance, an answer may be: “No, I don’t think it is right to steal in this case, but I’d do it because I’d be so desperate.” Therefore it is necessary to distinguish moral judgment from moral behavior.

In general, this research suggests a central relationship between cognitive and moral development and implies the importance of a higher intellectual level to reach the higher moral stages. No specific studies have been conducted on the gifted; nevertheless, gifted are presumed to have a privileged position in the maturation of stages, because of their precocious intellectual growth.

In this developmental cognitive approach moral behavior is considered to be largely dependent on moral judgment. Moral judgment, in fact, is viewed both as a necessary condition (one can’t behave fairly if one doesn’t know what is fair), and as a motivating condition (if one really knows what is good, this assumes a positive value for one’s actions) for moral behavior. Moral education has the same possibilities and limits of intellectual education. One can’t develop by simply memorizing norms or by repeating prescribed and positively reinforced actions. It is necessary to develop a broader comprehension of the nature of rules, of the differences among perspectives, of the relations among cognitive and emotional factors, both through intellectual and social stimuli. This was done in the “just community” approach by Kohlberg and other researchers.

In contrast to the above approach, other theorists (especially social learning theorists starting with Bandura & McDonald, 1963) focused on moral behavior as influenced by reinforcement and modeling procedures, and analyzed conditions for the efficacy of such procedures (e.g., characteristics of role models and their behaviors, efficacy of preaching vs. modeling). These theorists considered moral behavior mainly in terms of its concrete and social effects, and not only as an extension of judgment as cognitivists do. Consequently, many kinds of “pro-social” behavior have been examined, such as sharing goods, helping others in distress, or acting altruistically by giving time, money, and effort to persons and community. A great deal of research has examined these behaviors, analyzing in detail the effects of reinforcement procedures and of modeling conditions. The approach also outlined the great importance of models in determining moral judgment and especially moral behavior. One limitation of this approach has been that the subject is conceived as a passive organism, strictly shaped by exterior forces, wherein affects, sentiments, and values are underestimated.

Rest (1984) observes that different theories focus only on some aspects of morality and neglect others. In order to examine moral development in the full complexity and plurality of the dimensions involved, he proposed a model which provides a useful way to utilize the contribution of major theoretical approaches (behaviorists who study action, cognitive-developmentalists who study cognition, and psychoanalysts who study affect). He distinguishes four major components of moral behavior:

(1) interpreting the situation in terms of how people’s welfare is affected by possible actions of the subject;

TABLE 2
Inner Process Producing Behavior

Component 1

Major function of the process: To interpret the situation in terms of how one's actions affect the welfare of others.

Exemplary research: Response to emergencies, Staub (1978, 1979) and Schwartz (1977); social cognition development, Shantz (in press) and Selman (1980); Empathy, Hoffman (1977, in press).

Cognitive-affective interactions: Drawing inferences about how the other will be affected and feeling empathy, disgust, and so on, for the other.

Component 2

Major function: To formulate what a moral course of action would be; to identify the moral ideal in a specific situation.

Exemplary research: Cognitive-developmental, (Piaget (1932, 1965) and Kohlberg (1969, 1976); DIT research, Rest (1979) and Damon (1977); social psychology "norms", Berkowitz & Daniels (1963) and Schwartz (1977); post-Piagetian, Keasey (1978).

Cognitive-affective interactions: Both abstract-logical and attitudinal-valuing aspects are involved in the construction of systems of moral meaning; moral ideals are composed of both cognitive and affective elements.

Component 3

Major function: To select among competing value outcomes of ideals, the one to act on; deciding whether or not to try fulfill one's moral ideal.

Exemplary research: Decision-making models and factors that affect decision making, Pomazal & Jaccard (1976), Lerner (1971), Schwartz (1977) and Isen (1978); theories of moral motivation, E. Wilson (1975), Aronfreed (1968), Bandura (1977), Kohlberg (1969), Hoffman (in press), Durkheim (1925/1961) and Rawls (1971)

Cognitive-affective interactions: Calculation of relative utilities of various goals; mood influencing outlook; defensive distortion of perception; empathy impelling decisions; social understanding motivating the choice of goals.

Component 4

Major function: To execute and implement what one intends to do.

Exemplary research: Ego strength and self-regulation Mischel & Mischel (1976), Krebs (Note 1), and Staub (1979)

Cognitive-affective interactions: Task persistence as affected by cognitive transformation of the goal.

From: Rest, J.R. (1984). The major components of morality. In W.M. Kurtines & J.L. Gewirtz (Eds), *Morality, moral behavior, and moral development*. New York: John Wiley & Sons.

(2) figuring out what the ideal moral course of action would be;

(3) selecting from among possible outcomes in deciding what is actually to be done; and

(4) executing and implementing a plan of action (Rest, 1983, 1986).

Table 2 summarizes the four major processes implied in moral acts, showing that the moral behavior cannot be produced by a single process. The components represented in the table are just processes, not general traits of people, and interact with each other with distinctive cognitive and affective interfaces.

The Structure of Morality

Partially following Rest's suggestions, this review treats two main groups of factors, both comprised of various subcomponents: cognitive-rational factors and affective-motivational factors.

The Cognitive and Rational Factors

Cognitive factors include both rational, conscious considerations, as well as categorization and attribution

processes, which are often unconscious and affected by bias. Moral judgment and behavior require two processes: the evaluation of the situation (in particular, of roles and needs of the actors involved) and of the consequences (immediate or distant) of actions; understanding the rules which govern expectations and state rights, and their sphere of application.

UNDERSTANDING THE SITUATION

This aspect has been considered by classical philosophical theories of morality. Utilitarians affirm the necessity for a "right" action, to know the needs of all persons involved and the consequence of alternative actions towards such needs. In fact, the "right" action consists of satisfying, in the best possible way, the needs of everybody. The democratic principle (everyone's benefit must be considered equal to everyone else's) and the individual autonomy principle (personal benefit is defined as such by each subject) must be respected (Bentham, 1789). In a more recent formulation Hare (1981) sees this as an ideal objective since only an "archangel" would be able to know instantly what action is really "right". In reality people try to achieve this goal in two ways, first by using "prima facie" principles, suggested by experience and culture; and second by

examining problems thoroughly and by using scientific knowledge (e.g., in economy with the “marginal utility principle”).

The “responsibility” principle (cf. Jonas, 1979) is closely linked to this perspective. Moral responsibilities are directly proportional to the power of influencing needs and happiness of a larger number of people and of living beings. So, an increase in scientific knowledge and technical power implies the need for greater moral responsibility, since the future of mankind can be influenced towards good or evil. Scientific development requires moral development.

Psychological research has generated various models showing that a rational consideration of needs and interests involved in a situation can be strongly influenced by various types of cognitive, affective and social biases. Abstract principles do not provide guidelines for judgment or action until they are fleshed out with relevant details of concrete situations, and these are inevitably laden with evaluative biases.

Bias in categorization processes have been studied in the social field by cognitive theorists like Tajfel (1981), bias in reasoning processes by Kahneman and Tversky (1972), Nisbett and Ross (1980), and Johnson-Laird (1983), and from another theoretical model (social learning theory) by Bandura (1991) in his studies on moral disengagement. All demonstrate the strong influence of bias in understanding a situation. The prejudice is stronger when the situation requires a decision of action which might have particularly positive or negative personal consequences.

UNDERSTANDING RULES

This factor has been traditionally outlined by rationalist philosophers such as Kant (1788) and, more recently, by Rawls (1971). In this perspective, an action is moral only if it can be justified on the basis of a “universal principle,” i.e., a principle that can be used for everybody without leading to contradictory outcomes. According to Rawls, a “morally right” rule can be stated only through an impartial attitude, where each person applies the rule without qualification by the details of her/his actual situation, thus assuming that the situation would be the same for anybody else. This is seen as the condition of cooperation and of social living, and this attitude can be acquired by living in a free and caring community.

Kohlberg has referred to Rawls’ theory to define the developmental aim of moral reasoning, seeing it as a stage of thinking with the highest cognitive equilibrium and hierarchical integration, and which entails a consistent cluster of responses, internal consistency of reasoning and the development of moral judgment as a structured whole.

This concept of a rule emphasizes a principle of equilibrium of rights. Some recent authors have criticized this view as ethnocentric (see, for example, Kurtines & Grief, 1974; Snarey, 1985; and Gilligan, 1982).

They argue that rules always reflect the assumptions of a dominant group, élite or country (white vs. black, occidental vs. oriental, males vs. females). However, psychological research based on Piaget’s observations of the growth of rules in children’s play shows that rules have a universal nature when they are derived from a reflection on social cooperation.

The Affective and Motivational Aspects

The second group of dimensions of moral development concerns the motives for moral action. In fact, whether a person is able to apply his or her moral competence to a real-life context seems not only to be a structural problem but also a problem of affectively dealing with personal needs and self-interest in a situation.

As Bandura (1991) notes, “a person’s level of moral judgment may indicate the kinds of reasons likely to be most persuasive to that person, but it does not ensure a particular kind of conduct . . . different people can arrive at different judgments using the same principle of justness, depending on what factors they consider relevant and how they are weighted.” From such point of view, a broader conception of morality requires more than just skill in abstract reasoning. Affective and social factors play a vital regulative role in moral conduct.

Moral Motivation Theories

The problem of moral motivation can be addressed by three kinds of theories centered on emotion, on rationality, and on society and self.

Emotion Centered Theories

Guilt feeling is the first and more traditional reference point for morality in the psychodynamic theories, but other theories, including behaviorism, also consider it as the basis for moral behavior. For behaviorists, guilt feeling can be interpreted as anxiety anticipating punishment, or fear of punishment. Conditioned negative affect motivates morality (Aronfreed, 1968; Eysenck, 1976).

In psychoanalysis, guilt has a broad meaning, from normal remorse to absurd self-rebukes in severe depression. It is an affective state following an action that the subject considers “bad”. But, since the critical and punitive agent, the super-ego, is differentiated from the conscious self in childhood in the Oedipus stage, the guilt feelings, though tied to the internalization of demands and prohibitions of parents, have a largely unconscious origin and nonrational outcomes (Freud, 1923). At the other extreme, the positive feelings of social commitment and care for others are based on identification processes with parents and on the

development of basic trust in the positive primary relationships.

A somewhat different emotional state, related to guilt but with a positive quality, which has been considered as a source for morality, is empathy. For instance, Hoffman (1977) considers empathy, and empathy-based guilt, as the basis for altruistic motivation. Empathy is defined as "a vicarious affective response that does not necessarily match another's affective state, but is more appropriate to the other's situation than to one's own" (Hoffman, 1984, p. 285). This appropriateness depends on the knowledge about others and self, and definitely on one's cognitive level. Thus, it is possible to identify various developmental levels of empathic distress. Hoffman (1991) identifies four levels: global empathy, "egocentric" empathy, empathy for another's feelings, and empathy for another's life condition.

Rationality Centered Theories

In this perspective, the general nature of moral obligation is seen in the rational necessity of putting oneself beyond the particular. In the more abstract and philosophical expression, this point is made in Kant's categorical imperative, that expresses the general nature of obligation, in addition to specific, conditional imperatives such as those studied in deontic logic.

Impartial cognitive role-taking is postulated by cognitive developmental theories as the source of principled reasoning. Thus, rationality dictates morality: it is not possible to do right if one does not know what is right; and when one knows what is right, the need for cognitive equilibrium and the knowledge of general consequence of evil urges one to do right. In Piaget's theory, the obligation derives from an understanding of social cooperation and from one's own stake in making it work (Piaget, 1932). Similarly, in Kohlberg's work the origin of moral motivation is seen in the experience of living in just and caring communities. This can lead to an understanding of how cooperative communities are possible and to moral commitment (Kohlberg, 1985; Rawls, 1971).

Social and Self Theories

This perspective is elaborated in classical social learning theory, according to which people respond to reinforcement and/or modeling opportunities (Bandura, 1977), and in social cognitive theory, which includes the role of self and self-regulation mechanisms.

According to Bandura (1991), moral conduct is regulated by two major sources of sanctions: social sanctions and internalized self-sanctions. People's belief in their efficacy to exercise control over their own motivation, thought patterns and actions plays an important role. But the self is not seen as distinct from social reality, because social factors influence the operation of

the self system in three major ways: they contribute importantly to the development of self-regulatory competence, they provide collective support for adherence to moral standards, and they facilitate either selective activation or moral disengagement of self-regulation. In this perspective, even moral reasoning is not just an intrapsychic affair: "impartial role reversibility is imaginable in the abstract, but social experiences create too many human biases for impartiality of view and universalization of interest to be achievable in reality" (Bandura, 1991, p. 48).

Other researchers consider the role of the self to be a central factor in moral motivation. Concern for self-integrity and one's identity is the main moral agent for Blasi (1985); identification with something great and highly valued is part of the construction of the self for Erikson (1958). A special case of social motivation is the one illustrated by socio-biological theory. People behave morally because evolution has bred altruism into our genetic inheritance (Wilson, 1975). In the evolutionist perspective, moral behavior is assumed to be a solution to the problems of survival which confronted our ancestors, as the distinct feature of man's evolution is in the development of culture. Culture defines rules and values that support adaptive behaviors, which become a fundamental element to human survival. Some behaviors are essential for group living and the survival of culture. As they are conditions for the existence of any social group, they are universal. Nevertheless, they must be culturally transmitted, either through observation, modeling, or education. Finally, in addition to such basic rules, other rules may develop in relation to the specific conditions in which social groups live, and may change (see Hogan, Johnson, & Emler, 1978).

Ego Strength

Separate consideration must be given to the execution and implementation of a plan of action (see Rest, Component 4), which affects the relationship between belief and action. This component involves "ego strength" and self-regulation skills. Many researchers refer to this factor when discussing the observed incongruities between moral judgment and behavior (see Blasi, 1980). For instance, in an often cited study, Damon (1977) asked young children how 10 candy bars ought to be distributed as rewards. When these same children actually were given the 10 candy bars to distribute, they deviated from their schemes of fair distribution. Sobesky (1983) showed that when information about different types of consequences are added to even hypothetical moral dilemmas, e.g., as the severity of personal consequences increases, people favor self-interest over principled reasoning. In contrast, Barrett and Yarrow (1977) attributed a positive influence to ego strength, finding that social assertiveness was an important component in children's prosocial behavior.

Wisdom

The interweaving of affective and cognitive factors outlined above is also central in cultural traditions different from the Western one (Varela, 1992; Varela et al., 1991; Taylor, 1989). The traditional Buddhist concept of "wisdom" focuses on "being" right as a condition for real moral behavior: a "wise" person knows immediately what is right, without the need for conscious reflection. This immediate knowledge, which at first seems similar to unsophisticated stages of thinking, and where rules become conscious only after reflective thinking, is in fact produced by very sophisticated intellectual training processes. In this conception, moral behavior is not mere application of rules derived first from regular sequences of behavior and then from more abstract principles. Moral behavior derives from broad dispositions, possesses flexibility in the face of the great variety of circumstances confronted, and open to whatever aspect of the situation is relevant. On the whole, it is more similar to an enlightening intuition that grows from a training based on control of body sensations and functions, and joined with meditation.

Empirical Research on Moral Development in the Gifted

Although there are many empirical studies on moral development, particularly in the cognitive-developmental area (e.g., Kurtines & Grief, 1974; Modgil & Modgil, 1985; Rest, 1986; Colby & Kohlberg, 1987), research is scarce in the area of the moral development of the gifted. Abroms (1985) noted the scarcity of data on altruistic and pro-social behavior of gifted children. She also noted that the few studies gave contradictory results on the relationship between general intelligence, social competence and altruism.

There is no necessary relationship between morality and intelligence, as shown by studies on deviant behavior and crime among the gifted (Gath, Tennent, & Pidduck, 1970; Brooks, 1985). Narvaez (1991) notes that the relationship between moral development and giftedness can be described from two perspectives: the first considers moral giftedness as dependent on intellectual giftedness, whereas the second argues that giftedness is not a general factor, but is highly specific, since particular skills are fairly autonomous. Nevertheless, there are many signs of potentially positive moral development in the gifted, based on social competence or abilities.

In a review of research on giftedness in early childhood, Casey and Quisenberry (1976) observed that gifted children have high social ability and readiness to make friends with peers or older adults (see also Miller, 1956; Gallagher, 1958). Gifted children are also superior in social adjustment (Abroms & Gollin, 1980; Childs, 1981) although they may have some problems in interaction due to superior ability in verbal communication, which causes a dissynchrony of intellectual

needs and interests. Many aspects of social cognition imply conceptual tasks where bright children can do well, such as social perspective taking (Abroms & Gollin, 1980), social problem solving (Roedell, 1978), or social knowledge (Scott & Bryant, 1978). Janos and Robinson note that the most important social indicator, affective perspective taking, is correlated with IQ from the beginning of preschool years (unlike perceptual and conceptual perspective taking, which is correlated only later with IQ). On cognitive factors the superiority of the gifted has been mentioned by many authors. Terman (1925) noted that his sample of gifted children showed a superior maturity in moral development in choosing social constructive activities and in rating misbehaviors. Thorndike (1940) found that the intellectually gifted disregarded conventional prohibitions about personal habits, but were highly mature in judging antisocial behavior and showed a social maturity beyond their chronological age. Although these pioneering studies did not use completely reliable instruments, recent research using more sophisticated and standardized techniques (such as Rest's D.I.T.) have produced similar results. Intellectually gifted children appear to reach a relatively high stage of moral reasoning earlier than their chronological peers (Karnes & Brown, 1981; Tan-Willman & Gutteridge, 1981). Some may be able to use principled reasoning during mid-teens, a stage normally reached only in adulthood by a small segment of the population. Using Rest's D.I.T., Janos & Robinson (1985) also found significantly advanced moral judgment in older gifted students (up to 18 years old). Other authors stress that reaching higher stages of thinking is a prerequisite for reaching the higher stages of moral judgment described by Kohlberg (Walker & Richards, 1979). Walker (1991) believes that moral reasoning is based on, and constrained by, cognitive development; adequate solutions to difficult moral problems tend to require systematic thought and logical analyses. Advances in cognitive development place individuals in a state of readiness for moral growth, as they may more easily understand higher moral reasoning and recognize deficiencies in common moral thinking. High intellectual ability, fostered by education, favors reaching a postformal stage in moral reasoning (Armon, 1984). Generally speaking, it has been observed that gifted children and adolescents obtain better results in paper and pencil moral reasoning tests (see the review by Rest, 1986). Narvaez (1991) found a significant correlation between giftedness and principled scoring in students.

Andreani and Orio (1972), Andreani (1992), and Janos and Robinson (1985) found that personality traits frequently found in the gifted have potential relationship with some components of moral behavior, like ego strength and a capacity for implementing the correct course of action (Component 4 in Rest's model). Andreani and Orio (1972) examined the personality of a sample of 128 gifted subjects, by projective tests such as the Rorschach, and found a pattern characterized

by empathy, emotional reactivity, as well as strong aggressive and sex drives (usually well controlled), low conformity behavior, high need for achievement and autonomy. In a review of relevant literature, Janos and Robinson (1985) concluded that the gifted are characterized by self-sufficiency, independence, dominance, individualism, energy, self-direction and nonconformity.

Freeman (1991) noted that some of these traits or drives—such as dominance, competitiveness, or need for achievement—might lead in either positive or negative social directions. From the point of view of “morality of responsibility,” success in career aspirations, professional excellence and civic responsibility are related, and the basis for a rational moral behavior (oriented to maximum community advantage). Deemer, who tested 100 subjects over 10 years of age, found high correlations between Rest D.I.T. scores, career orientation, civic responsibility and political awareness (Rest et al., 1986). On the other hand, the nonconforming attitude of the gifted may, in certain situations, lead to opposition to and protest against authority and rules. In extreme forms, this may take the form of revolutionary actions or a retreat to a private world of unrealistic fantasies.

Usually, findings regarding favorable social adjustment come from studies of moderate rather than extremely gifted children. The most talented are more vulnerable, as they are often “out of synchrony” with others (Janos & Robinson, 1985). As Freeman (1985, 1991) notes, highly gifted children are particularly sensitive and reactive to social stimuli, and so are exposed both to most positive, highly intellectually and socially developed experiences, as well as negative ones. Such susceptibility to environmental conditions shows the importance of sustaining interventions, both in the intellectual and in the personality domain; as Heller (1992) reported from the Munich Longitudinal Study on Gifted Students, the belief that the gifted do not need special support or counseling is an incorrect assumption which has been empirically proven wrong. Andreani and Pagnin (1991, 1992) have examined these problems in studies on large samples of students (1140 and 371 subjects, respectively), using Kohlberg’s and Rest’s models to study moral judgment through the method of dilemmas, questionnaires and interviews. They used dilemmas which focused on the values of human life and social norms, more stimulating and nearer to personal experience or contemporary issues than the “classical dilemmas”—concerns about abortion, euthanasia, racial prejudice, kidnapping, bribery, and war. The texts of dilemmas were followed by prototype responses for objective scoring, such as in the classical D.I.T., but also by items concerning other dimensions of moral judgment (e.g., role taking, comprehension of situation, personal affective reactions). These were followed by individual interviews on a representative sample of subjects. Such measures were associated with other kinds of tests measuring abstract reasoning, creativity, values and, in a reduced sample, Piagetian stages of thinking (individually assessed by Longeot’s

test). The results showed that the gifted, relative to other students, give higher approval of abstract and general principles (postconventional in the sense of Kohlberg) and of respect for law and contracts, present higher coherence of reasoning, and give less importance to other people’s opinions and agreement. Finally, they gave less importance to sentimental–humanitarian expressions, which constituted the basis for a more intuitive morality in the lower ability groups.

On the basis of these results, Andreani and Pagnin (1991) proposed a two-level model of moral judgment. The first level is a morality of sentiments based on common sense and sympathetic feelings. The second level is a rational morality, centered on rational principles and the attempt to weigh the consequences of actions. The first level is more typical of average and low intelligence subjects, while the second is more typical of the gifted. While the first one adheres to a common standard, the second requires a calculation of benefits to different actors, a forecast of the outcome of actions, a balance of the different aspects of rights, and an examination of different possible roles to be assumed. All these factors influence outcomes of achievement and the possibility of self-realization, so principled considerations which are understood on the rational level may be omitted or distorted in the concrete situation. In addition to this general characteristic, it is possible to identify different patterns of moral beliefs and behavior in the gifted, due to important differences in the contents and in the values involved in judgments (Andreani & Pagnin, 1992). In fact, by focusing on logical coherence, some subjects tend to neglect the immediate feelings of empathy and the common moral inhibitions. For instance, if the main value is formal justice, helping or caring behavior might be neglected; or if the main value is personal freedom, the respect of law might be broken.

It can therefore be concluded that the gifted have the potential for a high level morality development, which would give them the opportunity to become real leaders, making a positive contribution to their community and to humanity. However, this potential will not be realized in a simple and automatic way in the absence of educational support and favorable intervention. There is the danger that the bright picture of gifted personalities, potentially ready to restructure ways of thinking and social situations with creative inventions, is obscured and deformed in the “gifted syndrome,” which emphasizes inner life and intellectual traits, leading to excessive abstraction (and perhaps even autistic thinking), to impulsive reactivity, anxiety, and rebelliousness.

Teachers and parents should appreciate the intellectual superiority and precocity, but not the narcissistic pride and excessive pursuit of personal success. The need for achievement should be task-oriented more than self-oriented and goals should be also be chosen for their social relevance. The gifted should be taught to exercise responsibility in their choices and to respect and help others.

Educational Interventions

If one wants to enhance the development of moral behavior, an environmental context which stimulates both cognitive and social-affective aspects of morality must be provided. Berkowitz (1985) and Keller and Reuss (1985) suggest that the capacity for moral judgment is based on the experience of discussing choices:

“The child must acquire the ability to express his or her own needs, interests, feelings and convictions, and at the same time to consider the claims of others. How adequately the child is able to do this depends on two factors: first, on the latitude of unconstrained discussion in factual communication and life practice, as well as in the context of institutionalized learning processes; second, on the child’s level of development” (Keller & Reuss, 1985, p. 121).

To be free to form a personal opinion, to justify it, and to face possible objections, is something that children learn only when given a fair chance, by being members of a relaxed discourse community, where they can experience the tensions involved in communicating in real life situations, to learn the ways of coping with obstacles, and to solve conflicts. Moral discourse involves the goal of reaching a justified agreement, shared by all those who are concerned.

In fact, cognitive–developmental oriented research has used communication, discussion and cooperation to enhance moral development. Kohlberg (1985) conducted interventions based on the “just community” approach to moral education, where such principles were applied. Kohlberg conducted his intervention in a school and also (with some difficulty) in a prison, with the aim of demonstrating the practical usefulness of the theory and of pointing out the relationship between cognitive and social aspects in his model. In fact, pupils experienced freedom of discussion about principles in an accepting and collaborating community. In this situation they were stimulated to look at concrete, real problems and at general, abstract ones, to state rules, to discuss how to maintain them, and to decide how to face the problems and conflicts inside the community. In this way, moral education was not simply reduced to a discussion about hypothetical dilemmas, but also involved social–cognitive experiences.

The efficacy of interventions in enhancing the level of moral reasoning is pointed out by many researchers such as Erikson et al. (1976), Panowitsch (1975), Preston (1979), Shafer (1978), Sprinthall and Bernier (1977), St Denis (1980), Riley (1981), Whiteley (1982) and Willging and Dunn (1982). A comprehensive review (including unpublished dissertations) is provided by Rest and Thoma (1986), who conclude their *meta-analysis* by stating that “moral education programs emphasizing dilemma discussion and those emphasizing personality development both produce modest but definite effects” (Rest & Thoma, 1986, p. 85). More recently, positive

results of intervention have been found by Keen (1990). These results are probably connected to the cognitive and role-taking prerequisites of the subjects, as Walker (1980) and Rest and Thoma (1986) note. Rest and Thoma remark that in order to obtain consistent results the educational programs must be at least three weeks long. Andreani and Pagnin think that much longer periods are necessary, perhaps with recovery intervals followed by new rounds of intervention.

Doubts about the impact of programmes based only on rational and verbal methods, like the discussion of dilemmas, have been expressed by many authors. They have observed that the usual cognitive interventions obtain more success in the improvement of moral judgment regarding theoretical questions than in discussion of real life conflicts (Oser, 1981; Villenave-Cremer & Eckensberger, 1985). Edelman (1985) claims to be “sceptical” about these programmes, because a theory of intervention into moral development must be part of a more encompassing theory of moral performance and at present such theory is at best a nascent one. Critics remark that the constructivist educational intervention is based on the function of cognitive conflict in development. The strategy used to induce cognitive conflict is discussion, involving comparison and contrast. However, it is not clear whether this strategy will work for moral growth, in the way that it works for cognitive growth. The radical critics see moral judgment as representative only of talk and argument, of an ability in verbal fluency or in elaborating excuses, and not of social action and behavior.

Faced with such criticisms, even cognitive theorists recognize that verbal moral judgment does not explain all moral behavior. In fact, many studies have examined the relation between moral judgment and moral behavior, using various kinds of behavior assessment, including laboratory measures (e.g., Prisoner’s Dilemma Game, cheating, sharing), and naturalistic measures (e.g., school and clinical ratings, reports of antisocial behavior, delinquency, performance in caring activities by doctors, or conscientious objectors). Rest (1991) notes that, in general, the finding from these studies is that moral judgment is consistently related statistically to behavior measures, but the strength of the relation is quite moderate.

Excessive emphasis of cognitivist theorists on the role of cognitive conflict in moral reasoning has also been criticized by others who have attempted other approaches. The most important contribution has been made by social learning theorists, who have underlined the role of modeling in developing social behavior. A great deal of research has examined the efficacy of modeling in relation to the characteristics, power, and the role of the model. Results show the superior efficacy of a loved model, of a model that has power to reward the child, and of a model wherein the child is rewarded for his/her behavior.

Parents are the first models for the child, as they are loved, near and powerful. The basic trust, necessary for

the construction of positive feelings of commitment with others, is experienced with them. Also the process of identification with parents is the basis for the construction of an ideal self, and of the self-regulation processes that are implied in moral behavior.

Teachers and educators also play an important and similar role. It can be noted that this function of models has been outlined since the classical, humanistic moral education. For instance, the study of history, even in the ancient Roman period, had the function of presenting ideal models of living for a virtuous person (e.g., the life histories written by Plutarchus or the examples suggested by Seneca). Walker has taken an approach which emphasizes the role of parents both as models and as agents of constructive discussion. On the basis of microanalytic methods used to study family interactions, he concluded that those children who evidenced the greatest moral development had parents who provided the stimulation of a relatively high level of moral reasoning and who engaged in behaviors such as eliciting the child's opinion, asking clarifying questions, paraphrasing, and checking for understanding (Walker, 1991). These are typically cognitive interventions. However, Walker notes that parenting behavior which predicted the greatest development also entailed supportive interactions, while the least moral development involved affectively conflicting interactions (Walker & Taylor, 1991). The negative role of family conflict is confirmed by the follow-up study of Freeman (1991).

Conclusions

To deal with the problems discussed above, it seems necessary to integrate the classical, Kohlbergian-type intervention with more emotionally and socially oriented programs, aiming in particular at a positive construction of the self. This is the intent of the so-called "value clarification" approach of Simon, Howe, and Kirschenbaum, (1972). Through a series of exercises, young persons (usually students) are encouraged to become aware of their own values and are then asked to affirm them in public and to openly commit themselves to the values (Blasi, 1985). This approach elicits emotional and social involvement of the person, but does not require a discussion and justification of values in rational terms. As Blasi points out, the approach makes clear that values elicit fidelity and pride, and shape and express one's identity.

In contrast, Kohlberg's cognitive-developmental approach emphasizes rational justification of values. When solving moral dilemmas, individuals are asked to discuss their choices: not simply accepting, but justifying. Teacher or peers challenge these reasons by pointing to contradictions or unacceptable consequences and by systematically comparing different criteria. In stating that moral values must be rational, this approach also holds that each person's ideas and values can, and should, be questioned. This appears to be more appropriate for

gifted children, who enjoy the discussion of principles and are ready to follow an argument. Blasi maintains that a true moral education, aiming at the construction of what he calls a "moral personality", should include both rational principles and a willingness to subordinate personal interest to universal principles. Beside these two factors, it seems important also to enhance the development of sympathetic feelings and a capacity for identification with others. Compared to strictly intellectual abilities, the gifted sometimes seem to be less developed in this area.

These reflections confirm that moral development is a result of many components that give rise to distinctive processes. The gifted are naturally at a higher level for some of these components, while for others they must be more specifically helped—particularly, in the exercise of delay of gratification, control of drives, altruistic behavior, and social responsibility. The process of education should integrate all of these factors through a process which favors an objective attitude towards facts and capacity for deductive and inductive reasoning. In the humanities the process may involve the analysis of novels and poems and the study of philosophy and history, as a means to increase the understanding of human behavior and empathic comprehension of others. Beside this, discussion with peers and with adults and experiences of cooperation could compensate for any lack of direct social experience. Although the gifted have a more precocious intellectual growth, they cannot anticipate the experience of life. They need to reflect on the contradictions between principles and values that are present in society.

The ideal aim of this integration of cognitive, affective and motivational aspects can be seen in the attainment of an ethical "know how", as Varela (1992) put it, referring to the distinction between "knowing what", i.e., theoretical knowledge, and "knowing how", i.e., a practical knowledge which can be translated immediately into action. This objective is particularly relevant for gifted, whose high level of ability and formal thinking might favor intellectual egocentrism (Inhelder & Piaget, 1955) and abstraction from real life and the concrete problems of people. Educational programs that increase moral judgment abilities through various cognitive techniques should also include the assumption of social responsibility, methods to foster sensitivity for the needs of others, to encourage altruistic behavior and cooperation more than competition, maintaining autonomy and independence of thinking, to increase ability of long-term planning, and the capacity to persevere when faced with difficulties and possible failures.

As Gruber (1985) writes, being gifted or creative imposes a special moral responsibility on an individual: a successful, creative person is in a position to assume moral responsibility since he or she has earned some degree of stature that may make it possible to affect the course of events. Gruber cites the example of physicists who, after having been involved in the invention of nuclear weapons, tried to discover ways of applying

the knowledge to purposes of social utility. In fact, all scientific discoveries and inventions can be used for the benefit of humanity or for destructive purposes. Surely, the gifted have an extraordinary potential for good or evil, since they could contribute to the solution of many problems such as health, hunger, pollution, and war, or they could become dangerous leaders of socially deviant groups. In short, giftedness, creativity and moral responsibility could be the winning weapon for human survival.

The presence of gifted children and adolescents in the younger generation is a challenge to the educational imagination, a moral responsibility for parents and adults involved in their care, and for the whole community that must reconcile the equality of opportunities for all with special strategies for nurturing the talents of the few, helping them to reach moral excellence together with excellence in specific domains. In a paraphrase of Plato's definition of the poet, we might say that "Light things are the gifted, winged and sacred: let us help them to grow and fly".

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Programs and Strategies for Nurturing Creativity

DONALD J. TREFFINGER, MARION R. SORTORE, AND JAMES A. CROSS, JR

Center for Creative Learning, Sarasota, Florida, U.S.A.

The topic of creativity has been a major theme of interest in psychology and education for at least four decades, and it has played a significant part in the literature of gifted education at least since the early 1970s. Interest in creativity in the business world has also increased dramatically in the second half of the twentieth century, and has begun to serve as a catalyst for research and development efforts to extend into educational theory and practice as well. On the whole, then, creativity continues to be the focus for much discussion among practitioners, and to an increasing extent an area of expanding research activity as well. Interest in creativity tends to focus on three principal issues: understanding the nature of creativity, methods and resources for identifying or measuring creativity, and methods, techniques, or programs for nurturing or developing creativity. The principal focus in this chapter will be the third of these issues, nurturing or developing creativity, recognizing that any discussion of this topic will necessarily also include consideration of some aspects of the other two issues. It is impossible to address many of the key issues in nurturing creativity without taking into account the important, related issues of defining and assessing creativity.

The four major purposes of this chapter are: first, to address briefly some basic issues of definition, so as to provide a common vocabulary for the chapter; second, to review, also briefly, the history or chronology of major themes in research on creativity development; third, to identify several areas about which there is a degree of agreement or consensus about creativity development, with specific emphasis on gifted education; fourth, to identify and describe briefly several critical issues in the field and several promising directions for future research on the topic.

Some Fundamental Definitions

Neither the word “nurturing” nor the word “creativity” are terms about which there is unanimity of definition, either among professionals or in a wider audience. Does nurturing or developing creativity mean making or enhancing potential where previously little or none existed? Does it mean to free or release potential to

whatever extent or degree it was previously present but unrealized or unexpressed? Or does it suggest an intervention that is more proactive and deliberate than merely releasing or activating?

For that matter, what does “creativity” mean? Does creativity refer to productivity in an artistic, scientific, or inventive context? Is creativity a kind of thinking, a way of solving problems, or a way of feeling, growing, or behaving? Might it take the form of attaining a higher degree of consciousness, or an expression of a certain lifestyle or a degree of personal self-fulfillment? Or might it be none, or all, or any of these? How certain are we, really, about what we want to discuss when we consider “stimulating creativity?”

The issue is not that we lack a definition of creativity, for in fact there are many definitions (Dacey & Madaus, 1969; Dacey, 1989; Treffinger, Sortore, & Cross, 1992a,b in press). But, there has been no single universally-accepted definition or model, nor a unifying synthesis among the models and definitions before us. Many explanatory frameworks have been proposed (e.g., Rhodes, 1961; Torrance & Safter, 1990; Treffinger, 1988; Treffinger, Sortore, & Cross, in press a; Treffinger, Feldhusen, Isaksen, Cross, & Remle, in press), but the quest for consensus remains substantially unattained. There is little or no conceptual clarity in the field (Treffinger, in press).

Some specific questions emerging from this issue in relation to gifted education include:

- Is creativity a condition for giftedness? Is it an expression of giftedness? Is the term “creatively gifted” descriptive, or redundant?
- Is creativity a dimension of intelligence; a kind of gift, separate in some way; or a dimension of talents in content domains?
- What are the strengths, limitations, and most promising potentials of various existing definitions of creativity with respect to advancing our understanding of giftedness?
- Should nurturing creativity be an appropriate goal of gifted education? If so, for whom, and how is it unique to gifted education?

For the purposes of this chapter, the approach presented by Treffinger, Feldhusen, Isaksen, Cross, and Remle (in press), who proposed a specific model to

Organization and Structure of Productive Thinking

C. The Complex Methods

Problem Solving	Decision-Making
<ul style="list-style-type: none"> • Understanding the Problem <ul style="list-style-type: none"> Identifying broad goals or objectives Describing an opportunity, concern, or challenge Gathering and sorting relevant data Defining a specific problem • Generating Ideas • Planning for Action <ul style="list-style-type: none"> Evaluating promising solutions Building acceptance and Creating a plan Monitoring implementation and feedback 	<ul style="list-style-type: none"> • Identify the objective • Describe the setting, context, & obstacles • Gather relevant information • Specify and analyze alternative actions • Delineate possible outcomes • Estimate payoffs or satisfaction for each outcome • Choose best action • Develop implementation plan.



B. The "Tool" Skills

Creative Thinking	Critical Thinking
<ul style="list-style-type: none"> • Fluency • Flexibility • Originality • Elaboration and Synthesis • Curiosity • Openness to many ideas, paradoxes, dealing with complexity, tension and ambiguities • Risk-taking • Imagination and humor • Finding "essences" and constructive resolution 	<ul style="list-style-type: none"> • Delineate a cognitive task or problem • Understand and interpret information • Judge accuracy and relevance of information • Identify assumptions and biases • Detect fallacies and biases • Derive and evaluate inductive conclusions • Reason deductively and judge validity of conclusions • Apply strategies to compare, contrast, refine, and/or strengthen ideas or arguments.



A. The Foundations

Knowledge Base	Motivational Elements	Metacognitive Controls
<ul style="list-style-type: none"> • Declarative knowledge • Procedural skills • Information • Concepts • Schema 	<ul style="list-style-type: none"> • Self-esteem • Persistence • Commitment • Attitudes • Styles • Sustained Interests 	<ul style="list-style-type: none"> • Planning • Goal Setting • Selecting Strategies • Monitoring • Using Feedback • Evaluating Results

FIGURE 1. Organization and structure of productive thinking. Source: Treffinger, Feldhusen, Isaksen, Cross, & Remle (in press), & Copy; 1993, Center for Creative Learning; reproduced by permission.

represent the organization and structure of productive thinking, will be followed. Their model is presented in Figure 1.

This model illustrates the need to view creativity within the broader construct of productive thinking. Creativity is one among a number of important skills people use to reason, solve problems, make decisions, and add meaning and value to life. In this chapter, however, in order to maintain a reasonable size and structure, we will focus primarily on research relating to creativity and problem solving.

An Historical Sketch

Within the twentieth century, three general periods or eras can readily be identified in relation to nurturing creativity. These might be referred to as:

- The “Creativity is Diverging” Era (1950s and 1960s).
- The “Packages and Programs” Era (1970s and 1980s).
- The “Ecological” Era (Harrington, 1990; Isaksen, Puccio, & Treffinger, in preparation), which is now emerging.

These three eras have approached two important research questions about creativity quite differently: questions relating to assessing creativity, and questions concerning the nurture or development of creativity. The differences among the three eras are summarized in Figure 2.

Three Major Eras in Creativity Research		
Era	Understanding of Process	Understanding of Assessment
1950's—1960's	Focus on divergent thinking. “Creativity=Diverging”	Study traits and characteristics of “the creative person;” tests of divergent thinking emerge.
1970's—1980's	Packages and programs; Balance between creative and critical thinking.	Use “multiple criteria;” Level of creativity “vs.” style of creativity; Efforts to link person and process (ATI).
1990's	Ecological view—focus on componential view of process; descriptive, natural—not prescriptive.	Emphasis on profiling; Taking into account many characteristics, processes, context, and tasks or outcomes.

FIGURE 2. Three eras in creativity research.

The “Creativity is Diverging” Era

The first modern era of research and development on nurturing creativity can be traced to the early 1950s, continuing into the 1960s, and centering around the seminal

writing and research of several key people. Guilford's contributions to stimulating interest in research on creativity are widely recognized, for example, as pioneering efforts. In particular, his address on creativity to the American Psychological Association (Guilford, 1950) is widely cited as a major event in the era. During this era, American education and psychology was influenced considerably by the pioneering efforts of Osborn (1953), Parnes (1967), Torrance (1962, 1963, 1965, 1970), Taylor (1964, 1968, 1969, 1986), and Stein (1974, 1975).

During this period, creativity came to be synonymous with divergent thinking for many people. This resulted from the attention given to Guilford's (1959, 1967) concept of divergent production in the Structure of Intellect model, Torrance's (1963, 1966) fluency, flexibility, originality, and elaboration, and Osborn's (1953) emphasis on the principle of deferred judgment and “brainstorming.” Some researchers, notably Barron (1968, 1969), MacKinnon (1962, 1965), and others at the Institute for Personality Assessment and Research at Berkeley, considered personality traits as correlates of creativity. The major focus of the era, especially insofar as efforts to nurture or develop creativity were concerned, was clearly on promoting divergent thinking.

Three major research and development efforts in this era give evidence of the importance of divergence: studies attempting to clarify the relationship between creativity and intelligence; studies focusing on the development and validation of creativity tests; and, early development of creativity instructional or training programs.

CREATIVITY AND INTELLIGENCE

As curiosity increased about creativity and its nature, particularly in relation to Guilford's hypotheses about a multi-faceted conception of intelligence, some researchers began to ask, “What is the relationship between creativity and intelligence?” If traditional conceptions of intelligence focused on information, memory, and logical thinking, or on more convergent mental operations (in Guilford's terminology), then surely the new focus on creativity, as divergent thinking, might be expected to be independent of, or uncorrelated with, such traditional measures. Getzels and Jackson (1962), Wallach and Kogan (1965), and Hudson (1966) conducted extensive studies seeking to differentiate creative (or divergent) thinkers from their intelligent (or convergent) peers. Wallach (1988) revisited much of the research of this era, and concluded that “ideational fluency tests . . . seemed to measure something other than, or in addition to, what is measured by IQ tests, whereas other divergent thinking tests merged more with IQ” (p. 103).

DEVELOPMENT AND VALIDATION OF TESTS

This era also included many pioneering efforts to create tests to measure creativity. Generally, regardless of

minor variations in terminology, the central focus of development and discussion was divergent thinking. Although several researchers created test batteries, the most widely used and researched were those developed by Torrance (1966) and Guilford (1967), both of which measured several aspects of divergent thinking, and by Wallach and Kogan (1965), who focused more specifically on ideational fluency. Measures of divergent thinking have been, and continue to be, the focus of considerable discussion and controversy in the literature (e.g., Wallach, 1970; Crockenberg, 1972; Tannenbaum, 1983). Runco (1990) reviewed and summarized the literature on divergent thinking among children, and concluded that such measures can be useful in studying variables related to creativity, but they should certainly not be considered comprehensive indicators of creative talent.

EARLY PROGRAM DEVELOPMENT

Creativity instructional programs in this era also emphasized the role of divergent production in creativity. Many of the forerunners of modern programs originated in this era. Many of the early programs provided teachers with a variety of divergent or brainstorming tasks to use in the classroom, referring to these as “creativity exercises” or “creative thinking” activities for the students. These included, for example, a series of “Ideabooks” (Myers & Torrance, 1964, 1966a,b), the Classroom Ideas program (Williams, 1970), and classroom materials based on Taylor’s (1968) “multiple talents” model. The Purdue Creative Thinking Program (Feldhusen, Bahlke, & Treffinger, 1969) provided a number of printed exercises which also emphasized verbal and figural divergent thinking. Treffinger and Gowan (1971) and Treffinger (1977) provided an extensive annotated bibliography of “methods, techniques, and educational programs” for creativity development. Almost all these resources focused primarily or entirely on the training of divergent thinking.

The research and development efforts of this era made some important contributions to our understanding of creativity and its development. Arguably the most important contribution was to begin to call the question of creativity to the attention of educators, psychologists, and researchers. Although Guilford (1950) noted the lack of attention that had been given to inquiry into creativity, by the end of the 1960s the situation had already changed considerably. The early efforts in test and program development during this era broke the ground, defining many aspects of creativity operationally and creating a foundation for research and development efforts to begin to address one of the most complex and fascinating dimensions of human potential. The researchers in this era began with hypotheses for which there was very little clear evidence or support in the literature upon which to base their predictions. They ventured in exploratory ways into domains that had previously been uncharted.

In addition, many of the early efforts did lead to results which some consider successful. The tests developed by Torrance (1966), Guilford (1967), and Wallach and Kogan (1965), for example, are still widely studied and used by creativity researchers. Some evidence supporting the concurrent and predictive validity of such measures, over time spans of more than 20 years, has been reported (e.g., Torrance, 1971, 1981a,b). Research with instructional programs established that students at many ages could improve significantly their ability to produce many, varied, and original ideas (Torrance, 1972, 1987).

The “Packages and Programs” Era

The initial development of training materials in the 1960s paved the way for the development of other, more complex models and programs in the 1970s and 1980s. The Creative Problem Solving (CPS) framework expanded into a five-step model, involving a variety of specific strategies and drawing on both creative and critical thinking (e.g., Noller, Parnes, & Biondi, 1976; Parnes, Noller, & Biondi, 1977). The Productive Thinking Program (Covington, Crutchfield, Olton, & Davies, 1972) incorporated principles of programmed instruction to guide students in learning and practicing creative thinking and problem-solving strategies. Torrance’s work on creativity progressed beyond the four basic creative thinking variables (fluency, flexibility, originality, and elaboration). His classroom studies gave increasing emphasis to context and environment or the conditions for “creative teaching and learning” (e.g., Torrance & Myers, 1970). Torrance’s view of the important measurable dimensions of creativity also expanded (e.g., Torrance, 1979).

In this era, deBono’s (1971, 1975, 1976, 1978) views of “lateral thinking” led to development of an extensive series of basic strategies for critical and creative thinking. This series, the *CoRT Thinking Program*, began to be applied extensively in both the business world and the classroom setting, and in a variety of countries in Europe, North America, and South America.

A number of additional programs for nurturing or developing creative thinking (Davis & Scott, 1971; Williams, 1972), critical thinking (e.g., Harnadek, 1976; Black & Black, 1984; Paul, Binker, Martin, & Adamson, 1989), problem solving (e.g., Kepner & Tregoe, 1981), philosophical reasoning (e.g., Lipman, Sharp, & Ocanyan, 1980), or decision-making (e.g., Feeher & Adams, 1986) also had their origins in this era.

Materials for extending the synectics approach (employing metaphors for “creative connection-making”) from the business world into the schools also emerged in this era (Gordon & Poze, 1979, 1981).

Research with the Purdue Creative Thinking Program also increased considerably during this era (e.g., Feldhusen, Treffinger, & Bahlke, 1970). Feldhusen,

Treffinger, and Thomas (1971) conducted an extensive componential study of the Purdue program, reporting significant training effects on several criteria. Several other experimental investigations were also conducted, and have been reviewed in detail in several sources (e.g., Torrance, 1972; Mansfield, Busse, & Krepelka, 1978; Feldhusen & Clinkenbeard, 1986).

A number of well-known educational programs for stimulating creativity, including *Odyssey of the Mind* (Micklus, 1984), *Future Problem Solving* (Torrance, Bruch & Torrance, 1976), and the *multiple-talents or Talents Unlimited* model (Taylor, 1986; Schlichter, 1986) all had their origins, or expanded significantly, during this era. Feuerstein's (1980) *Instrumental Enrichment* program was originally developed and tested in Israel, but has also been applied successfully in other countries, including both the United States and Canada. Impressive gains in skillful thinking and educational achievement were reported for many students who had previously encountered great frustration and failure in cognitive and academic tasks (see, for example, Link, 1991). The *Tactics for Thinking Program* (Marzano & Arredondo, 1986) was developed in an educational research laboratory and field tested in school settings.

In this era there was truly a profusion of activity related to the development of curricular or instructional resources on creative thinking, critical thinking, and problem solving. A recent survey of published "thinking skills" resources (Treffinger, Feldhusen, Isaksen, Cross, & Remle, in press) reviewed 50 publications, but located and catalogued more than 200 additional published materials. These resources varied widely along several dimensions, including size, scope, complexity, and research support. They ranged from brief compilations of 12–16 supplementary exercises or activity sheets to multiple-volume programs requiring extensive time and training to use. They ranged from exercises incorporating simple brainstorming or divergent production strategies to complex programs involving the use of extensive problem-solving methods and models. A few programs have been field-tested, evaluated, and used in experimental research studies, although the majority appear to have been published with little or no field testing or research to support their effectiveness.

In summary, this era was characterized by many and varied program development and promotional efforts. Although some programs were researched in school-based, quasi-experimental studies, or at least field-tested in school settings prior to publication, the major emphases were much more on promotion or dissemination than research and development. The major advances in this era might be summarized as the shift from an exclusive (or nearly exclusive) focus on divergent thinking, in relation to both assessment and nurture, to an emphasis on multiple criteria in assessment and nurture of more complex skills (both divergent and convergent thinking) and processes (problem solving and decision making).

The search for aptitude treatment interactions (ATI), in which student characteristics could be used as a

basis for prescribing one instructional treatment or another, was very appealing in this era. Efforts to define aptitude–treatment interactions (ATI) were tantalizing but elusive (and controversial) in many other areas of instructional research as well (e.g., Cronbach & Snow, 1977; Snow, 1989, 1992). In gifted education, the search for ATIs often took the form of a focus on the "differentiated curriculum." Unfortunately, in creativity research generally, the search for true aptitude–treatment interactions (especially disordinal interactions) was frustrating, and in reality, largely barren. It certainly cannot say definitively that any cognitive or personal characteristics can be linked to a particular creativity instructional approach. Nor can it be said definitively that a certain set of creativity strategies or techniques is best used by learners with particular, well-defined traits or characteristics of creativity. In gifted education, the search for such interactions has been similarly unrewarding, perhaps because of the tendency to treat giftedness as a single, unidimensional construct that is present or absent, and invariant, within an individual. Most efforts to define principles of curriculum differentiation based on such global characterizations of learners have yielded lists that are clearly relevant and appropriate for all students.

Many practitioners, and a number of theorists and researchers, in the United States and elsewhere continue to approach creativity assessment and nurture, especially in gifted education, in the same ways these topics were addressed in this era; change comes slowly, and often painfully, to education.

Contemporary Ecological Views

Many advances have been made in our understanding of the nature and development of cognitive processes since the topic of creativity began to be explored in the 1950s. There have been, for example, significant developments in expanding our fundamental conception of intelligence and giftedness (e.g., Renzulli, 1978; Gardner, 1983; Sternberg, 1988b; Amabile, 1983; Dunn, Dunn, & Treffinger, 1992; Feldhusen, 1992). These advances challenged traditional views of intelligence as unidimensional, static, and unchanging, emphasized the many and varied nature of human abilities and talents, and began to demonstrate that intelligent behavior and skillful thinking could be influenced or promoted (e.g., Costa, 1991; Feuerstein, 1980; Sternberg, 1988a,b).

Many approaches to creativity and productive thinking continued to be dynamic and expanding as well. Research and development on the *Creative Problem Solving (CPS)* process increasingly emphasized the importance of balance between creative and critical thinking and the critical role of variables such as styles and problem ownership at the early stages of problem solving (e.g., Isaksen & Treffinger, 1985; Isaksen, 1987). Further developments have led to an emphasis on components within the CPS process (e.g., Treffinger

& Isaksen, 1992) and towards more emphasis on linking CPS strategies with peoples' natural problem-solving behavior in real world settings (e.g., Isaksen, Dorval, & Treffinger, 1993). Torrance's studies of the complex and non-rational dimensions of creativity (e.g., Torrance & Hall, 1980) and the powerful role of techniques such as sociodrama (Torrance, 1975) led to the development of the Incubation Model of Teaching (Torrance & Safter, 1990). Creativity and creative problem solving are no longer viewed as processes that can be reduced to a simple set of prescriptive techniques or stages, to be followed dutifully from beginning to end, and to be used by all people the same way for every kind of problem and across all settings. Instead, today's efforts to nurture creativity must take into account a variety of different personal, process, and situational factors—the full “ecological system” of creative productivity.

Areas of Agreement

With regard to the development of creativity and problem solving, there are several areas about which there is a reasonably high degree of agreement within the field. These include:

Creativity is Complex and Multi-Faceted

Creativity is not just a matter of characteristics or traits, residing solely within the individual. Rather, creativity arises from the complex and interdependent interactions among their personal characteristics, with the operations they are able to perform, the context in which they work, and elements of the tasks or outcomes themselves (Treffinger, Sortore, & Cross, in press a,b).

The component of characteristics incorporates many factors, including such variables as cognitive abilities, knowledge base or expertise within a domain, personality, interests and motives, and learning styles. Operations refers to the strategies or process skills an individual can bring to bear effectively to deal with any task or problem (e.g., creative thinking or critical thinking techniques, problem-solving methods, decision-making strategies). Context refers to the setting or environment in which one's creative efforts take place, and the cultural or climate factors that inhibit or encourage productivity. Outcomes refer to dimensions of the task and expectations held for the results or products of one's creativity (including, for example, such considerations as novelty, usefulness, or elaboration). Each of these four components might be analyzed into a number of more specific sub-components or variables, and all of these (within and across the four components) might interact in a variety of ways. Creativity might best be thought of, then, as a function of how an individual makes the best possible use of his or her unique characteristics, selects and uses appropriate tools, and functions within a certain setting, to effect a particular

result, product, or outcome. This conception of creativity reflects what Harrington (1990) described as a “ecological” approach, or Isaksen, Puccio, and Treffinger (in preparation) referred to as an “interactionist” approach to understanding and recognizing creativity; it is at the foundation of the contemporary era of research on recognizing and nurturing creativity discussed above.

Creativity and Problem-Solving Skills Can be Taught

Many educators and a seemingly-endless number of journalists and graduate students never seem to lose their fascination with the question, “Can we teach creativity?” For many people, the question seems to stir deeply-fascinating images. Is it really possible to deliberately nurture a new Mozart, Rembrandt, Einstein, or Edison? Could psychologists possibly know enough about the complex inner workings of the brain, the mind, or the soul, to probe and manipulate the most complex and mysterious of all stirrings within the urge to bring forward something new to the world?

Gifted education needs no more masters theses or doctoral dissertations on the simple question, “Can we, through some deliberate instructional or training program, enhance performance on some specified measure of creativity?” The answer, unequivocally, is, “If you devise and carry out a reasonable treatment, and choose variables carefully to represent a realistic operational definition of creativity, then yes, you can enhance subjects' performance significantly.” From a researcher's viewpoint, then, the challenge is hardly so mysterious or fascinating. One can enhance students' ability to be productive thinkers and creative problem solvers. Despite some early reviews which expressed skepticism (e.g., Mansfield, Busse, & Krepelka, 1978), extensive research supporting this assertion has been reported (e.g., Stein, 1974, 1975; Feldhusen & Treffinger, 1985; Feldhusen & Clinkenbeard, 1986; Feldhusen, 1988, 1990; Parnes, 1987; Torrance, 1972, 1987; Van Gundy, 1987).

Importance of a rich knowledge base and metacognitive skills

Feldhusen (1990) concluded:

“There are specific strategies and skills by which creative cognition or reconceptualization can be facilitated or enhanced. . . Students who are above average in intelligence, who exhibit signs of particular talents, and who show signs of intrinsic motivation can develop the higher skills and strategies which facilitate creative cognition. . . Students can acquire skill in recognizing problems, clarifying problems, and using certain orienting or metacognitive skills while attempting to solve problems. They can be taught to monitor their own cognitive activity, to purposely seek alternatives, recognize new ideas or

solutions when they come to mind, and test the validity of potential solutions or new conceptions” (p. 15).

Problem Finding and Problem Solving

Another area of agreement is the generally-held principle that problem finding (defining, choosing, or constructing the problem or challenge on which to work) is as important as problem solving (or producing and choosing one or more ideas to deal with or resolve the problem or situation).

Recognizing the Vitality of Creativity for Life, School, and Work

Throughout much of the last 40 years, the field of creativity struggled for recognition and legitimacy. For many, the very mention of the term conjured up images of silliness and triviality of people and their efforts who do not deserve to be taken seriously. The challenge has been exacerbated by the prominence of “quick and easy” creativity formulas and their peddlers (“Unleash your hidden creative potency by listening to these ten audiotapes. Use your car’s tape player to turn the traffic jam into a steady flow of creative genius.”) Creativity has too often been a favorite topic of many gurus and marketers.

Today’s leaders in government, education, and the business world are becoming better able to separate the sales pitches from the serious efforts, and that there is growing recognition of the power and importance of creativity in schools, corporations, and many other organizations. In education alone, for example, many recent reports offering proposals for defining essential dimensions of educational and curricular reform have given specific attention to the importance of creativity and problem solving (e.g., Carnevale, Gainer, & Meltzer, 1991; Dow Chemical, 1991; Motorola, 1991; U.S. Department of Labor, 1991).

Issues and Future Directions

Although developing creativity has been a goal of interest and concern in education for many years, the subject of creativity continues to be surrounded by uncertainties and widely discrepant viewpoints. Even among those who are avid proponents of the importance and plausibility of creative education, the topic is filled with pitfalls. Many of the issues concerning defining, identifying and nurturing creativity have been reviewed extensively in several recent sources. Research in the United States has been reviewed in articles and anthologies by Rothenberg and Hausman (1976), Treffinger (1986a), Isaksen (1987), Sternberg (1988a), Glover, Ronning, and Reynolds (1989), and Runco and

Albert (1990). From a broader, international perspective, Raina (1980) presented research on creativity by 30 authors from 17 countries. Although Raina (1990) has recently argued that creativity research has often been limited in its global perspective, suffering from “ethnocentric confines,” there has been a very active and expanding exchange of ideas and information in recent years, evidenced by many publications and conferences. International contributions to creativity research have been presented in Colemont, Groholt, Rickards, and Smeekes (1988), Isaksen, Murdock, Firestien, and Treffinger (1993, in press), and Urban (1990, 1992). Several issues and challenges regarding efforts to recognize and develop creativity in a number of specific countries have also been reported recently. These included a South American perspective (Wechsler, 1990), research in India (Khire, 1985, 1990; Nirpharake, 1981), research in business organizations in Germany (Geschka, 1983, 1990) and The Netherlands (Buijs, 1990), and research and development from an Arab perspective (El-Aasar, 1990). In Israel, recent research on creativity and giftedness has been reported by Milgram and others (e.g., Milgram, 1983, 1990; Milgram & Milgram, 1976; Dunn & Milgram, in press). Creativity has also been a topic of interest in education and in business in Great Britain (e.g., deBono, 1976, 1978; Kirton, 1989; Rickards, 1980, 1988, 1990; Jones, 1990).

This section will focus specifically on several issues of particular relevance and concern in gifted education.

How Best to Nurture Creativity? (“What Works Best, for Whom, for What Purposes, and Under What Conditions?”)

The most intriguing challenges confronting researchers are now much more concerned with *how* to nurture creativity, rather than with whether or not it is possible to do so.

For creativity researchers today, the challenge of understanding the dynamics of students and appropriate instructional treatments has become more complex than the initial quest for Aptitude-Treatment Interactions of prior eras. Snow (1992, pp. 19–20), for example, reviewed ATI research and proposed that an appropriate focus for research now considers the hypothesis that “thinking skills reside in the person–situation interaction, not solely in the mind of the person.” Creativity researchers are challenged to explore new conceptions of thinking skills, new process variables, and most importantly, to investigate the complex and varied interactions among learner characteristics, process variables, and situational or contextual variables (Isaksen, Puccio, & Treffinger, in preparation). Increased understanding is needed about ways to make creativity instructional efforts more responsive to the learning styles or other unique characteristics of learners, and to variables involving the situational context for creativity (Isaksen & Kaufmann, 1991). In short, rather than asking *whether*

it is possible to enhance creativity, we need to ask *how* to do it as effectively as possible, taking into account the interactions among many factors (person, process, environment, and product, not just any one of these).

Linking Self-Initiated, Self-Directed Learning and Creativity

Generative learning models (e.g., Wittrock, 1990) emphasize that algorithms or process structures created by the learners themselves may be more effective or powerful for many purposes than algorithms or strategies presented by others. Given the historical emphasis in gifted education on autonomous learners (Betts, 1986) or self-directed learning (Treffinger & Barton, 1979; Treffinger, 1986b), it would seem to be important to explore ways of helping capable students to discover or create their own heuristics for creativity and problem solving. Some relevant questions include:

- To what extent do such self-generated frameworks enhance creative performance?
- Are the frameworks that individuals generate similar to, or different from, existing process models?
- Do people of varying ability, or in different talent areas, employ self-generated models differently, or with differential effectiveness?

Need for Developmental and Longitudinal Studies

Systematic longitudinal studies are needed to understand better the developmental issues surrounding efforts to stimulate creativity, such as the appropriateness of particular strategies at certain age levels. Torrance (1971, 1981a, 1981b) reported the results of longitudinal studies, in which children were initially tested in the elementary grades and then followed into adulthood. However, there have been few studies in which large samples have been studied using a variety of instruments and criteria, over an extended period, in order to consider the possibility of developmental stages in creative productivity or to use numerous indicators in a multivariate design to predict adult creative accomplishments. The Terman or Piaget of creative development has not yet appeared.

Is There a Generalizable Set of Tools or Strategies to Nurture Creativity?

Too often, discussions of creativity strategies reflect little or no distinction between the development and application of a specific strategy or “tool” (such as brainstorming, for example) and a more complex and extensive process or system for solving problems creatively (such as Creative Problem Solving, in which brainstorming certainly plays an important role, but which includes many other strategies and stages). Deliberate

efforts need to be made to describe and distinguish among several possible levels of complexity, from simple techniques for generating ideas to more extensive and sophisticated frameworks for productive thinking.

A number of more specific questions have been proposed for guiding future research efforts in creativity instruction (Treffinger, in press), and can be examined specifically in relation to their implications for gifted education. These include:

- Are certain strategies most productively used for particular purposes, or for very specifically targeted outcomes, or among students of particular characteristics or ability levels? For example, are some strategies more effective for stimulating flexibility, while others produce higher levels of originality, or still others lead to greater elaboration? Research with adults has only recently begun to identify promising hypotheses for linking objectives and strategies (e.g., Gryskiewicz, 1987), and few efforts appear to have been made to pursue similar lines of inquiry among children or adolescents or in groups of varying ability.
- Might some tools or strategies for diverging, or generating ideas, be more effectively applied in harmony with certain tools for converging? If so, what combinations work best, and under what circumstances?
- Are there ability-related differences in selection and use of divergent or convergent thinking tools, or in the effective “balancing” of both sets of tools?
- Do expert problem solvers differ from novices in their selection and use of various diverging or converging tools during a problem solving session?

Resolving Scope and Sequence Issues in Nurturing Creativity

While there may be increasing agreement that deliberate efforts should be made to nurture creativity, there is still little clear evidence concerning the necessary or optimum instructional sequences for accomplishing that goal, for all students, or for high ability students. A number of scope and sequence charts or organizing frameworks for presenting creativity strategies have been proposed in gifted education. These seem to have been the result of logical analysis or consensus among educators, rather than to have been created and tested empirically. Thus, many research questions remain unanswered, including:

- What strategies or basic tools for creative or critical thinking may be essential or prerequisite skills for success in more complex problem-solving or decision-making tasks? Are some basic tools more important, or more readily transferred to subsequent levels, than others?
- Is there a particular sequence in which basic creative and critical thinking tools should be learned for optimum effectiveness? If so, does that sequence vary in relation to intellectual ability or related factors?
- What effects do varying levels of content expertise

have on subjects' ability to learn and apply methods or strategies of varying complexity? What is the relationship between domain or discipline-specific knowledge and the ability to apply specific creative thinking, critical thinking, problem solving, or decision-making methods and techniques?

- What are the most significant task, personal, and/or interpersonal dimensions that distinguish "real" problems from "contrived" or "practice" problems?
- Do the answers to these questions vary in relation to the age, gender, or ability levels of students?

How Might Technology Better be Used in Stimulating Creativity?

The potential power of the computer and related modern technology for stimulating creativity is an important emerging issue (Sylvester, 1990; Chung, Lin, & Chen, 1992). It can be expected to become an increasingly vital issue with continuing technological progress and increasing computer sophistication throughout the population. There is already software available to guide individuals or groups in "brainstorming" or idea generation tasks. Recent developments in information storage, retrieval, and display technologies (such as compact discs or CD-ROM resources) and interactive video programs will soon extend our ability to introduce more complex techniques (such as visual connections or forced relationship strategies, for example) to an individual or groups at an individual computer or work station. Telecommunications and networking has developed to the extent that virtually unlimited informational resources are accessible to the public, and consultation or mentoring through telecommunication are already being implemented in some areas. Complex computer design and modeling systems, continuing advances in interactive technology and artificial intelligence, and the possibilities created by "virtual reality" technology will certainly open a variety of new opportunities for stimulating creativity.

Stimulating Means Linking Appropriate Assessment with Carefully Designed Instruction

It will be increasingly important in the future to recognize that creativity assessment and the nurture of creativity are not unrelated topics, but highly interdependent. For both research and practice, advances in authentic assessment, such as the expanded understanding and use of profiles and portfolios, may open the door for new investigations and insights into nurturing creativity. In gifted education, there will be challenges to view assessment in new ways, and to place more emphasis on understanding students' characteristics, talents, and instructional needs, rather than merely on declaring them to be "gifted," or "creative," or not.

Linking assessment and creativity instruction more effectively is also important as researchers and practitioners become increasingly cognizant of diversity. The more effectively differences among individuals' characteristics, skills, and styles, can be discerned, the more effectively creative operations or strategies and outcomes that are uniquely appropriate for them can be addressed. Thus there is increasing awareness that "stimulating" creativity is not a process of homogenization. It is not teaching everyone a fixed set of strategies, to be applied in a linear, prescribed manner, to a particular set of tasks; rather, the power of efforts to nurture creativity arises from our ability to help individuals recognize, develop, and realize their unique strengths and talents, to learn and be creatively productive in their own way.

Expanding Mentoring Opportunities for Creativity Development

Noller and Frey (1983) and Frey and Noller (1991) conducted extensive reviews of the literature on mentoring, and, concurring with Torrance (1984), argued that mentoring is often a very important consideration in fostering creativity. Mentoring has also been described as an important aspect of gifted programming (e.g., Haeger & Feldhusen, 1989). There is a need for research clarifying the nature and dynamics of the relationships among creativity, giftedness, and mentoring, and exploring ways to optimize the selection and training of mentors, the process by which they are matched with students, and the factors that sustain or discourage mentor relationships over time. It seems quite probable, for example, that dimensions such as learning styles might play an important role in the success and maintenance of such relationships.

Teaching to Nurture the Giftedness and Creativity in all Students

Expanding efforts in education to recognize and nurture creativity challenges researchers and practitioners in gifted education to consider new paradigms. These emphasize the possibility and importance of recognizing talents in many students (e.g., Feldhusen, 1992); enriching education on a schoolwide basis (e.g., Renzulli & Reis, 1985); or bringing out the giftedness in all students (e.g., Dunn, Dunn, & Treffinger, 1992). We should no longer be content with the notion that only a few, highly-selected students are capable of significant and worthwhile productivity or accomplishments. Rather than seeking to select a "chosen few" to be singled out for special programs, we are challenged to create instructional programs that develop the special qualities—the talents, strengths, and sustained interests—among all students. Not every student will use those opportunities to fullest advantage for outstanding achievement, but

anyone might, and almost certainly, *more* will do so than we had ever imagined.

Summary

In summary, nurturing creativity is an area within creativity research in which considerable effort and attention has been given for many years. Nonetheless, there are many unanswered questions. In addition, researchers today are posing more complex problems and challenges that reflect new directions for understanding creativity and its development. Thus, the topic continues to offer many and varied opportunities and challenges for the researchers of today and tomorrow.

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Administrative Issues in Organizing Programs for the Gifted

BAN ENG GOH

Gifted Education Unit, Ministry of Education, Singapore

Introduction

As educational administrators plan, organize, and implement programs for the gifted, they are often confronted with issues ranging from the philosophical, theoretical, and conceptual to the structural, organizational, factional, and personal. These issues, with emphasis on practical considerations, will be discussed in the context of a procedural model for organizing programs for the gifted. The proposed five stage Recursive Procedural Model will be presented and administrative issues of special concern in each of the stages discussed.

Gifted Programs as Innovation

An innovation arises out of a need to bridge the gap between what existing practices within the organization provide and what available goal-related opportunities and resources outside the organization can provide (Zaltman, Duncan, & Holbeck, 1973). Innovation, as defined here, is the process by which an organization adopts a technique, procedure, program or policy which is new to that organization though it may not be new to other organizations (Brown, Wyne, Blackburn & Powell, 1979). Within this meaning the institution of a program for the gifted in a country, state, school district, corporation or building where one did not exist before is, therefore, an innovation.

Administrators need to be cognizant of the factors that would make an innovation such as a gifted program more acceptable to members of the school community. The most important point is that an innovation should be seen to have the greatest advantage over other alternatives in providing what members of the school community believe to be important (Brown et al., 1979). It should also be clearly defined so that its goals can be clearly communicated to the staff since the more complex the innovation, the more difficult it is for staff members to accept (Lin & Zaltman, 1973). In general, teachers are less open to innovations that are perceived as increasing their workload (Havelock, 1973; Mahar & Chickedantz, 1977), threatening their traditional roles (Shephard, 1967), and requiring additional training and acquisition of new skills or knowledge

(Brown et al., 1979). In a study of specific deterrents to innovation, Mahan and Chickedantz (1977) found that, besides the fear of additional workload, there are four other factors which endanger the quality of elementary school innovation. These are lack of knowledge about how to use the innovation, conflicting educational attitudes and values, apprehension about an individual's competence to handle new ideas, and lack of communication. Hence, those who are involved in introducing a program for the gifted must be aware of these deterrents and be prepared to address them when planning and implementing programs.

Administrators' Role in Organizing Gifted Programs

Educational administrators are individuals whose positions at various levels place them at the forefront of educational reform and advancement. They are, individually or as a group, responsible for initiating and maintaining educational programs, and providing and coordinating educational experiences to meet the differential needs of school children of all ages. As facilitators of programs for constructive educational advancement, administrators should be concerned with how to contribute toward the development of a generation of educated youths who are intellectually agile, emotionally resilient, socially mature, and physically tenacious. They should also be concerned with how to develop a core of vibrant, enthusiastic, caring, and dedicated teachers who provide warm, stimulating, and enriching learning environments suitable for meeting the intellectual, social, and emotional needs of their students.

When involved in such education program development, school administrators' concerns about the place of gifted programs in their educational system range from fundamental questions on the characteristics and needs of gifted children to questions on how to build support for a program. Some of these questions are: Are there gifted children in the school system? Do these children require special programs? How should they be selected and what programming options should be made available to them? What features does a good program have? Is it elitist to provide special programming for the gifted? How does the community

view the program? Actually, an effective program for the gifted should do what education ideally aims to do for all children: it should be concerned with developing each individual's potential by providing appropriate services and environment. The difference is that greater emphasis is placed on creative processes and behaviors, critical thinking, social adjustment, responsibility, and the development of initiative and leadership qualities (George, 1990; Gustin, 1980). These objectives are desirable for all students, it is also true that they are an imperative for gifted students.

When effectively exercised administrative leadership can motivate instructional and support personnel to be meaningfully involved in systematically and efficiently operating a program for the gifted. Administrators should not only be concerned with initiating programs, they should also be concerned with ensuring the maintenance of these programs. Better yet, administrators, particularly building principals, should be partners with the teachers, parents, and community members in program planning, development, implementation, and maintenance. From the outset, administrators should be considered as members who have valuable contributions to make to program development. This cooperative group effort between administrators and teaching staff is possible only if the administrators are viewed in a positive manner, their roles are clearly defined and understood by their staffs, and they are given the opportunity to become actively involved in the development of gifted programs. Their involvement in gifted program development is dynamic and moves from that of initiator to advisor and finally to approver (Alexander & Muia, 1982).

The main challenge faced by administrators related to organizing programs for the gifted at all levels is to deal with the many and diverse issues whose solutions require informed decision making, careful planning and efficient implementation. Administrators interpret the school's and community's educational philosophy, establish priorities based on short and long term goals, are the catalysts for change, the mediators between different interest groups in the system, and act as a focus for the needs and demands of the different subsystems in the educational institution (Roeper, 1986). They are called on to interpret national and state laws, regulations, and guidelines concerning the gifted and talented. They must be knowledgeable about local policies and position statements; be sensitive to attitudes of the various publics in the community; and must make use of available national and state resources relating to all aspects of the gifted and talented (Vassar, 1980). In short, they are the executives, the financial officers, the public relations persons, and the directors for programs for the gifted (Roeper, 1986).

According to their commitment and position in the administrative structure, administrators are responsible for different aspects of program development. Administrators at national and state levels may be called on to provide the vision and formulate policies for

programs for the gifted; superintendents may direct, lead and encourage program development by selected staff and deal with community concerns and parent demands; building principals may supervise program implementation, deal with staff training, staff acceptance of the program, and logistics such as establishing contact time and appropriate learning environments; and finally, curriculum and special education directors may be responsible for planning, facilitating, and managing gifted programs (VanTassel-Baska, 1981).

Regardless of administrative titles and their specific roles in program development, all administrators are ultimately concerned with ensuring the success and longevity of all educational programs, including gifted programs, in their school systems.

A Model for Organizing Programs for the Gifted: the Recursive Procedural Model

Theoretical Basis

A set of procedures that can be used by administrators or change facilitators for organizing and implementing educational programs, particularly gifted programs, is proposed and presented here. These procedures are incorporated in the Recursive Procedural Model which has five stages with a number of phases within each. These include the following:

Stage I Visionizing

Stage II Initializing

- (a) conceptualization
- (b) steering
- (c) "climatization"

Stage III Planning

- (a) assessment of needs
- (b) formulation of goals
- (c) program designing

Stage IV Implementing

- (a) preparation
- (b) application
- (c) observation
- (d) evaluation

Stage V Institutionizing

All five stages are essential to ensure that programs are implemented in a systematic manner with provisions for refining and improving at various points through a recursive process.

New educational programs are often initiated and implemented without careful planning and skillful integration into the larger vision of the existing structure. In such instances, when a perceived need for change arises, promising strategies and programs which have proven successful elsewhere are selected and added on to existing practices. This creates a 'patchwork' of services that are not integrated into a single strong and powerful

program. Such unrelated and disjointed provisions for the gifted may not survive. It is useful to differentiate between such *ad hoc* services and well-planned and efficiently organized programs. Tannenbaum (1983) makes a distinction between *provisions* which he describes as being fragmentary without any long range goals and clear direction, and *programs* which are articulated with the whole school program. Passow (1986) argues for total planning so as to incorporate a total learning environment for the gifted. Both advocate thoughtful planning and integrative implementation.

The Recursive Procedural Model is built on several principles selected from a number of change models. These are the Social Interaction Model; the Research, Development and Diffusion Model (see Havelock, 1973, for an overview of these two change models); the Problem Solving/Problem Finding Model (Ingalls, 1976); and the Concerns-Based Adoption Model (Hall & Hord, 1987). These guiding principles affect the structure, communication patterns, and interpersonal components of gifted programs organized according to the Recursive Procedural Model.

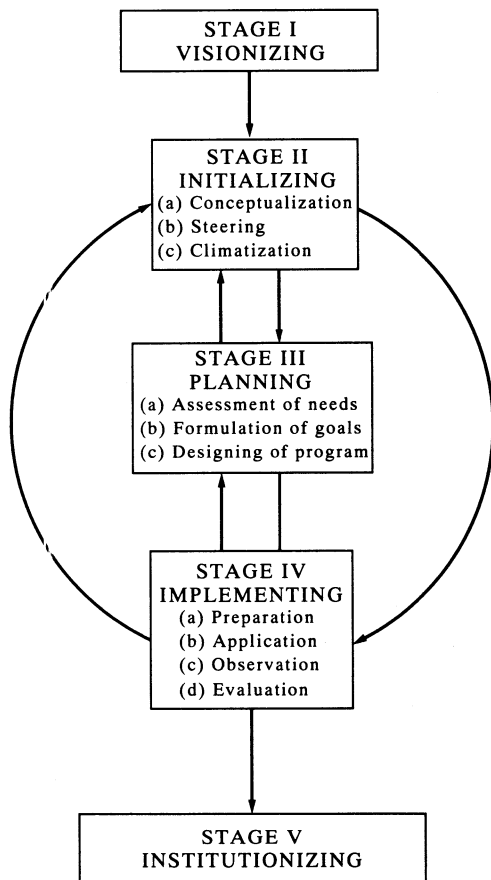


FIGURE 1. The Recursive Procedural Model for Organizing Programs for the Gifted.

The basic principle underlying the model is that change is a dynamic process (Hall & Hord, 1987). The implementation of a gifted program is to be viewed as a change process that may stretch over a period of at least three to five years before it is incorporated into the existing system. There is also a systematic developmental sequence (Havelock, 1973) which has specific concerns for those effecting and those affected by the change. This is based on the assumption implicit in the Research, Development and Diffusion Model that there is a logical sequence for evolving and applying a new program. It begins with information search and studies to understand the theories and principles underlying the innovation and its status based on current research. This is followed by meticulous development of the innovation and extensive dissemination to target groups.

There is also a strong bias toward consideration of group dynamics and human relations as emphasized in the Social Interaction Model. The emphasis on the identification and the diagnosing of user needs, and the development of non-directive, self-initiated, and self-applied innovative efforts are aimed at encouraging participation in the change process by both users and developers. Users are involved in the whole process of program development from the initial stages through close collaboration with the developers. They are involved in team efforts to set objectives, design the program and eventually to operate the program. Such an approach involving all participants will facilitate change and program implementation (Guest, Ellison, Seghini, & Wasden, 1990). This emphasis on personal concerns supports the concept of organizational adaptability through improvement in interpersonal skills and subsystem effectiveness (Hall & Hord, 1987). This will improve the climate of the change environment because staff development and training will nurture personal fulfillment (Ingalls, 1976). There is also emphasis on the establishment of communication networks between the change facilitators and the users to promote improvement activities and bring different subsystems closer together in collaborative efforts. The consensus decision-making process to identify and solve important problems (Andringa & Fustin, 1991) associated with program development has proven to be very successful in the school context. The diffusion of the innovation through continual information flow to create awareness, interest and commitment for the program is an important consideration in the early stages of program development as well as throughout program operation. Careful planning, unrestricted collaboration among participants and facilitators, and unambiguous communication are important to ensure efficient and effective implementation.

Procedural Stages: Sequence and Development

The Recursive Procedural Model begins with visionizing when an individual or a group of individuals dreams or

envisions a program for the gifted, to the institutionizing stage when the program becomes a permanent feature of the educational system. Each stage is dynamic and process oriented. Within each of the five stages are several developmental phases which provide for smooth transitions to the next level of development. Stages I and V are unitary stages, stages II and III have three phases each, and stage IV has four phases. Figure 1 shows a graphic representation of the model.

Although each stage progresses to the next in a sequential order, there is provision for recursion at a number of points to earlier stages to improve and build on a particular stage before advancing further. For instance, at the planning stage there might be a necessity, based on data obtained from the needs assessment, to go back to the conceptualization phase to modify the concept plan. After implementation, there might be a need to return to the designing phase to articulate the program with some new programs or concerns that affect the school, state or country. Only the visionizing and institutionizing stages do not recur as the vision infuses the whole program development process and institutionizing is the destination toward which the intermediate stages are directed.

STAGE I: VISIONIZING

Visionizing is an important first stage in the development of gifted programs. It begins when the administrators and/or teachers perceive a need for special services to meet the needs of the gifted students in their school system. Their vision for change and improvement when combined with the commitment and energy to realize that vision will provide the momentum for program implementation. This vision for change, however, does not always develop first at the national or state levels of education and then filter down to local levels. It may come from within the school itself. The vision can be global in nature in that it envisions the gifted program as part of the overall scheme of catering to the different needs of all children in the school; and it can be localized in that it envisions special programs for children within a class or grade level who are advanced in some special subjects such as mathematics, creative writing or science. When those who have the vision are ready to translate their vision to reality, the stage of initializing begins.

STAGE II: INITIALIZING

In this second stage, the vision is transformed into a realizable mission and made more concrete through the development of a concept plan. This begins with conceptualizing how that vision can be implemented, followed by a steering process of mapping the direction for development, and then testing the grounds and preparing the environment for the acceptance of the program through "climatization". In conceptualization, the vision or dream begins to take shape and is translated

to broad concepts. The term *giftedness* will be defined according to the vision and type of program decided upon. Programs could be basically enrichment programs or acceleration or a combination of both. A concept paper outlining what can be done in the light of existing practices and programs should be prepared and the philosophical orientation of the program clarified and documented. It requires that a team of change facilitators who are well informed in theories, principles, and research about the critical aspects of gifted education get together to provide direction for the program. Climatization or climate setting is the next step in program organization but it is often neglected when change facilitators are anxious to get a program going in as short a time as possible. Climatization involves preparing or making the environment ready for the program. This will ensure that the program is accepted and supported when prevailing attitudes, standards or environmental conditions are primed for receiving the new program.

STAGE III: PLANNING

This stage involves developing a mobilization plan as well as getting commitment from authorities and staff to be involved in the program. It initiates a highly intensive stage of acquiring as much information as possible about the needs of the people connected with the program—the students, their parents, the teachers, principals, administrators, and community members. Assessing the needs, interests and values of different groups or subsystems connected not only with the program itself but also with the whole school environment is the initial phase of the planning stage. Data collection and reconnaissance are, generally, necessary to develop understanding about the situation and, specifically, important for the identification of possible problem areas. Change facilitators should be aware of the problems that are likely to arise, be prepared for them and incorporate into the plan ways of dealing with them. This phase will provide information that can lead to a reconception of the form that the program ought to take.

When the needs assessment has been analyzed and any recursion to the previous stage completed, formulation of the goals and objectives of the program begins. The data obtained are analyzed to determine priorities for action and to identify strengths and strategies for the attainment of the goals and objectives. This is then followed by synthesizing all information and ideas into an articulated framework for the program

STAGE IV: IMPLEMENTING

The implementation stage consists of a preparation phase followed by the application of all that had been planned and the initiation of the processes of observation and evaluation. The preparation of materials,

selection and training of staff, purchase and acquisition of resource materials, and the selection of students should be carried out prior to the actual start up of the program. It is also the time to orientate all who are directly or indirectly affected by the program—students (both in the program and outside), teachers (of the gifted and of the regular students), parents, and community members—through formal and informal meetings and workshop sessions. This is an important phase and should not be shortened or eliminated. If the preparation phase is carefully designed and carried out, then the chances of success for the program are greater. The probability of having the program institutionalized is also enhanced.

Once the preparation has been completed, it is time to put the design into practice in the real world situation. Any problems in the program design will surface in this phase of the implementation stage. Observation will then begin concurrently with application. Observation is the process for monitoring the operation of the program and how both teachers and students in the program are responding to it. To have a finger on the pulse of the program right from the beginning will provide opportunities for dealing with incipient problems quickly and effectively.

Evaluation is a more formal process than observation. It helps to identify the gaps between what has been planned and what has been carried out. The evaluative information will form the basis for reformulating, redesigning, and redefining the program by bringing the change facilitators back to the earlier phases such as climatization, assessment, or designing. It forms part of the unending process of improving and perfecting the program via the recursive loop.

STAGE V: INSTITUTIONIZING

When the gifted program becomes a well-established and structured part of the educational culture, it can be said to be institutionalized. This is the stage of incorporating the new program for the gifted into the total system so that it becomes a permanent feature in that system (Tannenbaum, 1983). While changes may be made to the program, its existence in the educational system is not questioned. This is the ultimate goal that proponents of gifted programs hope to reach.

Summary

This model for organizing gifted programs seeks a balance between objectivity and subjectivity. It is concerned with the need for both efficiency and structure in organization and for the feelings and concerns of all involved in the planning and implementation process. It aims to integrate structure with the interpersonal process dimensions of program implementation. Finally,

it seeks to integrate all who are involved in education and engage them in working together to sustain programs for the gifted.

Administrative Issues

In the process of organizing programs for the gifted, there are a number of issues which the administrators face. They have to contend with the theoretical and conceptual foundation for programs, the organizational framework for charting the course of programs, the structural blueprint of programs, factional and personal concerns of groups directly and indirectly associated with the programs, initial training and ongoing professional development of staff and finally the procedural aspects for implementation of the programs. These issues will be discussed as and when they occur within each stage of the Recursive Procedural Model.

Stage I: Visionizing

The concept of vision is often linked to conscience and associated with “moral imagination” (Blumberg & Greenfield, 1986; Greenfield, 1987) because the criteria for this personal vision are based on the standards proposed by responsible members of the community (Licata, Teddlie, & Greenfield, 1990; Schein, 1985). The concern for moral and ethical standards is especially important for education as school children are vulnerable to adult manipulations. Maxcy (1991) argues against the concept of “moral imagination” preferring the concept of “critical pragmatic imagination” which he defines as “creative imagination tempered by reflection to determine ends-in-view” (p. 126). He states that conceptions of leadership based on moral imagination stress the personal rather than the public and democratic. Further, the locus of control should not be lodged in a remote authority such as administrators, but should be in those most affected by the changes. The teachers and students affected by any policy ought to have a say in the source and content of such a policy. In his opinion, school administrators do not have the prerogative to introduce private and personal imaginative moral propositions into the school.

If this is the case, then who should provide the vision for a gifted program? In any school, it is the nature of the school environment (Peterson, 1986) and the administrative structure, either hierarchical or participatory (Roeper, 1986), that determine the direction for visionizing a program. In a hierarchical structure, the administrator provides the personal vision and the motivations while in a participatory structure, the vision can arise from within the subsystems. However, leadership is not defined by the position held by the individual, it is the manifestation of appropriate characteristics and

behavior. In that sense, it does not matter where the vision comes from, as long as that vision causes the individual or individuals to embark on a mission to make it a reality. If the vision for a gifted program emanates from the top, then those at the top must convey that vision in as effective a manner as possible to those who are to be involved in implementing the program. If the vision comes from the bottom, then the main concern is to convince those at the top that there is a need for a gifted program so that they will accept and own it and be actively involved in its development. The support of the principals is one of the most important factors in ensuring success of any project undertaken by teachers (Flanagan, 1970; Hall & Hord, 1987; McCumsey, 1983; Reinhard, Arends, Kutz, Lovell, & Wyant, 1980; Taylor, 1986, 1987).

While it is true that programs are most successful if the initiative comes from within the subsystem, that is, from the teachers, parents and students (Friedman, 1991; Jensen, 1986; Reis & Renzulli, 1988; Roeper, 1986), administrators can very successfully realize their vision if they encourage active participation by their staff in program planning and development from an early stage. In addition, administrators have the power, authority and resources to make programs and innovations happen (Hall & Hord, 1987) and the responsibility of expressing a vision for gifted education that is encompassed by the larger vision of education in general. As administrative leaders of the whole educational institution or system, they are able to articulate a vision to meet the needs of all children and to set about focusing attention and allocating resources to make that vision become a reality (Rutherford, 1985).

In their qualitative study of eight effective principals, Blumberg and Greenfield (1986) found that effective principals possess the following characteristics. They are proactive and quick to take the initiative; resourceful and flexible at adapting to the demands of their roles; and inspired by their vision to make their schools over in their image. They are involved in charting, facilitating and monitoring educational programs. This view is supported by results of studies which showed that the variable explaining the most variance in teachers' perception of principal effectiveness is the vision subscale (Licata et al., 1990). This subscale reflects teachers' perceptions of their principals' effectiveness in exchanging ideas with teachers, students, superiors, parents, and other members of the community about the achievement of a school vision. The finding suggests that teachers support principals who consider the development and implementation of a school vision to be a process open to critical public examination. Successful leaders are those who are willing to substitute bureaucratic lines of authority for a kind of 'servant leadership' that is based on moral authority and a commitment to democratic tradition (Sergiovanni, 1992). They also do not stop envisioning as they actively work to exercise leadership initiatives and to realize a broader vision for serving the needs of their constituency.

Stage II: Initializing

CONCEPTUALIZATION

At the conceptualization stage, the abstract vision is given a more concrete form, becoming less nebulous and more defined. Operational definitions of terms like giftedness, talent, enrichment, acceleration, and various programming options are determined and clarified. Feldhusen (1991) provides clear definitions of these terms and makes fine distinctions between giftedness, talent, genius, prodigy and precocity. At this stage, various issues concerning the introduction of a gifted program into the school environment would also have to be discussed, issues which focus on the impact the program will have on the students, teachers and other support personnel in the school and on members of the community.

An important question is: In what ways will gifted students benefit from the program? Students must see it as being something they need. A gifted program should be organized to cater to the individual needs of gifted children rather than as an all-purpose educational program suitable for all gifted children. Decisions on where to place a gifted child, how to organize for his/her education and the appropriate teaching strategies and materials to use depend largely on the developmental pattern of the individual child and the provisions available for all children within the school. In general, a good gifted program provides instruction at an appropriate level and pace, intellectual challenges, opportunities for peer interaction, experience with problem solving activities (Barrington, 1979), and interaction with caring adults who have a passion to share with these children. Armstrong (1989) suggests that gifted students be given opportunities to be involved actively in planning their own education. She found that gifted children's educational preferences such as advanced content, interest-based instructional programs, cognitive/affective components, and differentiation which takes into consideration different cognitive styles, were consistent with those advanced in various theoretical models for gifted programs.

Another question is: How will various segments of the community view the program?

First of all, administrators, teachers, parents and taxpayers must see the program as being valuable and justified. It should not be perceived as a program bestowing special privileges to a select few but as one serving the needs of children with unique needs (Sapon-Shevrin, 1987; Starko, 1990). It would be more acceptable if it is articulated and coordinated with all levels of general education and with any other special provisions implemented at district or national level (Vassar, 1980). Teachers need to be convinced of the need for a gifted program and be self selective in participating in it. Any direct or indirect theoretical and philosophical antagonism toward gifted education by any member within the school could be addressed through information dissemination and collaborative

efforts. Once this very important aspect is cleared then other matters relating to curriculum and teaching strategies can be handled through inservice workshops and consultation.

STEERING

An advisory or steering committee should be set up to focus on crucial policy matters and decision making (Feldhusen, 1986). Its decision-making function is to review input from those directly affected by the program as well as those indirectly affected and then formulate a policy based on that information. The members of this committee should consist of administrators, teachers, parents, students, school board, community members and any staff member with an interest in the gifted and their educational needs (Engelsgjerd, 1988; Feldhusen, 1986; Reis & Renzulli, 1988). If they do not have the necessary background information on gifted education, then besides reading the literature, they should visit gifted programs and participate in workshops with guest speakers (Reis & Renzulli, 1988) covering topics on definitions of giftedness, identification and programming models and methods of providing inservice. This will enable them to make philosophical choices, and select a definition of giftedness, an identification system, and appropriate programming options. It might even be prudent to include in the committee a skeptic of gifted education who can contribute by providing an alternate point of view and giving the other committee members a chance at understanding the opposition. The steering committee should continue to provide direction and support for any revisions and additions to program design after the program is in operation (Feldhusen, 1986).

In this phase, it is also important to determine an appropriate leadership structure to facilitate program implementation (Clark, 1989). Other than the steering committee there might be a person or a team of specialists in gifted education at the national, state or district level with responsibility for developing programs and acting as instructors, mentors or resource persons to teachers and school administrators (Phua, 1983). They can provide consultation on identification and selection processes, curriculum development, pupil guidance and counseling, and other aspects of programming. This will give gifted programs priority status and also create an advocate or advocacy team with the commitment, time, and expertise to help various audiences understand gifted education (Clark, 1989). Such understanding and support are vital during program development, implementation, and maintenance. There is also a need for a strong informed leadership at the school level. Whether the administrative structure is hierarchical or participatory, the line of authority must be clear. The roles of the principal and coordinator in relationship to gifted programs must be addressed. Their responsibilities must be commensurate with the authority they are given within the administrative structure (Borland, 1989). As

instructional leaders in their school, principals play a key role in creating the learning environment for young people while the program coordinators are concerned with the day-to-day running of the program. Both are involved in educating others who wish to participate in such programs and handling relationships between those in the program and the rest of the school (Aldrich, 1977). For programs to be effective and successful, principals, coordinators and teachers must collaborate in not only planning but also implementing the program. Where such collaboration occurs, there is likely to be strong and self-renewing program implementation.

CLIMATIZATION

Climatization or climate setting is an essential first step in ensuring acceptance of the program. It is the setting of a receptive climate or creating a more positive climate where a negative one exists (Ingalls, 1976). It is concerned with the development of trust and effective communication patterns within the organization in order to gain acceptance and commitment from its members so that they will participate in the change process. This involves assessing the physical, psychological and organizational aspects of the environment and facilitating the development of a more supportive climate for the program to operate. The physical refers to the resources and surroundings; the psychological refers to attitudes, motivation, and energy of the people involved; and organizational refers to the administrative structure. When regular staff and community members are not prepared for the implementation of a gifted program, there will be a tendency to resist it and the usual stereotypical objections to a gifted program will be raised (Guest et al., 1990). Many programs do not survive because of the failure to cultivate broad-based support for it in the initial stage, and the failure to build up good public relations during its operation (Brown et al., 1979).

Sergiovanni (1987) pointed out that the relationships between school climate and school effectiveness are highly complex, and concluded that school improvement is not likely to be accomplished on a sustained basis without the presence of a favorable school climate. Where there is a positive school climate, there is a strong sense of academic mission, of student identification and affiliation, a high level of professional cooperation and collaboration among staff, and recognition of personal academic excellence (Edmonds, 1982). To develop a strong school climate during the initial phase of program implementation, it is necessary to establish the identity of the subsystems involved in the gifted program and gain their commitment. Then the support of the different subsystems not involved in the program must be cultivated (Ingalls, 1976) through raising the consciousness and awareness of parents, teachers, and adults at all levels to the needs of gifted children and programs for them. Reis (1983) pointed out that there is a possibility of a program for the gifted becoming separated from the

rest of the school if it does not attempt to reach out to those outside its immediate boundaries. To prevent such a situation from arising she suggests that efforts should be made to establish ownership of the gifted program among the regular teachers, students, and other community members. Ownership lends impetus, energy, and strength towards fulfilling the vision.

Relating to the public to build understanding of gifted programs must be guided by a balanced approach with the administrative leader positioned as a champion for the vested interests of different groups, not just the gifted (Clark, 1989). Any public relations program should aim at providing information to the different publics to increase their awareness. It should include a variety of activities such as orientation meetings, workshops, and conferencing sessions, for the development of positive attitudes about gifted programs. Climatization should be an ongoing activity with different levels of intensity at different stages of program development and implementation, and aimed internally at the whole school environment as well as externally to the community outside the school.

There are a number of characteristics of an environment that will make it conducive and ready for the implementation of a new program. Hage and Aiken (1970) assert that the professionalism of the staff affects the capacity of the system to innovate. The greater the length of educational preparation, the more apt the organization is to innovate. In-service workshops, and informal educational experiences for the staff in the school are all potentially useful tools that can be used to foster acceptance of the program. Michener (1981) found that administrators, teachers and community members who had obtained information about gifted education through conferences and workshops were most supportive of special programming for the gifted. A decentralized power structure encouraging cooperation between staff and administrators (Dart, 1986; Jensen, 1986; Roeper, 1986) as well as the clarity of program goals will facilitate the introduction of an innovative program.

On the other hand, there are a number of sources of resistance to change and these have to be investigated and attended to before program implementation. Among these are threats to the balance of power, miscommunication, group norms, and great diversity among the subsystems within the organization (Brown et al., 1976; Kast & Rosenzweig, 1974). On the personal level, administrators should also be sensitive to the kind of environment that will cause teachers who are not actively involved in the program to stop supporting it, and those directly involved to suffer from burnout. Findings from a study on the school culture that affects teacher burnout (Friedman, 1991) indicated four major school culture variables that contribute to teacher burnout: the imposition of measurable goal-achievement behavior by school administration, the lack of trust in teachers' professional adequacy, the circumscribing school culture, and disagreeable physical environment.

Friedman also stressed that there are certain behaviors and demands which act as stressors leading to burnout. The three stressors which administrators need to be concerned with are role conflict (conflicting job demands), role overload (being assigned more work than can be effectively handled), and role ambiguity (lack of information to carry out tasks). There are also some organizational factors associated with teaching and the school environment which impede change, including lack of staff and equipment, excessive paperwork, lack of advancement opportunity, lack of administrative support, and conflicts in the perception of the job (Farber, 1982; Sakharov & Farber, 1983).

One approach to improving school climate is through involvement of all participants in the change process (Furtwengler, 1986). The theory behind this is that educational organizations are dynamic social systems and a strong learning culture can be created by purposeful changes in social agreements among members of the systems. Leaders of gifted programs should be knowledgeable in the underpinnings of gifted education, personalized education, classroom supervision, and instructional strategies, and media/materials suitable for the gifted in order to induct others into the change process. Another strategy for eliciting change in the school climate is that of organizational development (Schmuck & Runkel, 1985). This strategy focuses on changing the norms of the organization through education in areas such as communication skills, problem-solving, conflict resolution, decision-making, and goal identification to establish a more conducive climate for the acceptance of change and new programs. However, favorable school climate alone cannot bring about school improvement; the quality of educational leadership that will channel climate energy in the right directions is also important. It is a combination of favorable school climate and quality educational leadership which is essential to sustain innovations such as gifted programs.

Stage III: Planning

In planning for a program for the gifted, administrators have to take into consideration the dynamics of the individuals who will be involved in the program. A program has a greater chance for success if there is collaborative planning as it leads to greater involvement and increased objectivity so that the available human resources are fully mobilized. This is the stage for establishing commitments among the various personnel involved in running the program. There are a number of factors which will affect the program design including (1) definition(s) of giftedness, (2) perceived needs of the gifted, (3) appropriate programming options, (4) curriculum differentiation, (5) personnel requirements, (6) staff and teacher training and development, (7) parental roles, (8) community's roles, and (9) communication networks and patterns. A number of these would have already been considered in the initializing stage, but at

this point, they must be viewed against the social-cultural environments in which the gifted program is to be installed. Conceptions of giftedness in multi-cultural environments, and by implication, identification processes which acknowledge cultural differences depend on the particular society's views and value of giftedness and the immediate environment in which the program is to be implemented (Reid, 1989). In the overall plan for the gifted program, these factors need to be defined and the recommendations incorporated in the program design.

ASSESSMENT OF NEEDS

A comprehensive assessment of needs is necessary which takes into consideration the needs of the students and all who will be involved in running and maintaining the program. Needs may emerge quite informally during the initializing stage, during consideration of climate factors and as people work together in planning the program. Their needs are often in harmony; but, just as often they are a reflection of the diversity and complexity of individuals, organizations and communities.

However, a formal needs assessment is necessary to determine the difference between the actual and preferred status of a given entity, and to focus on program action (VanTassel-Baska, 1980). Although need does not necessitate action, understanding and documenting needs is a necessary starting point for looking at program development. In order to plan effective special programs for gifted students, administrators must understand the special needs of the groups involved. Hence, obtaining information on needs from people who will be affected by the programming—students, administrators, teachers (including regular classroom teachers), parents, and community members—is necessary (Dart, 1986). Program needs such as the type of personnel essential to provide a comprehensive programming effort should be determined. Data on student needs are to be used to formulate program goals and objectives while data on program needs are to be used for deciding on the type of program and staff development required within the individual school context (VanTassel-Baska, 1989).

Hall and Hord (1987) have identified a set of common needs or concerns associated with most innovations and the change process that can be used to design staff training and development packages. There are seven stages of concern about innovation—awareness, informational, personal, management, consequence, collaboration, and refocusing. At the beginning of a change process, the typical nonuser has relatively high awareness, informational, and personal concerns. As they begin to be involved in the new program, management concerns become more intense; and when they become experienced and skilled with an innovation, the tendency is for impact concerns (consequence, collaboration and refocusing) to become more intense (Hall, George, & Rutherford, 1979). Knowledge of this likely profile of

concerns is useful for making tactical decisions about how the program should be initiated.

At the beginning, persons with high informational concerns do not want massive detail; rather, they need small doses of information ranging from face-to-face conversations, brief reports in staff meetings, newsletters, and press releases. During the implementation stage, management concerns typically become more intense. One implication of Hall and Hord's research (1987) is that management concerns should not be addressed solely by providing day-long workshops. They found that various kinds of alternative interventions that allow for "quick and idiosyncratic responses to the constantly evolving management concerns" should be used (p. 72). Experts giving advice on a hot line or through informal school sessions can be helpful to teachers. Newsletters and teachers' manuals that address teachers' concerns are also useful. Principals and other change facilitators should anticipate the various concerns that will arise and have mechanisms planned and established in advance to address these issues. In this way, program implementation becomes much easier.

FORMULATION OF GOALS AND OBJECTIVES

To achieve goals and objectives crucial to the successful establishment and operation of any educational program, it is imperative that a policy delineating the purpose and direction to be taken be developed (Grossi, 1980). To be most effective, the policy should provide direction, authority, and guidelines for establishing programs. Administrators are responsible for interpreting that policy and applying it to their systems. Feldhusen (1986) discusses three philosophical positions that affect state and national policy toward gifted education; the main position is that the student has a right to an education that meets his/her individual needs; another is that all children have the right to educational services that will develop their potential to the fullest; and the third is that the children should be developed to serve the nation. These philosophical orientations will influence the goals and objectives of the gifted program. An important concern is that goals of the program should be compatible with the overall stated goals of the school and in some way, that of the community as well. Roeper (1986) discusses two philosophic orientations to education—education for success and education for life—which affect not only the administrative structure but also the form of educational programs.

It is important to recognize that goals and objectives form a hierarchy of their own. Ingalls (1976) points out that goals at the top of the hierarchy usually tend to be global, while those at the bottom become quite detailed and localized. At the top there is a general statement of philosophy or overall purpose. At the subsequent levels are general operating goals, program objectives, group objectives, and finally behavioral objectives. This hierarchy of goals and objectives thus assumes the shape of an inverted pyramid. The administrative

structure, however, is often in the shape of a pyramid. Hence, there is a considerable distance between those individuals who formulate the overall philosophy and those who are responsible for implementing the day-to-day activities. This distance accounts for much of the misunderstanding that causes many plans and systems to fail. The people at the top often do not understand the complexity of the details and the people at the bottom often do not know how the part they play is related to the whole. In order to reduce this gap and establish an internalization of commitment to program goals and objectives, an efficient information dissemination process and greater interpersonal involvement must be instituted. Ingalls (1976) suggests that to reduce some of the dysfunctional elements of goal setting, the planning process could begin at or near the bottom of an organization.

PROGRAM DESIGNING

This is the synthesis stage where the details of the program are set out clearly in a blueprint to be used in the actual implementation of the program. Designing involves comprehensive planning for achieving the goals and objectives that have been formulated after careful in-depth consideration of data from the needs assessment. Any design should be carefully detailed in writing because when discrepancies arise later, a written document will be a critical resource for discovering emergent problems (Ingalls, 1976). Differentiated instruction and administrative designs for the gifted should be coordinated with general education and with any other special programs being implemented in the school system. In building construction, "grouting" is a process whereby mortar is put into fissures and cracks to consolidate adjoining objects into a solid mass. By analogy, the different programs within the school environment need to be consolidated into an overall education plan for the whole institution. In this way, programs in school are not looked upon as disparate segments but as an integrated, articulated and consolidated whole.

In creating an effective design, program evaluation should be incorporated early. This issue will be discussed further in the evaluation section below. Public relations is also an important component of design for a gifted program. It involves an ongoing effort to win others' acceptance of program goals and objectives and begins with climatization which has been discussed earlier.

There is a need to select the most suitable programming option for the target group of students and modify it to suit idiosyncratic needs. A wide variety of programming options and models are available to meet the unique needs of the gifted (Renzulli, 1986). The overwhelming choice by school districts in the United States of America (Gallagher, 1985) is the special class organized around subject matter. Independent study is the second choice. Other delivery systems used to serve the gifted include: early admission or acceleration options,

non-accelerative enrichment classes, special schools, mentorships, continuous progress, dual enrollment, and within-class individualization. These could be administered in self contained classrooms, resource rooms, pullout programs, and advanced placement in specific subjects. What is important is that the gifted are served within a structure that allows them to not only interact with children of similar abilities, interests and needs but also with other children in regular classes. In this way special opportunities and competitive challenges can be made available to them while building social, emotional, and intellectual bonds with children of all levels of ability. Gifted children will have opportunities for leadership, for service to others (e.g. in counseling and tutoring), and for exploring extraordinary ideas in an accepting environment (Anderson, 1985).

Parents have an important role in providing support for the gifted program and so a parent/teacher or home/school component is necessary. An effective program of parent involvement is one that is initiated and accepted by school personnel who sensitize themselves to the concerns of parents and establish a positive working relationship with this constituency (Coletta, 1977). Parental involvement is a natural resource available to the schools (Grossi, 1980). To meet the information and awareness needs of parents, Kaufman (1976) suggests newsletters, a parent handbook, classroom visits, small and large group meetings, field trips, theory and/or strategy courses for parents, and home activity sheets. The coordinator or counselor should help parents understand the basis for the selection of students, make personal contacts, and family visits so that they can be approached when problems of disappointment arise.

In the gifted program, normal development problems may be intensified because of advanced cognitive abilities and diverse special interests so a guidance and counseling component should be incorporated in the program design. Bibliotherapy (Frasier, 1981), preventive counseling, mental health programs, growth groups (Delisle, 1980; Kelly, 1980), group counseling (Tessier, 1982; Zaffrann & Colangelo, 1979) can all be used with the gifted. In this way, both the intellectual as well as social and emotional needs of the gifted are addressed.

Stage IV: Implementing

When needs have been translated into overall goals and objectives, and a design has been developed, the "moment of truth" is reached when the program is put into action. All the activities that had gone on before this stage are basically theoretical and hypothetical but with implementation, reality must be faced. Implementing a design that proves successful and appropriate to the needs of gifted students would result in improved climate in both the group implementing the program and the group that is participating, especially if the climatizing and preparation stages have been carried out properly.

Furthermore, any lack of success need not necessarily be seen as failure as it can be used as input for redesign.

PREPARATION

A number of administrative functions such as identification of students, selection and training of teachers, and information dissemination should be carried out in this phase. The identification plan for the program should be activated and students selected. Teachers for the program are also identified and selected according to program needs. Inservice and staff development feature prominently in the preparation phase. If programs are initiated by teachers, then it is important for administrators to be knowledgeable in the foundations of gifted education. It has been found that participants in administrators' training workshops have not only increased their knowledge base on gifted education but have also more positive attitudes toward gifted children in particular and gifted programs in general (Feldhusen, Haeger, & Pellegrino, 1989; Michener, 1980). If the teachers do not have experience in teaching in gifted programs, then orientation and training must be provided. In examining the demise of a gifted program, Starko (1990) found that one of the main reasons for the failure was the lack of teacher training. Training should include not only pre-program workshops on the characteristics and needs of the gifted children, identification, curriculum development, instructional differentiation, social and emotional needs of the gifted and counseling, but also ongoing training throughout the operation of the program. Development of a differentiated curriculum tailored to the needs of the children selected for the program must be carried out prior to the application of the program and resources such as books and supplementary materials and equipment purchased.

There should also be orientation sessions for the selected students to explain the expectations and demands of the program and to help them understand themselves, their needs, their strengths and their fears. Parents of the selected students should be orientated so that they will better understand their children's needs and characteristics as well as what the program aims to achieve. In fact, these sessions should be provided to parents prior to their making a commitment to have their children join the gifted program. Finally, teachers not in the program and support personnel within the immediate school environment should be orientated to understand how the gifted program fits in with their roles and other programs within the school and how cooperative and collaborative efforts can be arranged involving everyone in the school.

APPLICATION

In the application phase, the main issue is to handle problems that arise out of the day to day running of the program as well as the major flaws that might occur as a result of faulty needs assessment or poor

program design. Decision making is most important at this time and must be shaped by receiving input from as many as possible of those who are affected by the decisions. Administrators serve a supportive function by applying their expertise and resources to handle any initial problems. The many questions to be asked at this time are: Is there anything or anyone that has been left out? Are the teachers able to implement the new strategies? Do the students know what is expected of them? Was the design comprehensive enough and adequate to meet the needs of the problem situations as they arise? All of these questions highlight the critically important concept of learning from the experience of the moment (Ingalls, 1976) and addressing issues as they arise. If the earlier stages and phases have been conscientiously carried out, then there will be fewer problems emerging at this phase.

OBSERVATION

Observation is a sensitive process but if it is planned for and accepted by those involved right from the planning and designing stage, it is more likely to be viewed positively. Observation of teachers and students in the program should be a part of the regular monitoring process. Effective observation of teachers occurs in an environment where there is agreement on the following five points: (1) the value of observation must be viewed positively by the teachers, (2) its place in the program must be understood by those observed and by those doing the observation, (3) teachers must be clear about its nature and relevance in the process, (4) there is awareness that professional norms may be strained by such observations, and (5) there are time constraints that may affect the adequacy of the observations (Bird and Little, 1985).

Observations may range from short visits to a systematic, structured supervision program requiring follow-up and regular interaction between teachers and observers. A teacher's belief in the benefits of observations rests mainly on the criteria and procedures used to analyze teaching, and the extent to which their knowledge, confidence, skill or professionalism can be increased with input from the observers. Observations should be seen as part of the cooperative effort between teachers and administrators for the successful implementation of the gifted program. Feldhusen and Huffman (1988) in their evaluation of the effectiveness of a practicum course in teaching the gifted found that more than 75% of the participants indicated that the observations, feedback and interaction with the observers were valuable. This, of course, depends very much on the quality of the observations, the usefulness of feedback, and the professionalism of the observers. It is an area where administrators, particularly principals, can demonstrate instructional leadership and win respect from the teachers at the same time (Weber, 1989).

There is also regular monitoring of student performance, and observing of their cognitive and affective

development through the developmental guidance and counseling component. This component should provide regular sessions for the prevention of problems, besides individual counseling and career counseling for the students, group counseling for teachers, and family counseling for parents. Marshall (1979) suggested that parents should be brought in when the gifted child is not in trouble so that they can be involved in improving the school image and supporting the school within the community.

EVALUATION

The goal of evaluation is to document the initial needs for the program as well as the results and impact that the program has on the participants (Callahan & Caldwell, 1986). The size of the gap between what was envisioned (theoretical) and what actually occurred (practical) is the measure to be used for effective evaluation. This gap provides a basis for formulating new objectives and creating a new or modified design that will move the program another step closer toward the ultimate goal of it being institutionalized. The evaluation process should not be viewed as a time for judgment; instead it should be seen as a descriptive reassessment of needs. Viewing evaluation as a descriptive reassessment of needs enables it to be employed as a feedback loop. This technique has been referred to as a goal-referencing approach, a way of making a relative assessment of how well a program has moved along a continuum toward the actualization of the vision that first started the process (Coleman, 1985). This fits in well with the more diagnostic function of formative evaluation rather than the more judgmental purpose of summative evaluation. With summative evaluation, the purpose is to collect information which can be used as a basis for making decisions about program continuation, termination or expansion (Borland, 1989).

Evaluation should be carried out in the light of the goals and design of the program and should possess relevance, scope, importance, credibility, efficiency and timeliness among other criteria (Callahan, 1986; Lauer & Asher, 1988; Stufflebeam et al., 1971). It should enlighten administrators and others on the outcomes of different program designs and theoretical approaches (Miller, 1991) and be seen as a means of contributing to the survival of the program (Renzulli, 1975). Seeley (1989) suggests including a research component in the evaluation phase of a program as it allows for comparisons and controlling of variables. Research may be more costly than evaluation to implement but the results can be used to provide empirically derived data-based support for the program or feedback for program revisions. As feedback is the distinctive feature of this Recursive Procedural Model for program development, a feedback loop emerges from the evaluation stage to other stages such as planning, formulating and designing. Besides providing regular feedback at differ-

ent stages of program development, evaluation can help to discover unplanned and unexpected consequences of program implementation (Renzulli, 1984).

Renzulli (1984) pointed out that when evaluation is not planned for at the initial stages of program development, it strains resources and adds stress to program personnel. Engelsjerd (1988) also suggests that evaluation be planned in the early phases of program development so as to prevent such problems. The evaluation format should also be designed before the implementation of the program and trained evaluators should be used (Lawless, 1977; Traxler, 1987). Trained evaluators who are able to anticipate problems, know what to look for, and have the expertise to deal with problems are required because evaluation is a highly complex process. Traxler (1987) found that only 50% of the gifted programs she surveyed had evaluation programs designed before implementation with only a small number of them used by trained evaluators.

There are a number of psychometric problems associated with evaluation of a gifted program. One problem is that there are few tests that have high enough ceilings to measure skills and behaviors at the higher and more advanced levels of intellectual functioning (Renzulli, 1984). Since most gifted programs have objectives of developing higher level thinking skills, it is often difficult to find suitable tests to evaluate whether children in gifted programs have reached these objectives. The many problems of evaluation are discussed elsewhere in this handbook by Callahan.

Stage V: Institutionizing

This is the stage when the gifted program is eventually accepted and recognized as an integral part of the general education system (Huberman & Miles, 1984; Taylor, 1986, 1987). Institutionization occurs when gifted programs are viewed as a part of the total spectrum of services provided by an educational institution for meeting the needs of all their students, rather than as an adjunct to the program (Passow, 1986; Tannenbaum, 1983). Just as programs are provided for the learning disabled, the handicapped, the culturally diverse, or those with special needs, there will be programs for the gifted. And, like the general education program for the majority of the school population, its existence will not be questioned.

Passow (1986), however, is not too optimistic about gifted education ever reaching a stage when it "becomes an integral part of education for all, rather than an add-on fad or frill which can be dropped when educators or policy makers are diverted by other demands" (p. 223). He hopes that there will be a point in time when justification for the need of gifted education is no longer required or when gifted education programs are not considered "elitist", by some.

Conclusion

The administrative issues discussed in this chapter are varied, both global and local. The Recursive Procedural Model presents a way of systematically examining the issues that are both inherent in as well as externally associated with the organization of gifted programs. Although these issues may have more relevance for administrators in one country, state or school than another, what is relevant for all is that program implementation is a dynamic process which requires cooperation and understanding among a variety of concerned groups. The procedure has been described in sequential fashion but it is by no means linear, absolute or fixed. If educators—both administrators and teachers—and the community including parents are a part of the visionizing, initializing, planning, and implementing processes for organizing programs for the gifted, then gifted programs will succeed in gaining a safe place in the educational realm within the school, state or country. And if leaders dare to dream, and continue to have a vision of gifted programs being accepted unconditionally, then that vision will have a chance of being realized. It is a long and difficult process but not an impossible mission.

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Suggested Further Reading

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Ability Grouping With Gifted and Talented Students: Research and Guidelines

KAREN B. ROGERS

University of St. Thomas, St. Paul, Minnesota, U.S.A.

PIETER SPAN

University of Utrecht, The Netherlands

Changes in Education

In 1989 a report was prepared for the Organization of Economic Cooperation and Development in Europe, but what it contained appears to be true for areas of the world outside Europe as well. Titled *School Development and New Approaches to Learning: Trends and Issues in Curriculum Reform*, Skilbeck (1989) concluded that although many innovations have taken place in recent years, education has not yet adapted to the "structural changes" of the last decades. These structural changes have included the move from selective schools to a general school model and a refocus from education for a minority of academically capable learners to mass education. In Europe, at the elementary school level some progress has been made in adapting to these structural changes, particularly with the elimination of entrance examinations for secondary education. Teachers at the elementary school level have been afforded much more freedom in the design of instructional and curricular goals and content. New subjects have been introduced with more attention given to problems in nature and society and new instructional strategies have been implemented, reflecting modern cognitive science. In general, there has been a tendency to rely less on memorization and more on the use of problem-oriented learning.

Progress at the secondary level in Europe has been slow. There has been little adaptation to individual differences, with an estimated 80–90% of classroom instruction presented in lecture (i.e., frontal) form.

The general goal was and is the acquisition of a body of knowledge. Very few schools at the secondary level have connected knowledge and skills to actual problems, such as ecological and environmental issues, war and peace, human values, culture, or consumer awareness. There has been little willingness to move away from the traditional "basics" at the secondary level. What changes are to be found at this level happen locally, that is, are not systematically planned or centrally controlled. Hence, progress is uneven.

Efforts at educational change have tended to be conservative, as exemplified by the "Effective Teaching" movement. In part a reaction to increasingly large numbers of low-achieving learners in schools, this set of strategies encompasses a strict control over all phases of "frontal" instruction: pre-instructional preparation, management of the teaching-learning environment, the instructional behaviors of the teacher, and the continuous evaluation and testing of pupil achievement. Movements such as "back to the basics" and "effective teaching" may be one way of postponing the liberalization of education. It is not, however, just these movements that have contributed to the continuing conservatism in general education, but also such factors as the extremely high achievement of many Asian societies. The education of Japanese students, for example, is perceived by educators around the world as one of disciplined focus on the acquisition of a large knowledge base through memorization. Yet even in Japan there are signs of a slow evolution in the direction of liberalization (Amano, 1992). A growing dislike to suppress learners,

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a desire by teachers to encourage intellectual freedom over control, choice over competition, diversity over equality, and self-realization over efficiency have been reported. It has been suggested that Japan believes a continuation of a successful economic position in the next century is dependent on education in the direction of freedom, choice, diversity, and self-realization. There is no doubt that these goals of an educational system will be and have been of extreme importance for the teaching and learning of highly able children and youth.

Adapting Education to Differences in Ability

In principle, there are three levels in which differentiation in education, with matching differential programming, can take place: (1) the school level; (2) the class level; and (3) the mixed-ability context. Children tend to enter the elementary school level in the third context, heterogeneous in their academic abilities. Consequently, the organization of groups must be very flexible, especially in the first two or three years of schooling. In principle, there are alternative strategies to provide this flexibility, such as homogeneous regrouping by ability or academic performance for specific instruction, cooperative learning groups for which the more able students may be held responsible for the learning of their less able group members, and individualized teaching. Of these alternatives, the Montessori School and Jena Plan models, for which instruction is adapted to the speed of development of the children, have been found appropriate for some precocious children. Acceleration across classes or across subject areas has also been found beneficial.

As the years pass in elementary schooling, however, the flexibility of such options for children evolves into frontal instruction and, in most cases, whole group instruction. In fact, this phenomenon has been witnessed world-wide in recent years. Special elementary schools with flexible programming for the academically able can only be found in a relatively few countries. Publicity surrounded the founding of a special school for able children in London in 1991, primarily because of the rarity of such events in recent years. Of course, there are still schools which adapt the general level of education provided to their students when faced with more than the average number of able children, but these are most usually in areas with a large proportion of high socio-economic level families.

When children move on to the secondary levels, the school and class levels of educational differentiation tend to be the rule. In Europe, many of the schools which provide differentiation tend to be independent or specially designated for particular disciplines or talent areas. At the highest level for students with academic ability are the *grammar school*, *gymnasium*, or *lycee*, wherein a large percentage of the highly able pupils receive their secondary education. The provision of special secondary education for the highly able in

some nations is unpopular with the general public and is, at present, prohibited in several countries. In some European countries (for example, Sweden's "Grundskola") as well as in America, the phenomenon of a middle school for students 12–16 years of age has been favorably received, in part as resistance against any forms of homogeneous grouping by ability or performance levels. Such a school organization tends to focus on whole group instruction in mixed-ability classes. In general, this approach has not shown itself favorable for highly able learners, because the range of abilities in mixed ability classes has been too large to allow teachers to adapt their instructional experiences appropriately for such learners.

The cycle comes full circle as the differences among students become too large for schools to differentiate in a mixed-ability context. Some schools tend to "stream" their pupils by ability or academic levels to reduce within-class diversity. In general, this streaming aims at providing changes in the speed of progress through the school curriculum, the quantity of information provided to pupils, and the processing levels expected for the content and skills goals. There is very little difference in didactics—that is, instructional strategies selected—and instruction quality. How desirable this is has been addressed by the research on self-regulated learning by Risemberg & Zimmerman (1992) and Span (1993) who found that while average students need a lot of teacher-regulated instruction, highly able students prefer to regulate the teaching–learning situation themselves.

Most secondary schooling in Europe culminates in the phenomenon of the final examination, an event that tends to dictate the teaching orientation in a conservative direction for at least the last two years of secondary schooling. One Council of Europe research report recommended, for example: "Special schools and classes for the gifted, in isolation from their peer groups are only acceptable with regard to a very limited scope of special talents, e.g., music and the performing arts" (Boxtel, 1992).

Although the British school system has a number of characteristics that make it well-suited for the gifted (such as flexibility in curriculum—even in the context of the recently introduced national curriculum—early reading and writing, implicit selection procedures), there is still no specific overall educational policy for gifted students in regular schools in that country (Freeman, 1992). British teachers do not differ from their colleagues elsewhere in being uncomfortable with categorizing children by ability and feeling a deep commitment to mixed-ability teaching. Germany, in recent years, has moved far ahead of the rest of Europe in implementing measures for improving the structure of support for gifted students. There are "express classes," "plus-courses," accelerated math teaching, and even a boarding school for gifted students (Wagner, 1990). Such options are supported by research (Heller, 1992; Weinert, Schrader, & Helmke, 1990), despite the lack

of consensus on acceptance of such practices in most European countries.

Not only in Europe but also in the United States, there is strong opinion that most forms of ability grouping should be rejected (see, Oakes & Lipton, 1992). The belief exists among such writers that heterogeneous classes can actually be designed which "won't compromise the educational opportunities of gifted and talented students." Reis (1992), however, notes that the studies conducted through the National Research Center on the Gifted and Talented (NRC/GT) have indicated that the instructional and curricular practices provided gifted students in the regular classroom are practically identical with those provided to average ability students. So that the education of the gifted may be actually be compromised in the mixed-ability context. What is evident is that the 1990s are witnessing a movement of untracking or degrouping in the United States while European educators seem unable to cope with the difficulties of differentiating for their already heterogeneous classes.

The contrast may have its roots in differences in concepts about the purposes of education and society. The preference for a "meritocratic" view lasted longer in the U.S. than in Europe; the "egalitarian view" prevailing in Europe since the late 1960s. Tracking and ability grouping are seen to belong to a meritocratic school system, where differences in ability or academic performance are thought to require differentiation on school and class levels. A common curriculum is a characteristic of the egalitarian concept. In most countries, parts of the old system have survived, resulting in a mixture of meritocracy and egalitarianism.

In fact, there exists a variety of management strategies that fall under the rubric of ability grouping. In general, ability grouping refers to a variety of long-term and short-term options that place students on the basis of their intelligence or achievement levels into "homogeneous groups" for the purpose of focusing/adapting instruction according to the needs of the group. Tracking refers to a practice common in the U.S. and still found in many countries, that separates a school population usually into three ability strands or streams: low (or vocational), average, and high (or college prep). The separation is usually full-time and fairly permanent, with movement more likely to be downward to a lower track than upward, particularly after middle school. "Regrouping for Specific Instruction" refers to the separation of students by achievement level in specific academic subjects, such as reading or mathematics, with heterogeneous classes provided for the remainder of each student's day. "Cross-grading" refers to regrouping by achievement level for specific academic subjects but across grade lines. Conceivably, with this strategy, students in several contiguous grades would be studying the same reading or mathematics curriculum. "Within Class Grouping" refers to an individual teacher's decision to create small groups within a classroom according to the students' most current achievement or performance in a

specific academic subject. This form of ability grouping is probably the most flexible in making changes as individual students progress more or less rapidly within a school year. "Pullout Grouping" refers to the practice of removing children at one grade level or across grade levels from their classrooms for the purpose of providing enrichment or remedial experiences, which may or may not be connected to the regular school curriculum. The final form of ability grouping reviewed in this chapter is "Cluster Grouping," a practice that places the 5-8 most academically able students at a grade level with a classroom teacher who generally (1) is motivated to work with them; (2) has acquired the training to work with them effectively; and (3) is willing to devote a proportionate amount of classroom time differentiating their instruction.

For the most part, the six management strategies described as ability grouping are usually implemented for the purposes of providing an enriched curriculum for academically able students. In addition there are at least six forms of acceleration that can be managed through grouping strategies as well. "Nongraded Classrooms" refers to the practice of cross-grading the entire curriculum, in effect allowing students to progress at their own pace in every academic subject (e.g., traditional Montessori model). "Curriculum Compacting," a term coined by Renzulli, describes the strategy of allowing students to bypass curriculum they have already mastered, thereby "buying time" for accelerated curriculum. "Grade Telescoping" refers to the practice of allowing students to progress more rapidly than usual through a school curriculum such that, for example, three years of middle school curriculum are completed in two years time, or four years of high school curriculum are accomplished in three years. "Subject Acceleration" refers to rapid progress, beyond grade level expectations, in a specific subject area. "Early Admission to College" refers to a practice of allowing students to enter college without completion of their high school diploma. Early admission can also take place at any point where students are admitted to a program. Finally, "Advanced Placement" refers to programs, both national and international (International Baccalaureate) that provide an accelerated curriculum to secondary school students and the opportunity to take a rigorous examination; high scores result in college credit for these students at participating colleges and universities.

The third major form of grouping is cooperative learning, defined as the practice of identifying teams of mixed-ability learners who will share the learning of a common task and will be evaluated either by the averaged achievement of all team members, or, in some cases, with individual accountability as well.

Questions of whether gifted and talented students do better academically, socially, and emotionally in heterogeneous or homogeneous groups can only be answered in rigorous research. It should not be left to opinions of educational writers, no matter how well-worded their

pleas. A review of several meta-analyses of research, mainly done in the U.S. was completed by Rogers (1991) through NRC/GT. In the remainder of this chapter Rogers' study will be described, with a focus on the methods used to draw research-supported conclusions about practices concerning the grouping of highly able students by ability.

The Research on Grouping By Ability

The ongoing debate on ability grouping in the United States has raised a number of educational issues for teachers and school administrators. In efforts to restructure or transform schools thereby improving the general level of achievement for all students, many reformers have argued for the elimination of most forms of grouping by ability. They have also suggested that grouping be replaced by mixed-ability classrooms in which whole group instruction and cooperative learning are the major instructional delivery systems. In many cases this restructuring has included the elimination of accelerated classes and enrichment programs for the gifted and talented in the name of reform. "The Research" has been cited by these reformers as the rationale for such classroom changes (George, 1988; Oakes, 1985).

Approximately 30 years ago, the issues surrounding applications of the research on ability grouping of the gifted were the subject of a similar debate. In 1962, Passow describing "The Maze of Research on Ability Grouping" listed the difficulties educators are confronted with when trying to generalize from the research on grouping: (1) variations in study scope and purpose; (2) variations in sample size and comparative group numbers; (3) variations in treatment duration; (4) variations in study design and sample selection; (5) variations in how effects are measured; (6) lack of focus on what occurs once students are grouped; (7) lack of focus on teacher characteristics and instructional quality; and (8) lack of focus on how grouping may affect teachers and administrators.

In the 1980s, with a literature base of over 700 studies on ability grouping (Kulik & Kulik, 1982), 312 studies on acceleration (Rogers, 1991), and over 300 studies on cooperative learning (Johnson, Johnson, & Maruyama, 1983; Slavin, 1984), it became increasingly unlikely that any researcher would have the resources or time to make an effective, comprehensive analysis of these literature bases. In fact, there have been 13 syntheses of research in the past 10 years, all of which represent analyses of parts of these bases. By analyzing these 13 research syntheses, one can acquire a sounder understanding of what the research really has to say about grouping by ability in general and about grouping students who are gifted and talented for the purposes of enrichment and acceleration, in specific.

Meta-analysis of research was first proposed in an

effort to manage increasingly large bodies of studies. Previous attempts to synthesize through narrative reviews of research or "box score counts" of studies had been found increasingly unreliable (Glass, 1976; Cook & Leviton, 1980). The meta-analytic approach involves an attempt to collect all experimental and comparative research studies conducted on a strategy and to average across all the studies to calculate a mean "Effect Size." The Effect Size is first calculated for each study included, using the formula, $ES = M_e - M_c/s$, where M represents the mean scores, respectively of the experimental (e) and control (c) groups and summarizes the general direction and degree of outcome between the two groups. These individual Effect Sizes are then averaged to calculate the mean Effect Size across all the studies. In some cases, this averaging process is done regardless of the quality of individual research studies included, the sample sizes in the studies, the period in which the studies were conducted, or the specific forms of the strategy. Such was the case, for example, for the first uses of meta-analysis in gifted education. Kulik & Kulik's (1982) synthesis of research on ability grouping with secondary students included studies of within-class and between-class grouping, added these across junior high and senior high students samples, and made no allowance for size of sample or differences in research design (for example, three track XYZ studies were combined with studies comparing students of like ability enrolled or not enrolled in special programs). Despite the potential for misinterpreting the effects of such a synthesis of research, there can be a greater degree of validity in drawing conclusions about the effects of an instructional practice when care has been taken to use well-defined a priori criteria for inclusion in a meta-analysis.

Slavin (1986) proposed a variation of the meta-analysis—the "best-evidence synthesis"—which incorporated an evaluative step in the inclusion process before Effect Sizes were calculated. By ordering all studies by the strength of their design and sample size, clustered mean Effect Sizes of the strongest designs could be compared for homogeneity to clusters of less well-designed studies. Only those studies found homogenous with the "best-evidence" studies would be included in the final synthesis. Criticisms of the best-evidence approach have primarily been leveled at: (1) the role of the synthesizer as both "judge and jury" of the research base (Guskey, 1987); (2) the effects various differences in inclusion criteria might have on synthesis conclusions (Abrami, Cohen, & d'Apollonia, 1988); (3) the dependence on "dated" studies (Hiebert, 1987); and (4) potential neglect of the conclusion to examine the conceptual adequacy of the studies included for synthesis (Gamoran, 1987). All but the first criticism have also been aimed at the meta-analytic approach to research. It becomes apparent that a thoughtful reader of the best-evidence synthesis and the meta-analysis must remain vigilant to the possibility of these errors occurring, despite the potential these approaches have

for drawing generalizations about the specific effects of given education practices.

Concerns have also been raised about the limitations of the measures used in those studies which can be quantitatively combined in their assessments of achievement. Most often, standardized tests of achievement have been used, with no documentation that the tests actually measure what was taught in the experimental study or that the tests provided generous enough ceilings or were given at out-of-grade levels to differentiate for achievement at the extremes of ability or performance. For instance, no difference in achievement might be the conclusion drawn about gifted students who were ability grouped if they and their equally gifted controls had both scored at the ceiling of the criterion measure used to assess differences in achievement. Likewise, there is some concern that achievement may be measured only in part by standardized tests. Grouping effect as measured by achievement gains on standardized tests is an extremely limited perspective when viewing the goals of and experiences provided in programs for the gifted and talented. Among the many meta-analyses and best-evidence syntheses cited in this chapter, only Vaughn, Feldhusen, & Asher's (1991) meta-analysis of enrichment pullout programs appears to have taken these concerns into account.

Despite concerns with the potential limitations of these synthesis methods, their reported outcome, the Effect Size, translates easily into understandable classroom application. An Effect Size of +.30, generally accepted as indicative of moderate, but practically substantial effect, would indicate any or all of the following interpretations (Glass, McGaw, & Smith, 1981):

(1) The improvement (approximately three months' additional achievement) of the experimental group over the control group on a grade equivalent score scale.

(2) The difference in standard deviation scores between groups of approximately one-third of the standard deviation unit higher for the experimental group.

(3) The equivalent position of a school year's teaching efforts—experimental students were taught in three years what the control students would accomplish in four.

In addressing the research on grouping (enrichment, acceleration, cooperative learning) there have been 13 major syntheses of research that have used the meta-analysis approach in the past 10 years. While acknowledging the potential pitfalls of this approach to research, the remainder of this chapter will draw conclusions across this base of syntheses about the issues relating to grouping gifted and talented students for instruction. In other words, the conclusions listed in this chapter are based on a meta-evaluative synthesis of previous meta-analyses and best-evidence syntheses of research on grouping (Rogers, 1991). The research syntheses were clustered for analyses by *management strategy* (type of ability grouping [$n = 6$], type of accelerative option ($n = 6$), type of cooperative

learning [$n = 9$]), by *school level* (elementary, secondary), and by *synthesis author*. After individual analyses of the 13 syntheses by study inclusion/exclusion criteria, number of students synthesized, general conclusions drawn, and weaknesses in synthesis, a common set of findings was identified through content analysis and a series of recommended guidelines were produced, based on the breadth of the research base, strength of study design, and reported Effect Size amongst the syntheses that pertained to specific instructional management strategies. For example, the first recommendation for full-time placement in special programming for gifted students was based on the body of 25 controlled studies K-12 of such an option, a larger and better controlled set of studies than the research base on cluster grouping, the second recommendation among the guidelines. All 13 syntheses of research have been fully cited in the references section. In general, the integration of these 13 analyses provided substantiation of the positive academic, socialization, and psychological adjustment effects of a variety of grouping strategies upon students with gifts and talents.

Conclusions on Grouping

Across the five meta-analyses on ability grouping for enrichment (Kulik & Kulik, 1982, 1984, 1990; Kulik, 1985; Vaughn, Feldhusen, & Asher, 1991), the two best-evidence syntheses of Slavin (1987, 1990), and one ethnographic/survey research narrative synthesis (Gamoran & Berends, 1987), the following conclusions can be drawn.

(1) While full-time ability grouping (tracking) for regular instruction makes no discernible difference in the academic achievement of average and low ability students (Slavin, 1987, 1990; Kulik & Kulik, 1982, 1984, 1985, 1990), it does produce substantial academic gains for gifted students enrolled full-time in special programs for the gifted and talented (Kulik & Kulik, 1982, 1984, 1985, 1990; Vaughn, Feldhusen, & Asher, 1991).

(2) High ability secondary students who are "tracked" have more extensive plans to attend college and are more likely to enroll in college, but research has not been able to substantiate that this is directly influenced by grouping (Gamoran & Berends, 1987). Likewise, research has not been able to substantiate that there are marked differences in the quality of teachers who work with high ability students or in the instructional strategies and learning time apportioned in such classes. It is probable, however, that the substantial gains in achievement reported for gifted and talented students in 6 of the 8 research syntheses is produced by the interaction of richer and more complex content, greater degrees of learning potential, teachers who are interested in their students and in their subject, and the willingness of gifted students to learn while in a classroom with other interested, high ability learners (Kulik, 1992).

(3) Ability grouping for enrichment, especially when enrichment is part of a within-class ability grouping practice or as a pullout program, produces substantial academic gains in general achievement, critical thinking, and creativity for the gifted and talented learner (Kulik & Kulik, 1990; Vaughn, Feldhusen, & Asher, 1991).

(4) Ability grouping, whether for regular instruction or enrichment purposes, has little impact on gifted students' self-esteem. When full-time grouping is initiated, there is a slight decrease in esteem, but in special programs for gifted students, there are no changes in self-esteem (Kulik & Kulik, 1984, 1984, 1990). Enrichment pullout programs show only a small but positive increase in self-esteem (Vaughn, Feldhusen, & Asher, 1991).

(5) Ability grouping for the gifted produces a moderate improvement in attitude toward the subjects for which students are grouped. A moderate improvement in attitude toward subject has been found for all ability levels when homogeneously grouped on a full-time basis (Kulik & Kulik, 1982, 1990).

(6) Ability grouping is not synonymous with "tracking" (Slavin, 1987, 1990). It may take many forms beneficial to gifted learners, including full-time enrollment in special programs or classrooms for the gifted, regrouping for specific subject instruction, cross-grade grouping for specific subjects or for the entire school curriculum, pullout groups for enrichment, and within-class ability grouping, as well as cluster grouping (Kulik & Kulik, 1990). The major benefit of each grouping strategy for students who are gifted and talented is its provision of the format for enriching or accelerating the curriculum they are offered (Kulik & Kulik, 1990, 1992). It is unlikely that grouping itself causes academic gains; rather, what goes on in the group does.

On the basis of two meta-analyses (Johnson, Maruyama, Johnson, Nelson, & Skon, 1981; Johnson, Johnson, & Maruyama, 1983) and one best-evidence synthesis (Slavin, 1990) on the academic and nonacademic effects of mixed-ability cooperative grouping, the following conclusions may be drawn:

(1) Cooperative learning in mixed-ability groups for regular instruction cannot be shown to be academically beneficial for gifted and talented learners. Likewise, there is no research below the college level to support cooperative learning in like-ability groups for gifted students (Robinson, 1990, 1992).

(2) Although there is some evidence to support academic effects on a general population of learners for those forms of cooperative learning that incorporate individual task accountability or competition (Slavin, 1990), little research has been reported that would allow this to be extrapolated to the gifted population (Robinson, 1990, 1992).

(3) Although there is some evidence to support sizable affective outcomes for mixed-ability cooperative learning, particularly for the acceptance of culturally diverse and academically disabled students (Johnson, Johnson, & Maruyama, 1983; Slavin, 1990), no research has been

reported which would allow this to be extrapolated to the gifted population (Robinson, 1990, 1992).

Across the one meta-analysis (Kulik & Kulik, 1984) and one best-evidence synthesis (Rogers, 1991) on accelerative practices for gifted students, the following conclusions about grouping for acceleration can be drawn:

(1) Grouping for the acceleration of curriculum for gifted students produces substantial academic gains for the forms of Nongraded Classrooms, Curriculum Compacting, Grade Telescoping, Subject Acceleration, and Early Admission to College. Advanced Placement programs were found to produce moderate, nearly substantial academic gains as well (Rogers, 1991).

(2) Those forms of acceleration for which groups of gifted learners may be involved do not appear to have a direct impact on self-esteem, either positively or negatively (Kulik & Kulik, 1984; Rogers, 1991). It is apparent that a host of other environmental, personal, and academic variables may be more directly involved with changes in self-esteem.

Guidelines for Serving the Needs of the Gifted and Talented

The following guidelines are listed, based upon the valid conclusions of the 13 research syntheses evaluated. Each guideline will be simply stated followed by a short discussion of its research-supported rationale. In effect, the guidelines are listed in research-supported priority.

Guideline One

Students who are academically or intellectually gifted and talented should spend the majority of their school day with others of similar abilities and interests.

As the four research syntheses of James and Chen-Lin Kulik have shown (1982, 1984, 1985, 1990), there is a marked academic achievement gain across all subject areas, as well as a moderate increase in attitude toward the subjects in which these students are grouped, when the grouping is full-time in differentiated programs ($ES = +.33, +.27$, respectively). What form this grouping may take is open: both general intellectual ability grouping (e.g., School Within a School, Gifted Magnet School, etc.) and grouping for special academic talent (Magnet Schools, accelerated subject classes) appear to be academically beneficial. A concern must be raised that the development of such programs, if not established with open communication about the purposes of the program, may be construed as "elitist." Sensitivity to public concerns about equity and equal access to quality education is critical to the development of such program options. Also of concern is the difficulty such an option presents in very small schools or districts without large enough numbers of students or resources to support a full-time, homogeneously grouped program.

Guideline Two

For schools that cannot support a full-time gifted program (whether demographically, economically, or philosophically), the cluster grouping of approximately one-third of a class load of students, either intellectually gifted or gifted in a similar academic domain (or domains) will suffice. The classroom "cluster" teacher needs to be sufficiently trained, given preparation time, and willing to devote a proportionate amount of classroom time to the direct provision of learning experiences for the cluster group.

As the Kuliks were able to establish in their 1990 synthesis, the mean Effect Size for within-class grouping of the gifted is $+0.62$, a sizeable academic achievement gain across all academic areas. This guideline was not listed first in importance due to the comparatively small number of research studies to support this practice ($n = 4$). It is estimated that with a comparative sample of 25 studies, as exist with separate gifted programs, a substantial Effect Size comparable to the full-time special program Effect Size ($+0.33$) would be more characteristic. Such an option cannot be only partially implemented: If the "cluster" teacher is not motivated or trained to work with gifted and talented students, or if the remainder of the class is comprised of extremely demanding or difficult students, or if the "cluster" curriculum is not appropriately differentiated, then the academic results will likely be lackluster.

Guideline Three

In the absence of full-time gifted program enrollment, gifted and talented students might be offered specific group instruction across grade levels, according to their individual knowledge acquisition in school subjects, either in conjunction with cluster grouping or in its stead.

Slavin's synthesis, although it did not include gifted and talented ability comparison studies, specifically, produced Effect Sizes large enough for the "Joplin Plan", commonly understood as cross-grade grouping by performance level, in reading ($ES = +0.45$, across 13 studies) to suggest that such outcomes might be expected of bright students in subjects beyond reading when placed in cross-graded situations. The Kuliks, however, reported a smaller Effect Size ($ES = +0.26$, across 16 studies). Full-time "cross-grading" might also be considered Nongraded Classroom experiences, which for the gifted have been found to produce a mean academic Effect Size of $+0.38$ (Rogers, 1991). Putting these three sets of findings together makes a good case for the strength of this form of educational provision for the gifted.

Guideline Four

Students who are gifted and talented should be given experiences involving a variety of appropriate

acceleration-based options, which may be offered to gifted students as a group or on an individual basis.

As the Kuliks pointed out in their meta-analysis that combined several forms of acceleration, gifted accelerates showed an achievement gain of $ES = +0.88$ over their gifted nonaccelerate controls and a trivial gain ($ES = +0.05$) over their gifted older-aged controls. Rogers found substantial academic gains for 5 of the 6 forms of acceleration which may be implemented as small group strategies: Nongraded Classrooms ($ES = +0.38$), Curriculum Compacting ($ES = +0.45$), Grade Telescoping ($ES = +0.56$), Subject Acceleration ($ES = +0.49$), and Early Admission to College ($ES = +0.44$). The sixth option, Advanced Placement/International Baccalaureate Programs, was close to a substantial academic gain at $ES = +0.29$.

Guideline Five

Students who are gifted and talented should be given experiences which involve various forms of enrichment that extend the regular school curriculum, leading to the more complete development of concepts, principles, and generalizations. This enrichment could be provided within the classroom through numerous curriculum delivery models currently used in the field, or in the form of enrichment pullout programs.

Vaughn, Feldhusen, & Asher's (1991) meta-analysis of studies involving enrichment pullout programs showed substantial academic gains, ranging from $+0.32$ to $+0.65$ in the specific areas for which experiences (e.g., creative thinking, critical thinking, achievement) were provided in the pullout program. The opportunities offered in such programs can be effectively delivered within the classroom, as well as through the variety of enrichment models that have been developed in the past two decades.

Guideline Six

Mixed-ability Cooperative Learning should be used sparingly, perhaps only for social skills development programs.

Robinson's (1990, 1992) exhaustive searches of the literature were unable to uncover any well-designed research to substantiate academic achievement gains for gifted learners when placed in cooperative settings with students of mixed ability. Slavin's concern about the "Robin Hood Effect," the slight rise in achievement for low-ability learners with a simultaneous decline in achievement for high-ability learners, must be taken seriously until a solid body of research has been established to: (1) counteract Slavin's concern; and (2) provide evidence that homogeneous cooperative groups produce more academic effect than heterogeneous cooperative groups or than homogeneous ability groups using a variety of learning modes (individualistic, small group, competitive, and so forth).

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*Reference is one of the 13 research syntheses referred to in text.

After School Programs, Competitions, School Olympics, and Summer Programs

DAVID GOLDSTEIN

Duke University, Durham, North Carolina, U.S.A.

HARALD WAGNER

Institute Bildung und Begabung, Bonn, Germany

Introduction

It is often assumed that the gifted and talented will "make it on their own", without the need for any special encouragement or instruction. This assumption is totally unwarranted. Bloom (1985) has noted that regardless of initial characteristics or gifts of the individuals, they will not attain extreme levels of capability unless there is a long and intensive process of encouragement, nurturing, education and training.

Even the most innovative and attentive school cannot be expected to meet the educational needs of the most gifted and talented students within the regular curriculum or even within the regular school calendar. Accordingly, special out-of-class programs are required to provide the necessary challenge and guidance to those of very high ability.

A similar rationale has been offered by Feldhusen (1991), who has outlined several special needs that are not typically addressed within the context of the regular classroom. He notes that while pullout or resource room programs or even full-time self-contained classes for the gifted may be able to address some of these special needs, these programs are not widely available and so for most talented students "supplementary program services on Saturday and in the summer or after school are needed to fill in some of the missing educational experiences" (p. 197).

A Framework for the Development of Talent

Weinert has recently proposed a framework for the development and fostering of talent (see Weinert & Wagner, 1987) that may serve as a theoretical underpinning for programs for the talented. He concluded that effective measures to support the development of potential in young people should be characterized by the following features:

(1) Incitations: Curiosity, quest for knowledge and the interest in learning has to be incited by a multitude of attractive sources of information within easy access.

(2) Offers: A variety of options has to be available to engage in learning activities such as workshops, courses, summer programs and competitions.

(3) Challenges: The difficulty and the level of the activities should match the level of ability so that very able pupils feel sufficiently challenged and have to exert considerable effort to reach the goal.

(4) Incentives: The activities should be exciting and attractive and should provide the experience of success and personal recognition.

(5) Counseling: The young people, their parents and teachers should be able to obtain qualified information on existing and available support programs and on the unique aspects of the students' potential.

(6) Cooperation: Very able young people should be brought up and educated in a community of peers to experience a variety of social contacts, to acquire social responsibility and to facilitate a harmonious development of their personality.

According to this framework, at least in the domain of intellectual abilities, it seems to be quite unrealistic to strive for a comprehensive, valid and reliable system of early assessment of potentials followed by a closed system of support programs. Instead, every effort should be made to provide a variety of measures to meet the needs of those who are eager to achieve and show a high degree of motivation. They should be able to be implemented pragmatically, easily accessible, differentiated and as open as possible.

Naturally, one cannot provide programs for the talented without first identifying such individuals. There are essentially two ways to accomplish this task. One can create an arena where individuals are allowed to perform some task or set of tasks with those whose level of performance is judged superior, by whatever definition or criterion, selected as eligible or alternatively, one can use a psychometric approach,

relying on standardized tests that are, or at least should be, valid predictors of talent or high ability. The first approach is best exemplified by academic competitions; the second by the talent search.

In this chapter we examine the various facets of out-of-class programs and services, including the identification of high ability students through talent searches and academic competitions and special programs held after school, on weekends, or during summer holidays. While the chapter attempts to be inclusive in its coverage of the numerous out-of-class efforts currently in existence, detailed attention is paid to a small number of representative efforts in order to demonstrate in specific ways how these programs work and what they have accomplished.

Competitions and School Olympics

Throughout the United States and Europe, academic competitions, such as science fairs and school olympics, have been developed to challenge and encourage those students with special abilities. While often derided as “elitist”, these programs can serve to give the talented youngster the message that he or she can indeed excel. One Nobel laureate and former science fair winner has noted “competition encourages youth to do things well, better than they would have thought themselves capable of doing” (Cowen, 1991). In the United States, opportunities to participate in special competitions tend to be of two types: those which are “triggered” by scores on standardized tests, usually those tests designed for college admissions (e.g., the SAT or ACT), and those that are based on after school accomplishments in specific domains such as science or mathematics. A notable example of the first category is the Presidential Scholars program. The second category is exemplified by the Westinghouse Science Talent Search and the MATHCOUNTS program. In Europe, competitions have been designed to meet the special needs and circumstances of European youth. Each of these various endeavors will be discussed in turn.

Presidential Scholars

The Presidential Scholars program was established in 1964 by President Lyndon Johnson to recognize and honor 121 of the United States’ most distinguished graduating high school seniors. In 1979, President Jimmy Carter extended the program to include the recognition of 20 students with exceptional ability in the visual, creative and performing arts. More than 3500 Presidential Scholars have been chosen since the program began. All students who take the SAT or ACT are eligible for consideration. An initial group of 2600 top scoring students, representing all of the states and jurisdictions of the United States, are selected based on these scores. These students are invited to complete an

application and each year approximately 1700 do so. The Review Committee then selects a pool of 500 Finalists. The 141 Presidential Scholars are then chosen from this pool such that at least one male and one female are selected from each of the 53 states and other jurisdictions of the United States. The scholars, their families and one teacher nominated by each scholar are then invited to attend a week-long series of programs and receptions in Washington, D.C., culminating in a visit to the White House and a meeting with the President.

These students have been studied in detail over a period of several years by Kaufmann (1981) and more recently by Goldstein and his associates (Goldstein, Stocking, & Sawyer, 1992). In general, the Presidential Scholars come from intact, middle-class families characterized by high levels of parental education and commitment to academic and extra-curricular achievement. The Scholars attend the more prestigious and academically rigorous colleges and continue to demonstrate high levels of accomplishment in adulthood.

Westinghouse Science Talent Search

The Westinghouse Science Talent Search was started in 1942 by two former journalists for the purpose of promoting an interest in science among American high school students. In the ensuing half century, over 2000 finalists have been recognized and awarded a total of nearly \$3 million in scholarships and cash prizes.

The selection process is based on the submission of science projects. From a field of about 1500 entries, eight judges select 300 semifinalists and 40 finalists. Based on interviews with each finalist, the judges then award substantial scholarship prizes to the ten “winners” and smaller awards to the remaining 30 finalists (Cowen, 1991). The 52nd Westinghouse Science Talent Search for 1993 offers the following scholarship prizes: one at \$40,000; one \$30,000; one \$20,000; three \$15,000; four \$10,000; and thirty \$1000.

Since the program began, five Westinghouse finalists have gone on to become Nobel laureates; two have won the Fields medal (the “Nobel Prize of mathematics”) and eight have won MacArthur Foundation fellowships, better known as the “genius awards” (Cowen, 1991). Other Westinghouse winners have achieved at high levels in various science and math fields as well.

MATHCOUNTS

When the MATHCOUNTS program was established in 1983, it was touted as “the first nationwide effort of industry, education and government to promote excellence in mathematics through a junior high school mathematics competition” (Jones, 1983, p. 482). MATHCOUNTS was developed by the National Society of Professional Engineers (NSPE), the National Council of Teachers of Mathematics, the CNA Insurance

Companies, the National Science Foundation and several additional educational associations. The purpose of MATHCOUNTS was to increase the motivation of students in grades 7 and 8—key grades for math instruction—to achieve excellence in math as well as to promote public recognition of math achievement.

The organizational structure of MATHCOUNTS is typical of academic competitions. Initially, local chapters of NSPE provide schools in their geographical regions with contest materials at the beginning of the school year. Each school is then allowed to select four students to represent it at the chapter-level competition. Local NSPE chapters throughout the United States conduct the chapter-level contest on the Saturday of National Engineers Week in February. The top four teams and the top twelve individuals are awarded trophies. In April the state-level contest is held, with trophies awarded to the top five teams and to the top nine individuals in each state. Finally, the national-level contest is conducted in Washington, D.C. in May.

MATHCOUNTS is administered at no cost to the schools or the students. The mathematical content of the questions varies from 40 short-answer questions administered during the written round of the competition, to oral examination by a panel of judges of the ten top-scoring students.

By any reasonable standard, MATHCOUNTS is a successful program. Since the program began in 1982, more than three million students have participated; more than 17,000 volunteers (teachers, engineers and others) participate annually to coach students and conduct competitions; and over 8000 schools register annually to participate. MATHCOUNTS participants have been successful in subsequent competitions: 40% of the scholarships awarded in 1992 by the National Society of Professional Engineers Education Foundation went to program “alumni”, even though only 25% of the applicants were former “mathletes”. However, the gender gap found in other math competitions is present among “mathletes” as well—of the 224 competitors at the 1992 national competition, 187 (83.5%) were male (Pifer, 1992; Goldstein & Stocking, 1992).

EUROPEAN COMPETITIONS

In Europe, the programs that are well-suited to the special circumstances of European societies as well as the theoretical needs outlined by Weinert are academic competitions. They are relatively easy to administer and to organize, they can be made accessible to a broad number of participants and they can be differentiated to suit any level of ability. Competitions are an excellent tool to elicit, stimulate and challenge talents in many different fields. They are supposed to activate and strengthen the inclination for the subject matter and thus to improve knowledge and ability. Struggling with the tasks of the competition enhances the abilities of working autonomously while researching,

experimenting, problem solving, learning and practicing release energies and enhance perseverance.

By taking the challenge of a competition, the participants gain insight into their abilities and their position in comparison with peers beyond the confinement of their classroom and school. Coming together with other participants, they have the opportunity to meet similarly interested and able peers who are usually not so easily found. Attractive prizes like scholarships, summer programs, or money are additional incentives. The UNESCO General Conference on Education in October 1989 recommended that “member states should promote out-of-school activities such as the international and regional olympiads in the sciences and mathematics in order to encourage scientific talent and initiative among young people.”

In Germany, for instance, competitions are considered to be important and valuable additional instruments in the educational process. There are more than twenty nation-wide competitions in addition to several dozen smaller competitions organized at the regional or state level (Bundesminister, 1991). More than 100,000 pupils participate annually either individually or in groups in disciplines such as mathematics, science (biology, chemistry, physics, technology, computer science, environmental studies), foreign languages, social studies, history, creative writing, music, composing, drama, film and video production (cf. Table 1). Most of these competitions are subsidized by the Federal Government, with a total allocation of more than 6 million DM in 1992. In addition, a considerable part of the cost is covered by sponsoring foundations and industry. While most of the academic competitions are aimed at upper secondary school students (16+ years of age), some in the humanities and in the performing arts are open to younger ones as well. The youngest age group in the music competition is 7 years and below.

Without doubt, one of the most remarkable competitions is the Bundeswettbewerb Fremdsprachen (Federal Language Contest), as it is a unique comprehensive approach to support acquisition and application of foreign languages among secondary school students. The contest was initiated in 1979 by the Stifterverband für die Deutsche Wissenschaft (the most important German organization to sponsor the academic sciences) as a means to encourage students to learn foreign languages and to become interested in other countries and cultures at an early age. It has been developed and administered by independent experts from universities, schools and industry. Since 1985, the Federal Languages Contest has been sponsored mainly by the Federal Ministry of Education and Science. Bildung und Begabung e.V., a non-profit-making private association, is responsible for the organization and coordination of the contest.

The contest comprises three levels:

(1) A group contest for students in grades 7–10 (13–16 years, in their third to sixth year of foreign language learning). The group contest encourages project work

TABLE 1
Federal competitions for secondary school students in Germany

<i>Title</i>	<i>established in</i>	<i>ca. no. of participants</i>	<i>individ/group participants</i>	<i>age of participants in years</i>	<i>task/subject area</i>
<i>Science, mathematics, informatics</i>					
Jugend forscht	1966	3,600	i/g	≤ 15, 16–21	self-assigned research in biology, physics, chemistry, mathematics, technology, environmental studies or computer science
Bundeswettbewerb Mathematik	1970	2,000	i	≤ 19	solving mathematical problems
Auswahl zur Intern. Mathematik-Olympiade	1977	150	i	≤ 20	solving mathematical problems; selection for the International Mathematics Olympiad
Auswahl zur Intern. Physik-Olympiade	1974	400	i	≤ 20	solving physics problems; selection for the International Physics Olympiad
Auswahl zur Intern. Chemie-Olympiade	1975	300	i	≤ 20	solving chemical problems; selection for the International Chemistry Olympiad
Bundeswettbewerb Informatik	1980	2,000	i	≤ 21	solving problems in informatics, computer science
<i>History, political education</i>					
Europäischer Wettbewerb	1954	90,000	i	≤ 13, 14–16, 17–21	identical assignments in 19 European countries pictorial or written treatment of European perspectives in social, economical, political or cultural affairs
Gestaltungswettbewerb Zeitgeschichte	1989	1,100	i/g	17+	design a piece of artwork expressing the given theme taken from contemporary history
Schülerwettbewerb zur politischen Bildung	1971	5,000	g	12–14, 15–17	group work on six assignments in political education
Schülerwettbewerb Deutsche Geschichte um den Preis des Bundespräsidenten	1973	6,000	i/g	8–21	self-assigned research in local history within a given theme
<i>Foreign languages</i>					
Bundeswettbewerb Fremdsprachen	1979	8,000	i/g	13–16, 15–16, 17–19	group competition: self-assigned production of an audio or video tape in a foreign language; individual competition: several oral and written tasks in one or two foreign languages
<i>Performing arts, writing, composing, film and video</i>					
Vorlesewettbewerb des Deutschen Buchhandels	1959	6,000 schools	i	12 (grade 6)	reading (oral presentation) of texts
Bundeswettbewerb Jugend musiziert	1963	10,000	i/g	≤ 7, 8–10, 11–13, 14–16, 17–21	playing musical instruments as soloists or in ensembles; singing
Schüler Theater	1980	150 groups	g	6–21	production of an original drama
Schüler machen Filme und Videos	1982	500	i/g	6–12, 15–17, 18–24	video or film production

TABLE 1 (cont'd)
Federal competitions for secondary school students in Germany

<i>Title</i>	<i>established in</i>	<i>ca. no. of individual/group participants</i>	<i>age of participants in years</i>	<i>task/subject area</i>
Schüler machen Lieder	1984	200	i/g 11+	original production (composition and lyrics) and presentation of a song
Bundeswettbewerb Schüler komponieren	1986	100	i 12+	production of a composition for a given instrumental arrangement
Schüler schreiben	1986	1,300	i 10+	creative writing: production of a free written text to five pages

to produce a presentation (audio or video tape and additional written material) on a self-assigned subject (cf. Blüm, Hertel, & Schröder, 1992).

(2) An individual senior contest for students in their fifth or sixth year of foreign language learning (15–16 years of age). It consists of an oral section (listening comprehension and oral production) and a written section (a cloze test, i.e., a text in which missing parts of words have to be filled in) and a semi-creative writing task. The best participants in English usually demonstrate a higher proficiency than first year university students in English Studies.

(3) An individual senior contest for students in grades 11–13 (17–19 years) in which at least two foreign languages must be presented. This contest consists of four rounds over a period of twelve months. It begins with an oral production in two languages (e.g., explaining the situation depicted in a cartoon, reading a text and answering questions on the text). The second round is a written examination with elements of translating, writing and summarizing. The task of the third round is writing a 3000-word essay on a given subject within a six week period. The final round consists of a one-hour multilingual debating session in groups of four together with language experts and of individual oral examinations (cf. Hertel et al., 1991). Placement in all rounds depends upon achievement only. The participants do not compete against each other as in a sports contest.

Successful participants can expect a variety of prizes. Winners of a first prize in the final round (“federal winners”) are granted a scholarship for university studies from the most prestigious scholarship foundation in Germany (Studienstiftung des deutschen Volkes). Second and third prizes consist of cash. Several prizes (e.g., travel grants, books, records) are awarded by foreign embassies for special languages. The Federal Minister of Education and Science awards a five-week stay in a summer studies program at a university in the United States to three participants who wrote outstanding essays on U.S. related subjects.

There are many other types of competitions in Europe as well. More than twenty European countries run competitions for young researchers in the sciences

(e.g., “Jugend Forscht”, “Science Fair”). Up to three entrants from each country may participate in a European competition for environmental studies initiated in 1990 by “Jugend Forscht” and “Deutsche Bank”.

World-wide, competitions in mathematics seem to be by far the most popular. A compendium published by O’Halloran (1992) lists 231 competitions on the regional, national and international levels with a total of more than four million participants.

In addition, pupils with outstanding achievements compete in various international olympiads which are held annually in mathematics, chemistry, physics, informatics and biology (see Table 2).

TABLE 2
International olympiade in mathematics and sciences
(adapted from Gau, 1992)

<i>Subject</i>	<i>established in</i>	<i>participants per country</i>	<i>number of participating countries (1992)</i>
Mathematics	1959	6	60
Chemistry	1966	4	33
Physics	1967	5	37
Informatics	1989	4	45
Biology	1990	4	13

Conclusion

These various types of academic competitions have clearly been successful, both in the United States and in Europe in identifying and nurturing talents. Academic competitions have the advantage of being flexible and adaptable to a variety of settings, domains of endeavor and financial constraints. The continued use of competitions and their further refinement should be encouraged.

Talent Search Programs

Origin of the Talent Search

A primary alternative to academic competitions is the psychometric approach, based upon the use of

standardized tests of aptitude or achievement. Students whose scores exceed some criterion are judged to be talented or of high ability.

In his autobiographical essay, Julian Stanley (1991) described the origin of the talent search concept. The story began in 1968, when a brilliant 12-year-old named Joseph Bates enrolled in a summer computer program for junior high school students on the campus of Johns Hopkins University. The young man's instructors were so impressed with his abilities that they asked Professor Stanley, an authority in educational psychology, to meet with him. In the course of his evaluation of Bates, Stanley administered several difficult tests, including the SAT. The student's scores, Stanley relates, were "remarkable". Being aware of the pioneering work of Leta Stetter Hollingworth with exceptionally talented students, however, Stanley recognized that Bates was probably not unique. Indeed, shortly after Bates's admission to Johns Hopkins at age 13, two other extraordinarily talented youngsters (one aged 13, the other aged 16) applied for admission as well. All three succeeded at Hopkins. As Stanley describes it: "These three cases were enough to suggest that there were quite a few extremely talented youths who needed far more stimulation than could be provided by almost any high school. They should be identified and given special, supplemental educational opportunities in mathematics and related subjects" (p. 346).

Subsequently, Stanley received a grant from the Spencer Foundation and in 1971 the Study of Mathematically Precocious Youth (SMPY) was begun. The first talent search was conducted in 1972, in the area around

Baltimore, Maryland, the home of Johns Hopkins University. In that first search, 450 students in mostly seventh and eighth grades took several mathematics and science tests, including the SAT-Math. By 1979 the talent search effort had grown to the point where a separate organization was deemed desirable. Accordingly, the Center for the Advancement of Academically Talented Youth (CTY) was founded. CTY initially conducted a talent search for mathematically and verbally precocious youth in 13 Eastern states, later adding 6 states in the Far West. In 1980 Stanley encouraged the creation of an organization similar to CTY at Duke University. That group, the Duke University Talent Identification Program (TIP), began a talent search in the 16 states in the South and Midwest. Shortly thereafter, additional talent searches were begun at Northwestern University and the University of Denver. These four regional talent searches now serve all 50 states (see Figure 1).

The Talent Search Process

The primary purpose of the talent search is to identify those students of exceptional ability who, given present educational practices, are often not identified and consequently ignored or under-served (Cohn, 1991). The talent search process at Duke University (TIP) and at the Johns Hopkins University (CTY) involves seventh-graders who score in the top 3% on a nationally normed, in-class achievement test. At Northwestern

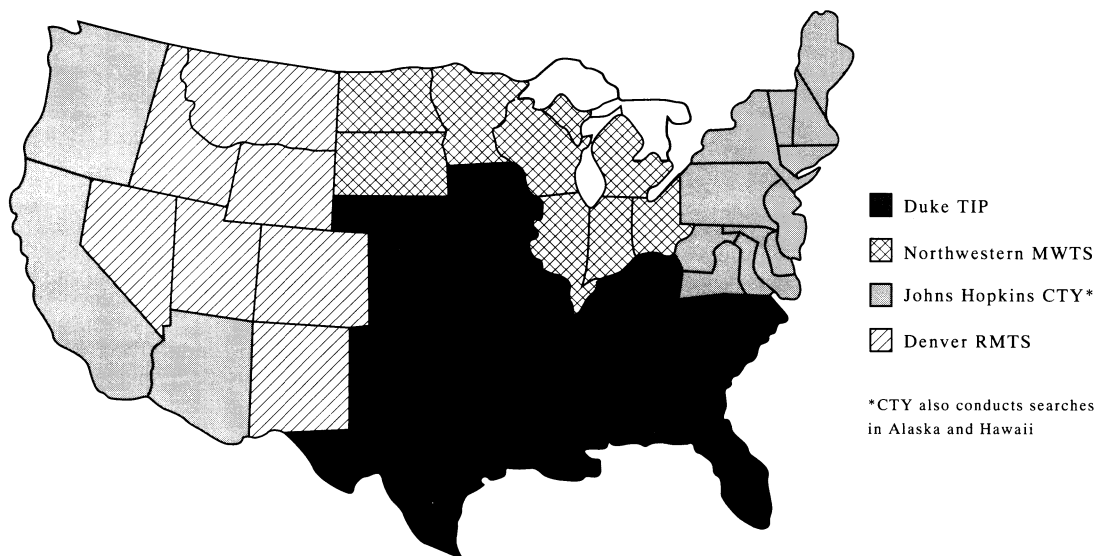


FIGURE 1. Talent Search Regions.

University (Midwest Talent Search) and the University of Denver (Rocky Mountain Talent Search), students in grades 6 through 8 who score in the top 5% on a nationally normed, in-class achievement test are eligible. Students who meet these criteria are nominated by their middle-school or junior high school counselors to participate further by taking the SAT or ACT standardized tests originally designed for college-bound high school students. By using these out-of-level tests, young students of exceptional ability, who reach the "ceiling" on in-class tests, have the opportunity to demonstrate the full extent of their abilities. Parenthetically, these youngsters take the college-admissions tests at the same time and often in the same room, with the regular clientele of 16- and 17-year-old high school juniors and seniors. In addition to the opportunity to take a more challenging, out-of-level examination, students who participate in the talent search receive a variety of educational and counseling materials as well as access to various programs, the most notable of which are the summer residential programs (see below). For example, TIP provides an *Educational Opportunity Guide* to all participants in the talent search. The Guide's purpose is to inform these students and their parents, teachers and counselors of the many summer and school-year programs especially designed for academically and artistically talented youngsters. CTY offers a variety of publications and resources designed to assist parents and teachers, such as the *Sourcebook for Parents of Academically Able Students*. In addition, all four regional talent searches offer a variety of school year programs, designed to offer academic challenges, stimulate interest in various careers and provide information about college options.

The talent search culminates with recognition ceremonies. These ceremonies represent the first and possibly only opportunity for public recognition and acclaim that many of these exceptional youngsters will receive. The students learn that it is acceptable to be bright, creative and interested in intellectual pursuits. This message is especially significant for children from rural areas or from economically disadvantaged families where academic excellence may not be reinforced.

Growth of the Talent Search

The talent search has grown rapidly. For example the number of youngsters who participate in TIP's Talent Search has increased dramatically, rising from 10,969 students in 1981 to 61,700 in 1993 (see Figure 2). In 1992, the Johns Hopkins University (CTY) Talent Search identified approximately 40,000 students; Northwestern University's Midwest Talent Search identified approximately 30,000 students; and the University of Denver's Rocky Mountain Talent Search identified approximately 5000 students. Thus, in 1992 alone these four regional talent searches identified nearly 140,000 talented youngsters, making the talent

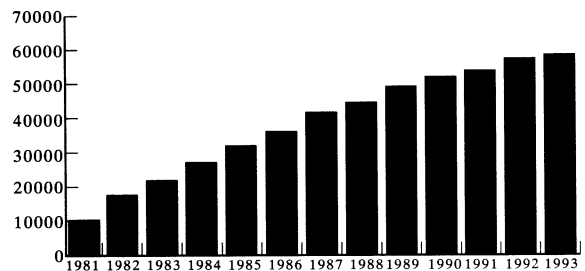


FIGURE 2.

search the largest effort of its kind in the United States, if not the world.

The students who participate in the talent search have been studied extensively (see, for example, Goldstein et al., 1992; Stocking & Goldstein, 1992). As with the findings from the Presidential Scholar samples discussed earlier, these data suggest the important role of family variables in the development of exceptional ability.

Conclusions

As was the case with academic competitions, the nearly 20 year experience with the talent search demonstrates the utility of the psychometric approach to the identification of talent. Whatever the drawbacks of the SAT and ACT as predictors of success in college, their use as screening tests of exceptional academic talent in young adolescents has been shown to be of great value (Stocking & Goldstein, 1992).

The identification power of academic competitions and the talent search process has not yet been compared. For example, do these two approaches identify different students, or is there a large overlap in the samples of students identified by each method? Presumably, these two methods, which closely resemble the distinction between speed and power tests, have different strengths and weaknesses, so that the use of both approaches is probably warranted. The best mix of approaches, however, awaits the result of empirical analysis.

The task of identification, of course, is only part of the challenge. Once students have been identified, appropriate programs need to be provided. Otherwise, the task of identification can be a sterile and meaningless endeavor. In the next sections, various types of out-of-school programs for the talented are described, ranging from after-school programs to intensive summer residential experiences.

After-School and Saturday Programs

Parent Initiated Programs

Parents are generally the first adults in a child's life to become aware of the child's talent. When the child

first enters school, it may become especially necessary for parents to provide supplementary activities by introducing the child to exciting and fascinating subjects. Often nature trails, visits to historical sites, museums, exhibitions, technical installations and concerts for children will stimulate the child's interest in a particular subject matter.

Early introduction to the use of information sources such as reference books and public libraries can take the strain off parents of those children who are particularly eager to learn. This should be done with the aim of arming children with tools to enable them to learn independently by discovery and investigation. The main idea is not merely to accumulate knowledge—in which the highly able succeed with ease—but to develop intellectual depth and creative thinking by combining elements of knowledge. In addition to this, particular value should be placed on developing creativity in various fields (e.g., languages, play-acting, music, art, dance, sports, handicrafts) and nurturing social responsibilities and social consciousness in particular in those children whose intellectual development may be far beyond their social-emotional development.

For many parents this task is rather intimidating. When they seek professional help and advice from pediatricians, teachers, school psychologists or educational counselors they are sometimes confronted with ignorance and prejudice about the talented child and imputations that they are “pushy” parents.

Parent Self-Help Groups

Faced with the predicament of having to solve their problems more or less on their own, the parents of highly able children in many countries have established self-help groups in the form of associations such as the Gifted Child Society in the United States, the British National Association for Gifted Children (NAGC), the Deutsche Gesellschaft für das hochbegabte Kind in Germany, “Pharos” in The Netherlands, “Bekina” in Belgium, Association nationale pour les enfants intellectuellement précoces (ANPEIP) in France, or Elternverein für hochbegabte Kinder (EHK), Schweiz, in Switzerland.

The NAGC (UK) is the largest European parents' initiative for highly able children (approximately 2000 members). Its immediate work with children and parents takes place throughout England and Wales in 35 branches (regional groups). Most of these organize so-called Saturday Clubs which offer a wide range of activities. Their joint aim is to:

- (1) Provide an opportunity for gifted and talented children to meet and to pursue their intellectual or artistic activities or sports in company.
- (2) Facilitate contact with interesting and informed adults, offering children intellectual stimulus and an introduction to a wide range of interests.
- (3) Provide and encourage companionship between

children and adults, other than their parents and schoolteachers, in order to help children integrate socially and develop in emotional maturity both at home and at school.

(4) Give help, advice and information to parents of gifted children.

(5) Increase community awareness and understanding of the need to develop links with and information for local professionals such as teachers, social workers and medical practitioners.

It is the policy of the NAGC not to compete with state-run educational programs or to prescribe a more or less fixed special program for gifted and talented children. In addition, the NAGC strives not to relinquish the support or spontaneous cooperation of parents and other adults in favor of a more professional approach. The NAGC does not organize programs or other services whose implementation requires action or choices at school (e.g., class allocation or streaming for gifted children). It aims, rather, to provide incentives as a supplement to formal educational provisions. The intention of Saturday Clubs, therefore, is to offer an enrichment program. Courses held at the various branches are run by adult volunteers, often a parent of one of the children or someone who is generally interested in the children's progress. They determine to a large extent the selection of activities available. One Saturday's program could, for example, consist of any of the following: sports; arts and crafts; courses on electronics, natural sciences and computers; foreign languages; board games; or making a newspaper.

The Association is funded by membership fees and donations from industry and foundations. State institutions provide support from time to time by, for example, granting the use of facilities. The NAGC courses are suitable for children and youngsters between the ages of 5 and 17. An IQ of at least 140 is suggested, although it is appreciated that IQ assessment is not an absolute measure of a child's ability, in particular for children with disadvantaged or different cultural backgrounds. Other factors are therefore also taken into account when children are selected: highly recommended by social workers, medical officers, etc.; are from one-parent or poor families; are culturally deprived; are causing problems at home or at school; are lonely; or have parents who have offered skilled help. Siblings are invited to join the Saturday Clubs because it has been shown that in many cases more than one child in a family is of high intelligence.

Long-Term Courses

The program of courses offered by parents' associations are dependent on many, often chance, influences such as the number of children of a certain age group interested and willing to participate, the availability of course instructors, or special rooms, materials and equipment. A considerably more intensive form of provision are

intellectually demanding long-term courses which take place in the afternoons, on weekends, or during holidays and which allow for a more systematic approach to a specific subject area.

As an example of this type of program, the "Hamburg model" is to find and foster mathematically able pupils will be described in more detail. In 1983, inspired by the work of Stanley and his group at Johns Hopkins University (Benbow & Stanley, 1983), a group of psychologists and mathematicians at the University of Hamburg developed an annual regional search for mathematically able pupils at the end of grade 6 (12-year-old) (Wagner & Zimmermann, 1986). Selection criteria were (1) German versions of the mathematical parts of the Scholastic Aptitude Test and (2) a test of mathematical problem solving consisting of seven items, both of which were taken during an examination of three hours' duration.

Pupils interested in the talent search received a preparation booklet in advance containing a complete version of the mathematical parts of the SAT to be worked through and attempted at home. About 2100 pupils have taken part in the ten talent searches carried out so far (1983–1992), of whom 486 (about 23%) were invited to participate in a long-term program of instruction. During the 1992–1993 school year, approximately 180 pupils attended Saturday morning classes at Hamburg University. The pupils work in small groups on challenging mathematical problems, with topics that vary from week to week. Expert secondary school math teachers, mathematics students and mathematicians serve as instructors.

Rather than cover future curriculum material, the mathematical areas selected are predominantly those which pupils would find interesting and appealing and at the same time are important for the application of modern mathematics (e.g., graph theory, combinatorics, representation of numbers in connection with measuring, number theory, geometry and game theory). The problems are always chosen in such a way that they can be extended to allow the development of a small mathematical theory and put pupils in a research situation—albeit an elementary one. New problem areas are introduced by a short paper including a few initial questions which help to motivate the pupils.

In addition to developing and practicing strategies for problem solving, special importance is attached to recognizing, formulating and perhaps solving subsequent problems.

Despite the considerable length of the course (participation is possible for up to six consecutive years) and the very challenging course work, the extremely low dropout rate together with the high rate of attendance and the very positive opinions that the pupils have of the course are all indications that this type of program successfully meets such pupils' needs. The program's success is due, in part, to the stimulus provided by the assignments and to the informal manner of working in small groups, in pairs, or even alone, which is

quite unlike that at school. There is, on the other hand, an important social motive for taking part: in this group pupils meet age-mates of a similarly high intellectual level and with mutual interests, without encountering incomprehension or even rejection. This type of separate provision for the highly able does not (as is sometimes implied) lead to social isolation but actually causes participants to feel less like outsiders. Most of them have for the first time been faced with a challenge commensurate with their capability and aptitude.

Funds from the German Federal Government initially helped to get the program started. After three years the program was self-supporting through contributions from the parents. Offshoots of the Hamburg project show that even when confronted with the typical transport and distance problems of a rural area the appeal of the program prevails despite the long journeys involved.

Residential Programs

Summer Programs in the United States

The difficulties of commuter programs are overcome by residential programs which typically last from one to several weeks. This setting allows total involvement in a certain subject with intensive tutoring and a multitude of social contacts. Particularly in the United States, such programs have long been a fixed element of out-of-school provisions for highly able students (Olszewski-Kubilius, 1989). As noted above, one of the most sound and consistent approaches was developed at the Johns Hopkins University. It has been emulated by several institutions in the USA (including Duke University, Northwestern University, the University of Denver, Arizona State University and California State University at Sacramento) and will here be presented in detail.

Since 1979, the Johns Hopkins University's Center for Talented Youth (CTY) has identified more than 300,000 highly able seventh grade pupils by means of regional, national and international talent searches, providing detailed educational and career guidance to pupils who have qualified. A network puts parents in contact with other parents of academically able pupils.

The core activities for the able are, however, the three-week residential summer programs which have been held since 1980. In the summer of 1992 over 3500 pupils from all over the United States and from over 30 countries participated in these programs, which are located at five college sites in New York, Pennsylvania, Massachusetts and California, as well as on the Johns Hopkins campus in Baltimore.

CTY's academic program is based on the following premises: (1) academically talented students should be provided with the opportunity to learn subject matter and to develop skills at a pace and level appropriate to their abilities, rather than to their age and grade level; (2) academically talented students require a rigorous, challenging course of studies in the liberal arts; and

(3) students' academic accomplishments should be acknowledged and rewarded (CTY Young Students Summer Programs 1992, p. 5).

The pupils work at one course in their chosen subject for five hours per day, five days per week. Each evening pupils are expected to spend at least two hours preparing for classes the next day. The courses, with an average size of 15 participants, are taught by an instructor and a teaching assistant. Each site offers a variety of 12 to 21 courses for the 300–500 residents. Courses cover humanities, writing, mathematics, science and computer science. Multiple sections are provided for the most popular courses, which are precalculus mathematics and writing. Time is allotted for socializing, sports and music to provide a respite from the high-level academic program. This, in addition to the actual work, contributes considerably towards the great success of the CTY program. Many return to their home communities fortified to achieve even more than before, both academically and socially. Students between the ages of 12 and 16 repeatedly attend the programs, some even taking two successive three-week courses. Some very bright pupils as young as 13 or 14 can become teaching assistants, which provides the opportunity to develop even more academic and social maturity. Many of the students' local schools will acknowledge results and achievements from the summer programs by giving credit and/or advanced standing to the students.

In 1992, the talent search approach and the residential programs were extended to fifth and sixth graders, while commuter programs were offered to pupils in grade two with courses in French, mathematical problem solving, or environmental science.

Other summer residential programs offer additional courses of study. The 1992 TIP Summer Residential Program at Duke University enrolled over 1300 students in over thirty different courses offered on the Duke University main campus, at its Marine Laboratory, on the campus of Davidson College (near Charlotte, NC) and at five international sites (Great Britain, Germany, Italy, Japan and Costa Rica). TIP's Satellite Science Program, Language and Culture Institute and international programs all offer unique opportunities for exceptionally able young people and provide a supportive environment that, among other things, helps young women who have strong interests in the sciences to develop their potential.

The Center for Talent Development (CTD) at Northwestern University runs a variety of summer programs on the Northwestern campus, in a suburb of Chicago. A Summer Program for academically talented adolescents in grades 7–9 offers both residential and commuter options. Students take one intensive, fast-paced course designed to be the equivalent of one full-year high school honors-level course. Classes meet five hours a day, five days a week. The Equinox Program is a three-week program of advanced study for academically talented adolescents who have just completed tenth grade. Course offerings include

Advanced Placement (AP) English Literature, AP Language and Composition, AP European History and courses in mathematics and in science. The Solstice Program is designed for students entering the junior or senior year of high school offering college level coursework in science and science-related topics. Finally, the Academy Program is designed to give students entering the junior or senior year in high school the opportunity to study philosophy with a working philosopher.

The RMTS Summer Institute offers fast-paced courses to junior and senior high school students on the campus of the University of Denver, in Colorado. During the two three-week sessions, courses are offered from a variety of disciplines, including mathematics, science, international relations and literature.

In aggregate, then, these four summer residential programs are offered at a dozen sites in seven US states and at five international sites and provide intensive academic stimulation to over 6000 high ability youngsters each year. Although a large number of high ability youngsters is served by these programs, each of the programs turned qualified students away in 1992 because of a lack of space. It is a challenge for all of those interested in the education of the gifted to meet the large and growing demand for high quality instructional opportunities.

The German Schülerakademien

Inspired by the American approach to providing summer programs for highly able young people, in 1988 Bildung und Begabung, a non-profit German association sponsored by the Federal Government, started residential summer programs for 16–19-year-old secondary school pupils, thus filling a critical gap between the last school years and higher education. Within a few years these "Schülerakademien" (pupils academies) have developed into an outstanding opportunity for academically highly talented and motivated adolescents which seems to be unique in Europe.

The main objectives of the Schülerakademien are: (1) to offer several fields for scientific endeavor in order to develop and improve methods and abilities of knowledge acquisition, interdisciplinary thinking, research techniques and autonomous learning; (2) to challenge intellectual potentials to their limits; (3) to provide role models through encounters with highly creative, able, motivated and inspiring teachers and scientists; and (4) to experience a community of equally able and motivated peers, to develop lasting friendships and thus to accept one's own personality as valuable and "normal".

The 17-day Schülerakademie typically embraces 90 boys and girls, each participating in one of six courses covering a broad range of diverse academic disciplines. The spectrum of courses offered in the academies has been extended considerably over the

years, adding to the initial subjects of mathematics, physics and foreign languages, with courses in creative writing, music, biology, chemistry, computer science, philosophy, history, economics, psychology, rhetoric and visual arts. The total amount of time spent on course work within the 17 days is about 45 hours. The level of work is mostly comparable to advanced university seminars. Two teachers (scholars, expert Gymnasium school teachers or free-lancers) design and run each of the courses with a minimum daily duration of 4–5 hours. The rest of the day is filled with additional optional activities such as sports, music, excursions, discussions and drama.

Between 1988 and 1992 eleven academies with over 800 participants had operated in boarding schools which have proven to be ideal locations for these programs in Germany. Within a few days, each of the academies develops a unique and special atmosphere, filled with enthusiasm and motivation of both participants and instructors, characterized by intensive and open personal relations and discussions until late at night. The numerous positive evaluations from participants, their local schools and parents confirm the immense impact the academy has on the participants.

The participants are expected to pay a fee that covers accommodation and food, the rest of the expenses being subsidized by the Government. Financial assistance is available to needy families. Pupils are invited to apply for a place on the basis of successful participation in one of the intellectually demanding competitions in Germany or on individual recommendation by headmasters, teachers, educational consultants, or psychologists. In 1992, 427 (56.5%) of the 755 boys and girls who were invited applied for the 264 available places in the three academies. An extension is planned for the years to come.

Science Training Programs

Another interesting option for those secondary pupils who are talented and interested in science is training programs at research institutions or at universities. They are designed to provide the pupils with educational opportunities in science, engineering and mathematics beyond the usual school level. Within these programs outstanding pupils are brought into contact with the instructional staff, research personnel and general resources of colleges, universities and research institutions.

Programs involve students as junior associates of a research team or as a principal investigator on a problem of appropriate difficulty, under the direct supervision of an experienced research scientist. Other programs provide courses specially designed for the pupils or regular early college courses, or a combination of these features. The *Directory of Student Science Training Programs for Precollege Students*, published annually by the Science Service, Inc. in Washington, D.C.

(the same organization that sponsors the Westinghouse Science Talent Search), listed more than 400 entries for the United States in its 1992 edition.

Other countries offer similar programs. One of these is the highly reputed one-month international Summer Science Institute for pre-university students at the Weizmann Institute of Science in Rehovot, Israel. The Weizmann Institute is devoted to research and teaching in the natural sciences and includes 21 research units in biology, biophysics–biochemistry, chemistry, mathematics and physics. A staff of 1800 researchers, engineers and technicians are involved in some 800 basic and applied research projects. Each summer some 75 outstanding science students (high school graduates) from Europe, Asia, the Americas and Israel have the opportunity to work alongside top researchers and to use the sophisticated scientific instrumentation.

Applicants are selected on the basis of previous experience in laboratory research (e.g., competitions), high motivation, interest in pursuing a career in scientific research, recommendations from their local school and interviews. Each participant can choose a subject in accordance with his or her own interests. At the conclusion of the three-week laboratory experience, the student is required to present a seminar and to write a thesis on the completed work. Additional program features are a four-day visit to a field school in the Negev desert, lectures given by senior Institute scientists, and, of course, sight-seeing.

Conclusions

A sampling of some of the most effective out-of-school provisions for highly able young people have been described. Additional examples can be found in the comprehensive Richardson study (Cox, Daniel, & Boston, 1985). The major benefit of these programs seems to be that they provide opportunities for interaction with equally able and motivated peers. Pupils feel accepted often for the first time in their lives and many of them are astounded to discover how easy it is to communicate with and to make friends within this group. The results are frequently long-lasting relationships and communication networks.

Encounters with excellent instructors provide valuable role models for an academic orientation. They can be helpful in career counseling and might open perspectives into unconsidered professional areas. The intense atmosphere of residential programs is capable of activating and stimulating dormant potentials. Many of these pupils relate with amazement what they were able to achieve in a short time.

In short, these programs have a tremendously beneficial impact on young lives. It would be highly desirable to increase the number of such programs, as the current demand far exceeds the existing supply of places.

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Evaluation Programs and Procedures for Gifted Education: International Problems and Solutions

CAROLYN M. CALLAHAN

University of Virginia, Charlottesville, Virginia, U.S.A.

Historical Perspective

In one way or another, formally or informally, educational programs have always been evaluated. Decisions for expanding, down-sizing, or eliminating programs, for changing educational curriculum or approaches, for changing staff, for increasing or decreasing spending on one educational program or another have always been based on someone's judgment of whatever evidence was available, on that individual's or group's values and their interpretation of the evidence in light of those values and on the political climate in which the decision is made. However, the formal study of and creation of a discipline entitled educational program evaluation (as distinct from educational research) and the development of models to assess program effects emerged in the United States in the 1960s in response to the demand of the U.S. Government that some assessment be made of the impact of increased federal investments in educational programs (Weiss & Gallagher, 1982, Barnette, 1984). Up until that time most formal program evaluation had been done by educational researchers and had focused largely on the application of traditional research paradigms to studying educational issues with a concomitant emphasis only on very reductionistic and outcome oriented questions such as: Did the students become more creative as a result of this instructional program? Are the students more motivated to achieve as a result of this program?

The emergence of models which emphasized the concept of evaluation as the process of gathering information for the purpose of decision-making by Scriven (1967), Stake (1967), and Stufflebeam (1968) resulted in an expansion of the focus of evaluation to providing information about any aspect of educational programs which might influence the effectiveness and efficiency of program implementation. While recognizing that outcome variables legitimately remain one of the foci of evaluation efforts, these new models and those which followed provide decision-makers with the information which has potential to inform the entire program planning, implementation and coordination process. When properly conceived and

executed, program evaluation parameters are extended beyond simple determinations of successes or failures on test scores or other outcome variables to include data collection allowing for determinations of which factors are likely to have contributed to or detracted from those failures. Further, it provides a vehicle for determining whether there are effects—positive or negative that might not have been anticipated by program administrators or evaluators.

A further important evolution in the field of program evaluation has been an expansion of the conception of decision-maker within the evaluation process to include not only those in authority to make executive/administrative decisions about program implementation but any individual or group who has a vested interest in the program. These individuals have been variously labeled stakeholders, audiences (Stake, 1975; Callahan & Caldwell, 1986; Dinham & Udall, 1986) and prime interest groups (Renzulli, 1975). With this orientation to evaluation the process of program evaluation has taken on a different character. It has come to be regarded as a process that provides data to meet the needs of a variety of constituencies in their attempts to make informed decisions *for multiple purposes*. This has brought about an emphasis on the inclusion of stakeholder groups (ranging from school board members to teachers, to parents, to the students themselves) in the process of establishing both the focus and the parameters of evaluation, the strategies and models of implementation, and the discussion of findings and recommendations.

Among the many general purposes for which evaluation might be used which are cited in the evaluation literature (both meritorious and not so praiseworthy) are: improving effectiveness of programs and program personnel, reducing uncertainties, assisting with decision-making and goal setting, seeking justification for decisions, meeting legal requirements, fostering public relations, enhancing the professional status of the evaluator or program administrator, boosting staff morale, mustering program support, and changing policy, law or procedure (Alkin, 1980; Bissell, 1979; Mathis, 1980; Ostrander, Goldstein, & Hull, 1978; Raizen & Rossi, 1981). Each of these purposes have been served by the evaluations

reported in the literature in gifted education. For example, Kaufmann, Tews, and Milam (1985) used program evaluation to justify the choices made relative to breadth and depth of curriculum offered in the New Orleans Center for the Creative Arts; VanTassel-Baska, Landau, & Olszewski (1984) report using their evaluation of a Talent Search program to identify areas in need of improvement; Cohn (1983) documents program accomplishments; and the work of Gallagher and Coleman (1992) uses policy analysis in an attempt to influence public statues, policy and procedures relative to identification of and implementation of programs for underserved gifted students.

Callahan and Caldwell (1986) identify eight legitimate purposes of program evaluation specific to programs for the gifted: documentation of the need for the program, documentation of the case for a particular approach, documentation of the feasibility of a program, documentation of program implementation, identification of program strengths and weaknesses, provision of data for in-progress revisions of the program, documentation of the results or impacts of the program, explanation and description of the program to interested but uninformed audiences. Again, these have all been documented in the existing program evaluation literature. Carter (1986a) documents the results of using a particular curriculum which included both documentation of curriculum use and assessment of student outcomes as a result; Robinson and Stanley (1989) also assessed the achievement of students (in a mathematics program); Callahan, Covert, Aylesworth, & Vanco (1981) report on a curriculum documentation process used for documentation of implementation, assessing the results of the program and description of the program to uninformed audiences (which is, in reality, one of the outcomes and purposes of all published evaluation reports).

The Status of Evaluation in Programs for the Gifted

Despite the evolution of the field of program evaluation and the development of theoretical frameworks, working models and the repeated call to assess the effectiveness of gifted programs, program evaluation has remained, in practice, one of the most neglected areas in gifted education. The paucity of program evaluation internationally is striking. For example, in New Zealand, a listing of all the articles published since 1940 on the gifted and talented includes only 19 references with descriptors including program evaluation, three more which refer to student evaluation (with one of these overlapping the prior list and one not relevant), and two on evaluation methods. The total number of references to evaluation is only 4% of the total. Furthermore, program evaluation was most often a clear secondary categorization of the reference. None of the references is devoted exclusively to either issues of program evaluation or systematic reporting of the effects

of programs for the gifted and talented. Examination of these references reveals that many are limited school evaluations that only report on numbers served or subjective judgments made about programs; many are not truly evaluation studies but rather summaries of other research; and only eight were produced within the last ten years (Pickens, Reid, McAlpine, & Marland, 1992). However, New Zealand is far from unique in this respect, merely an example.

Unfortunately, one finds similar inattention to these issues internationally. Because evaluation reports themselves are not research or theory oriented (and in current interpretations of the field should not be), they are unlikely to be published in journals of the field. Carter (1986b) pointed out that "field based outcome evaluations lack the scientific rigor of the controlled laboratory setting" (p. 92). Hence, an attempt was made to gather relevant articles and reports of evaluations from the authors of this volume by corresponding with each non-American author.

Reports from scholars in Great Britain include the comment that "regretfully very little has been written on evaluation. Indeed, we have excellent enrichment materials which have not been evaluated. People tend to trust the professional judgement of good teachers" (George, 1992). Freeman (1992) adds "gifted program evaluation (as such) is not in operation over here, at least to my knowledge".

Gross reports "very, very little sound or structured evaluation of gifted programs has been undertaken in Australia" (Gross, 1992). Gagné was unable to locate written evaluations of French programs for the gifted in Canada (Gagné, 1992). de Alencar of Brazil (de Alencar, 1992), reports that she "does not have much on the evaluation of programs for the gifted in Brazil".

German educators have reported some attention to evaluation in that country. Even though Trost of Germany reports a "shameful lack of decent studies for the evaluation of programs for the gifted," he does indicate that "participants of such programs are followed up for some time in many cases." Unfortunately "these studies often suffer from serious methodological problems and are seldom published in scientific media" (Trost, 1992). In Korea, we find the *first* systematic evaluation of the program sponsored by Korean National Association for Gifted Children (a volunteer program resulting from the lack of programs in the Korean schools for gifted children) reported in 1990 (Chung, Moon, & Kim, 1990).

Maoz (1992) and Butler-Por (1992) also report limited evaluation in Israel, but there are examples in the literature of evaluation in Israel which use questionnaires (parent and/ or student) to modify curriculum and programs and assess student attitudes (Burg, 1990; Burg, Or-Noy, & Taitel, 1986; Butler & Butler, 1979; Eylon, Hofstein, Maoz, & Rishpon, 1985), and student outcome assessment to assess program effects (Eylon, Hofstein, Maoz, & Rishpon, 1985).

The paucity of program evaluation has been similarly

noted in the United States. Gallagher (1982) noted that program evaluation as a formal process in the United States was new not only to gifted education, but to education in general. In addition, he noted that “the data collected on program evaluations for gifted programs suffers from a lack of attention to evaluation design and lack of trained evaluation personnel” (p. 68). Despite the continued evolution of the field of evaluation in general over the last 30 years (indicated by graduate training programs, the establishment of the American Evaluation Association, the establishment of a division of the American Educational Research Association) and the tremendous growth in resources allocated to special programs for the gifted in this country, the evaluation of gifted programs still is meager. A survey of all known coordinators of gifted programs in the United States, distribution of calls for information through state directors of gifted education and state associations, announcements in professional journals and a search of all relevant bibliographic data bases (from 1970) yielded only 112 reports of formal program evaluation of gifted programs; of these only 70 were complete enough to be included in a study of characteristics associated with gifted program evaluations (Hunsaker & Callahan, 1991).

Acting on the assumption that sound educational planning and delivery should include a component that systematically assesses the effectiveness of our efforts, one would expect far more in the way of documentation of the effects of programs for the gifted child, expect much more in the way of efforts to determine which components of programming efforts and curricula are effective in producing the desired outcomes, and expect more demands for accountability for the ways in which the time of our gifted and talented students and the resources allocated to schooling these students are expended. Why is there such disappointing attention to these aspects of our programming efforts? It is not because of the lack of theoretical models, recommendations, and consistent demand for such study (e.g., Renzulli, 1975; Callahan, 1983, 1986; Carter, 1986b; Dinham & Udall, 1986; Weiss & Gallagher, 1982). Does the literature offer us explanations for this lack of attention to evaluation or suggestions which might enhance the practice both in quantity or quality? The remainder of this chapter examines potential problems which might contribute to this situation and the suggestions offered in the theoretical and empirical literature to counter the obstacle: to program evaluation.

Factors Impeding Complete and Effective Program Evaluation and Potential Strategies to Remedy the Problems

Factor 1: The Threat

Educational program evaluation has never been an easy task, for the evaluator or for those who are being

evaluated. Nor has it been perceived by most as a welcome part of program activities. Evaluation within any educational program is, in fact, most often regarded at best as a nuisance, and at worst, as a threat. Because gifted programs seem particularly vulnerable—especially to those who are the administrators and teachers in these programs, the process of program evaluation is regarded as particularly menacing. Much of the wariness to engage in program evaluation seems to center around the notion that evaluation is only summative and judgmental in nature. School officials too often see the evaluation process as one where a decision is made as to whether a gifted program “continues” or is “discontinued.” Unfortunately, most program evaluations are structured around this “go/no-go” option because of the timing of evaluations, the kinds of questions that are posed in the evaluation plan, and the stance of the evaluator. This threat is especially potent when the gifted program is perceived as an independent entity in the school program.

Potential Strategies for Reducing Threat and Intimidation

One of the most significant strategies for reducing threat and intimidation in the evaluation process is to ensure that the evaluator has an understanding and acceptance of the basic premises of gifted education. This is not to say that the person selected for program evaluation should have a particular bias for or against a particular model of programming—such a person would be ineffective as an evaluator. However, if a person does not accept the premise that all students should receive instruction which is addressed to their particular characteristics and that gifted students have special educational needs, then the evaluation process will be quickly understood to be one of “setting out to eliminate the gifted program” and the likelihood that valid and reliable data will be collected from program staff and other affected groups is much diminished. The intimidation factor is also considerably diminished if the evaluator is an individual who clearly sees and presents the evaluation process as one of improving educational programs rather than one of judging programs (Callahan & Caldwell, 1984). Alkin & Law (1980) argue that the single most influential factor in determining whether or not evaluation information will be used is the orientation of the evaluator and the consequent sense of ease of those “evaluated”.

The second step in reducing threat and intimidation is to encourage early evaluation planning and involvement of all interested staff in the evaluation planning process. Much has been written about the inclusion of prime interest groups (Renzulli, 1975) and interested audiences in the planning process, but often the evaluation is “commissioned” by a central office administrator or the school board and not enough consideration is given to the interests and concerns of those most directly involved

in the program itself. No evaluation plan should be drawn up without the inclusion of the major players involved in program design and delivery (Renzulli, 1975; Callahan & Caldwell, 1984, 1986; Dinham & Udall, 1986). These principles include program administrators and staff as well as parents and students. The initial planning of program evaluation should include not only a consideration of a wide constituency, but also the individual needs of each of these audiences and a system of prioritizing those needs (Renzulli, 1975; Callahan & Caldwell, 1986; Dinham & Udall, 1986).

Focusing *initial* evaluation efforts on aspects of programming which are still in flux, posing evaluation questions which are not tied directly to questions of continuation of programming—in particular, the program which currently exists, and stressing evaluation concerns which are tied to program improvement also are recommended strategies for reducing the menace of evaluation (Callahan, 1991). This is not to say that the full evaluation plan should be limited to these questions. Rather, the focus is on building trust in the process first, then later asking the more difficult and more sensitive questions after establishing that the process will yield reliable and valid information for program improvement (Callahan & Caldwell, 1984).

Early evaluation questions might address issues such as: Does the planning for the program reflect “state of the art” in gifted education? Are gifted students identified according to the definition adopted by the school district? Are identification procedures being implemented as described? Are resources adequate for implementation of this program? Do staff development activities result in changes in instructional practice? Allowing stakeholders to identify areas where they are confident that evaluation will yield positive affirmations of the program is also considered a means of establishing the process as one which will yield both verification of the positives as well as identification of areas of improvement.

Later evaluation questions can begin to address issues of impact, effectiveness of program in achieving desired outcomes, etc. It is critical to remember, however, that the important questions will derive from audience needs (Dinham & Udall, 1986). If the school administration is faced with the question of accountability from the funding source, then accountability must take priority in the process or there may be no program to evaluate later. And program outcomes, particularly student outcomes are not to be ignored in the evaluation process (Carter, 1986; Carter & Hamilton, 1985).

Program evaluation efforts are also likely to be effective if they are carried out before a gifted program is directly threatened from outside. One of the common situations encountered by evaluators is the call to evaluate a program which is being examined as part of a budget reduction process, is being reconsidered as part of a school reorganization or restructuring project or is under attack from some faction in the school or community. When evaluation begins while

other ominous activities are in process, the waters are clearly muddied by the interfering influences. It is both difficult to get the cooperation and support of those involved and it is difficult to separate conflicting agendas of administrators who must be part of the data collection process (Callahan, 1991). If a principal perceives that he or she needs funds for a personally more favored project as part of a school based management project, then the data collection process is likely to be biased.

Factor 2: The Definitional and Program Description Issue

How can we evaluate programs for students when the school has not clearly defined who it is serving, under what circumstances and to what end? Unfortunately, one of the presumptions we make in evaluating gifted programs is that the developers and implementers are clearly aware of the population they wish to serve and why. This presumption is unfortunate since it may lead to determining only whether goals (in terms of student achievement changes) are achieved without closely examining whether the staff has a clear sense of whether the program they offer is even appropriate for the students they have identified. Further, it is often difficult to judge the reasons why program goals are or are not achieved because of lack of description of what really constitutes program.

The goals of gifted programs provide a unique challenge in their structure. The goals are often ill-defined with a false sense of comfort in the use of terms like outstanding academic achievement, creativity, higher level thinking processes, critical thinking, and self-concept (Callahan, 1983; Dettmer, 1985). Yet, the program staff is often quite unable to define the terms used and the evaluator quickly assumes the role of program developer if he or she defines those terms for the program—either directly, or indirectly, through the choice of test or other assessment tool.

Possible Solutions to Definitional and Description Problems

Callahan and Hunsaker (1991) have identified 14 areas in which description is necessary for adequate program evaluation (Table 1). If the staff of the program and the program evaluator can see the first step in evaluation as the process of program description, including the process of clearly describing the population to be served and providing a rationale for serving that population, the first level of evaluation questions can be generated around the general evaluation concern: Is the program providing differentiated services to a group of gifted students who would not be otherwise fully served by the existing educational program? Then one is in a position to ask the next most important question: Does the proposed program have the features which are likely to lead

TABLE 1
Program Components Essential for Adequate
Program Description

(1) Program definition	(8) Budget
(2) Philosophy	(9) Program evaluation
(3) Procedures and criteria for identification	(10) Management
(4) Program goals and objectives	(11) Instructional strategies
(5) Student goals and objectives	(12) Programming options
(6) Curriculum	(13) Descriptions of relationships and inter dependence of program components
(7) Resources which support each program component	(14) Personnel

Callahan and Hunsaker, 1991, p. 183.

to effective program(s) for the identified population? Sadly, few of the evaluations which are ultimately published in the literature of gifted education provide models of the necessary process of identifying the full spectrum of the program under consideration. Whether because of space limitations, focus on data collected or simply a lack of recognition of the critical nature of such description, the program description is usually limited to a brief description (one or two paragraphs) of sketchy information on identification and program arrangements.

When evaluating poorly articulated programs, the problem of attributing outcomes and tracing components which have contributed to or detracted from achieving those outcomes when evaluating poorly articulated programs can be rectified by working closely with all involved in the program in writing a clear and mutually agreed upon program description before the next stages of the evaluation process begin (Callahan & Caldwell, 1984, 1986). All components of the program (e.g., identification, teacher selection, teacher training, curriculum development, instruction, management, evaluation, etc.) should be identified and then a description of the resources used to execute the program, the activities of the program and the expected outcomes of the program should be articulated and agreed upon (Callahan & Caldwell, 1986; Rimm, 1982). This process will lead to the generation of evaluation questions which focus on more than student outcomes and summative information alone. It leads naturally to questions of resource sufficiency, the degree to which instructional activities are likely to lead to desired outcomes, whether the curriculum is a match for the identified students, etc. Rimm (1982), Provas (1969), and Yavorsky (1984) provide strategies for detailing program descriptions in a manner conducive to insuring that the results of program evaluation will lead to this end.

Discussions of the problem of vaguely stated student outcome goals permeates the literature on evaluation as does discussion of the difficulty in identifying the appropriate assessment tool once goals or objectives have been clarified (e.g., Callahan, 1983, 1986; Callahan & Caldwell, 1986; Renzulli, 1975; Buescher, 1984;

Archambault, 1984; Aylesworth, 1984; Reis, 1984; Ganopole, 1982; Parke & Buescher, 1983) The question of goal specificity is very difficult, but program goals and objectives must be clarified if effective assessment is to occur (Ganopole, 1982; Archambault, 1984; Callahan, 1983; Renzulli, 1975; Dettmer, 1985). Dettmer (1985) provides a beginning list of goals to be considered by teachers and administrators in the specification of goals. One device which is useful is to have the staff describe a student who they would judge to be successful in the program. What would that student do differently after participation in the instruction to be provided? How would this student's products be different because of the program? What would the student say, think or do differently if the program were a success? (Callahan, 1991).

Of course, evaluation questions do not only include questions relating to student outcomes—if the evaluation is complete. Thus, one might also ask questions like: How are these teachers' behaviors going to be different if the staff development program has the expected impact? How will their lesson plans differ? Or one might ask of the communication component of the program: What questions will parents be able to answer about the program if communication has been adequate? What will parents say about the communication process if the communication has been adequate? (Callahan, 1991).

Factor 3: Finding "The Program" and Isolating its Effects

One of the enigmas in gifted program evaluation is finding "the program" to be evaluated. In many cases, only part of the program is identified. For example, programs are often described as resource room programs or pull-out programs. Then evaluators are satisfied that if they evaluate the instruction and the goals for the given period of time each day or week during which the gifted student is involved in activities in that particular setting have evaluated "the program". However, all programs involve much more than the direct instruction that takes place under the rubric of the title "gifted program" and a complete evaluation should incorporate all aspects of instruction for gifted students.

In programs where the gifted program is considered a "mainstreamed" gifted program and all instruction is offered within the regular classroom setting, program description is often limited to some few words about all teachers having responsibility for differentiating instruction within their own classroom with some set of common goals. In gifted programs which are considered "individualized" the problem of defining program and evaluating program outcomes becomes even more difficult as the goals vary from individual to individual and the strategies are tailored to specific children (Callahan, 1983).

In some countries and in some cities and states in the United States, the program for gifted children is

provided within a separate school or even a separate “track”. In these cases, the assumption is often made that the selection process so differentiates the quality of student, that little “proof” is required to demonstrate that the program is effective. Obviously there are often many indicators of success of the students in these programs. Newspaper articles in the United States, for example, repeatedly point out the greater numbers of National Merit finalists and Westinghouse Science Fair award winners who come from these special schools. Students who are tracked into college or university preparatory schools in other countries are obviously more likely to be those who attend university and achieve success there. These are taken as indicators of success. But these indicators are shallow and open to great criticism. First, one has to ask whether the scholarship winners would not have been successful if they had been in any program—not just the special one created in the special school. Is it this particular program or the students’ genes, environmental background, and outside experiences which produce these outcomes? Second, one has to ask if this educational program has done *as much as it could* for the students. Has the program *maximized* student learning and development or simply encouraged that learning and development to be just a notch above that of others (which they already were when selected)? When we are satisfied that we have schools that produce university students, are we relying on an identification procedure which screens out others who might have been just as successful if admitted? What evidence is there that students who are not given the privilege of attending such schools would *not* have been successful? For those who are admitted to these tracks, is there evidence that these schools are teaching the *most important* ideas as effectively and efficiently as possible, *has enough been done or all that could be done?*

Potential Solutions to Finding “The Program”

The generation of evaluation questions and subsequent data collection will be more useful to school staff if forced to describe the entire educational program for gifted students, not just the component which has some separate funding or administrative arm. This may also reduce the threat issue. Such descriptions force the realization of the ways in which seemingly separate and disparate units must work together for successful programs, they allow us to see the outcomes as related to many aspects of the school program for gifted students, and they provide for the collection of more complete data on program impacts.

This procedure may also be useful in encouraging the schools to see that there should not be a gifted program, but rather, gifted programming options for gifted students. One way an evaluator might frame such an approach would be to apply a set of characteristics of effective schools to the gifted program(s) within a school. For example, George (1992) outlines 10 areas

for consideration in an assessment of the effectiveness of the school: qualities of pupils, goals of the school, organization of the classroom, praise, homework, discipline, teacher experience, surroundings, school leadership, responsibilities accorded to children. If these are used to form the basis of judging the effectiveness in serving all students with standards defined to maximize the potential of all, the threat to those persons serving the gifted is minimized and the responsibility of all to meet the needs of the gifted is given added credence.

Factor 4: Formulation of Appropriate Questions and Setting Priorities

Any of the models which have been outlined in the general evaluation literature are likely to lead an evaluator to the generation of innumerable evaluation concerns and questions. Even so, unless careful program description precedes the stage of question generation, it is likely that important questions addressing the concerns and needs of all audiences will be overlooked (Callahan & Caldwell, 1986). But a complete program analysis will also lead to the generation of more questions than can be reasonably addressed by any evaluator. It is important that time and energy not be invested in attempting to address all of those questions which are inappropriate or unanswerable. The process of deciding which questions are the important ones may be both overwhelming and insurmountable without guidelines. Values are obviously an important issue in this process of generating and selecting evaluation questions. The earlier discussions of the importance of attending to the values of the audiences for the evaluation (Dinham & Udall, 1986) suggests that evaluation planning must involve representatives of these audiences. Further, it is crucial to explore and appropriately balance academic and psychological outcomes. For example, Crocker (1987) investigated under-achievement in working class boys in Great Britain and concluded that it is not always “right” to “rescue” such boys from under-achievement based on his finding that they did not show any signs of distress when they came from stable homes where their families considered that they were doing well. Given a tendency to believe that under-achievement among the gifted is a negative construct to be corrected, gifted programs often address the remediation of this problem in academic terms without evaluating potential negative consequences for personal adjustment.

Potential Solutions to The Priority Question

As a general guide, Callahan (1986) stresses relevance, usefulness and importance as criteria for inclusion of any question in the evaluation process. She cautions against seeking to substitute generation of information which may be generalized to the general field of

gifted education for the provision of useful data to the specific gifted program being evaluated. The best evaluation questions posed are those structured to provide data to the relevant audiences of the program under consideration.

Guidelines have been provided in the general evaluation literature and in the literature on evaluating gifted programs. Yavorsky (1984) lists four criteria for prioritizing questions: the first priority is to be given to questions of concern to internal and external audiences; the second is to attend to questions relating to areas of the program that are of central functional importance (the success of the program is highly dependent on the success of that component); the third is to identify questions that are suggestive of problems (most often these are identified by looking for areas where program design is in question or controversy or there has been a history of problems); and finally one should identify those questions where information is needed. Callahan (1986) suggests one also should generate questions relative to the adequacy and availability of resources which are needed to execute the program, the adequacy of planned activities, the degree to which implementation follows plans or is appropriately modified, and the degree to which the components of a program are in accord with one another and operate as a unit.

Worthen and Sanders (1987) offer the set of criteria which have been translated by Callahan and Hunsaker (1991) into the following guiding questions to be used in prioritizing evaluation questions in the evaluation of programs of acceleration:

- (1) Would the findings be of interest to key audiences?
- (2) Would the answer to this question reduce present uncertainty?
- (3) Would the finding yield important information?
- (4) Would the results be of continuing interest?
- (5) Is the question critical to the study's scope and comprehensiveness?
- (6) Is the question answerable given financial and human resources, time and available methods and technology?
- (7) Will we or can we act on the information if it does not confirm our expectations? (p.187).

In considering the values issue, evaluators would be well advised to attend to the issues of the values of the clientele of a program and the unintended outcomes which are so well described by Stake (1972) in his responsive evaluation model and by Scriven in his goal-free evaluation model (1973). Examples of evaluating other affective outcomes obviously of value to the communities where gifted programs were operating are provided by Carter and Kuechenmeister (1986) in their evaluation of the development of elitist attitudes, social interactions of the students and expectations of teachers (surveys administered to students, parents, teachers, and administrators), by VanTassel-Baska, Landau, & Olszewski (1984) in their assessment of motivation (questionnaire to parents), Cohn (1983)

in his measurement of attitude toward mathematics (questionnaire to students), and by Kaufmann, Tews, & Milman (1985) in appraising the attitudes toward education (questionnaire to students).

Further, evaluators would be well advised to acquaint themselves with the discipline of the field and the standards of quality in the field before beginning an evaluation. In evaluating a staff development program in which the goal was to provide teachers with skills to differentiate the regular curriculum to meet the needs of gifted students Callahan was asked to evaluate the degree to which the teachers found the staff development process useful and the degree to which they learned to integrate process skills into curricular modifications. Initially, the task was to evaluate only the degree to which the new activities developed were "different" from those in the regular curriculum. Such a task would have been easier than the one negotiated which was to judge the curricular modifications against standards which reflected "best practice" in modifying curriculum to meet the needs of gifted students. Hence, the resulting evaluation rested on a scale for rating the teacher-developed activities which reflects the degree to which content, process, product and learning environment are adapted to meet the needs of the gifted. The resulting evaluation report, reflected a sense of the teachers' success in achieving the stated project goals, but also a sense of the shortcomings of the project in achieving the goal of differentiation as it is defined by experts in the field. In other words, the evaluation does not have to be an either/or situation where one evaluates the goals of the project only or the standards of the field only. In Scriven's terms, it is possible to be both goal free and goal-oriented in evaluation.

Factor 5: The Comparison or Standards Issue and the Control Group Problem

Is this program better than "nothing", better than other gifted programs, or is it meeting the highest criteria we set in the field? The way in which the evaluation question is phrased will certainly direct both the design of the evaluation and the way in which data is interpreted. The assumption that one is comparing a gifted program to no program is always unfounded (Renzulli, 1975). It is easy to assume that in evaluating a new reading program that if this program is not continued then another will be adopted. But some evaluators (and administrators) often assume that if we don't have a gifted program, there will be no program. In reality, the question of whether the program is "better than nothing" is not a question because the gifted students will still be in the school in *some* educational program even if the formal gifted program does not exist. Hence, there is always some comparison to be made, even if that comparison is to the educational program offered in the absence of a specific program for the gifted.

The standards question is sometimes framed as a

decision to ask normative or criterion referenced evaluation questions. Do we compare this program to other gifted programs or to a set of standards (criteria)? To what degree do we hold the program responsible for meeting the standards of “the field” and to what degree do we hold the program responsible for achieving the goals set by the administrators and teachers of that program, even if those goals as inadequate for gifted students and their education (Callahan, 1986)?

The obvious answer to many of these questions as they relate to student outcomes are addressed in traditional research paradigms by establishing a randomly selected experimental and control group. The ethical issues and political problems presented by this option have been discussed in many articles on gifted program evaluation (e.g., Carter, 1986; Callahan, 1983; Renzulli, 1975; Payne & Brown, 1982). There is simply no way we have been able to (or should) restrict access to gifted programs by gifted students. However, even in comparing staff development programs, the issue of control groups is a dilemma. For example, in a recent evaluation, aimed at trying to determine whether the training provided to teachers was having desired effects on behavior, the first thing discovered was that the group which was under consideration was a volunteer group and all groups to be trained after that point would be “the others” and would not be volunteers. Obviously, “the others” would not serve as an adequate control group as their attitudes (and probably behaviors) were likely to be quite different.

Potential Solutions to the Issues of Comparisons and Control Groups

Solutions to this problem have focused on one of several quasi-experimental strategies: using students as their own controls, using counter-balanced designs, and using matching control groups (aggregate rank similarity method) (Archambault, 1984; Payne & Brown, 1982; Callahan, 1983; Carter, 1986). Typically, using students as their own controls involves application of single subject designs in which the evaluator gathers baseline data on outcome measures, institutes instructional intervention and measures outcomes. Then the intervention program ceases for some period of time and then another measure of outcomes is made, intervention is re-introduced, measures taken, etc. This process is not easily implemented in gifted programs for two reasons. First, parents are not willing to have the instructional program of their children interrupted for evaluation purposes. Second, the instructional processes which are used with gifted students are not easily “interrupted”. That is, once the process of establishing independence in learning is begun properly, it is not easily put on hiatus. However, this procedure might be used in evaluating models such as the Revolving Door component of the Schoolwide Enrichment Model of Renzulli. Comparing projects completed while the student was “revolved into

the program” to those projects completed as part of regular classroom instruction (using criteria established as goals for the Schoolwide Enrichment Model) allows the evaluator to demonstrate the differences in types of projects produced within the special classroom setting and also the influence of the program on other projects (Callahan, 1991). Time series designs are discussed by Carter (1986). The greatest flaw in this design, one of assessing the performance of a group of subjects over several intervals representing no-treatment, intervention, no-treatment, is the lack of control for other events which may simultaneously influence the treatment.

Strategies for establishing matching control groups have been described by Payne and Brown (1982) and Callahan (1983), but the difficulties have been noted by Carter (1986). One difficulty is created because of the unique context—the schools—of gifted programs. There are so many variables on which school populations differ that researchers have criticized this procedure because of difficulty in establishing the most important variables on which to establish equivalence.

Carter (1986) has also pointed out that it is difficult to locate a district which has either identified but not served gifted students or who has not identified gifted students but is willing and able to participate in such a process. Although the logistics of finding a district which has identified but not served gifted students, or doing the identification in another school seem formidable, Wu (1986, 1991) reports of such a design being used by National Taiwan Normal University in a nationwide study.

The most convenient (and perhaps best suited) control group for matching is often a group of students—older or younger—within the same school system who would have been part of the program if it existed. For example, if an administrator wanted to expand a program to third grade next year, he or she could assess this year’s third grade class according to the identification procedure to be used, identify a pool of students who would have been assigned to the program and then assess them on the outcome variables. This data would then be held for comparison with the first class that enters the program. Chung, Moon, & Kim (1990) used a modification of this design in their evaluation of a program in Korea by using students in the program less than one year (but admitted by the same criteria) as a control for students in the program more than one year in an ANOVA design. They further analyzed the data by correlating scores on their outcome measures with number of years in the program (within each grade level to control for maturation) assuming that a positive correlation would support the argument that the program had influence on the achievement of reasoning skills and science process skills.

Other matching control groups may come from other school districts that are similar in demographics such as socio-economic status, population, level of achievement, identification procedures, etc., but different in gifted

program offered. Identifying students in that district who would be in the gifted program if they had lived in the district to be evaluated could provide a control group. (Of course, political issues should be considered here. It is dangerous to identify students in one district who would not be identified in another. But often identification procedures are so similar that there will be considerable overlap.) Care should be taken to assure that the groups are comparable at the outset on variables that might influence the results (e.g., ability, interest, socio-economic factors, etc.) (Archambault, 1984) and on variables which are to be the outcome variables.

In the counter-balanced design Callahan suggested, students in a gifted program are sub-divided into smaller units and some are provided one component of the curriculum while others are exposed to a different component(s). These groups serve as controls for each other. Carter (1986) recommends adding control groups of non-gifted students to this model who do not receive instruction in the curriculum at all in order to demonstrate that the curriculum is in fact differentiated from the regular curriculum. While this model might be criticized for the comparison of achievement of students of unequal ability and achievement levels, one might apply the regression discontinuity model introduced by Archambault (1984) and then expanded upon and illustrated by Stanley and Robinson (1986) in their evaluation of a mathematics program for gifted students. This design uses statistical rather than design controls to account for differences between treatment and control groups when one is different from the other on a significant variable. In the Stanley and Robinson study, for example, the students in the control group were students considered but not selected for the program. Essentially, the statistical procedure allows us to determine whether the treatment accounts for higher outcome scores than the identification variables would predict.

One alternative commonly used for evaluation of programs for other special programs such as those for the handicapped or for remedial programs is comparison of growth to norms provided by the test developers for expected change over a designated period of time. Unfortunately, the instruments which should be used for assessing gifted students do not provide norms for that group and the norms on standardized achievement tests reflect expected growth for the average student rather than the special population of gifted students (Callahan, 1983).

One recommendation given by Payne and Brown (1982) for the situation in which establishment of a comparison group is impossible is retrospective testing. This strategy, most often used to assess affective outcomes, involves asking students or other individuals assessed to complete an instrument after instruction and then to complete it as they believe they would have prior to instruction or implementation of the program. This strategy is flawed in its assumptions that individuals can accurately reflect the state prior to instruction.

Carter (1986) has discussed other alternatives to the designs discussed above including causal-comparative and correlational analyses, both weaker designs because of the relational rather than causal conclusions which are legitimately derived from these analyses.

Controls for assessing staff development programs are difficult because the threat of evaluation seems to increase with age. Teachers are often reluctant to allow observation of classes or examination of instructional plans and very unlikely to be willing to take "tests" of their knowledge or skill level. If a group of volunteers can be separated randomly into treatment and controls, then incentives of using data from pretesting and post-testing for modifying staff development activities can be used to garner the cooperation of the control group. In a recent evaluation of a program to develop teacher questioning skills, a volunteer group of teachers was divided into two groups with the first group identified to receive instruction and peer coaching directed at improving questioning skills while the second group was scheduled for "a second round of instruction". Assessment of changes in questioning skills were conducted using classroom observations across both groups while the first round of instruction took place. The data from these observations were given to the teachers at the beginning of their round of instruction to give them a basis for looking at their own behavior relative to the goals of changing level of questions (Landrum & Callahan, in press).

Factor 6: The Teacher as Program

In any small and largely contained educational program such as a gifted program, we are often not evaluating a program per se, but rather a teacher or a small group of teachers. In other words, the effects measured may be program effects, but the program is really the teacher(s). This leads to several problems. The first and most obvious is how to separate personnel evaluation from program evaluation, and the second is how to make recommendations which can be implemented without publicly reflecting on individual teachers.

Addressing the Personnel/Program Issue

First, in some cases and in relation to some variables it may simply be impossible to separate these variables. For example, if the classroom climate is evaluated, it is apparent that the teacher is the major force in establishing the climate. In those cases where individual teachers' performance is clearly reflected in the results of evaluation it is critical that these results be handled confidentially and that the staff members involved understand that their right to confidentiality will be respected.

Further, a thorough evaluation will reflect that classroom climate interacts with many other variables in the

program (i.e., staff development, program management and identification procedures) in producing program effects. To the degree to which staff are assured that the program evaluation will address all aspects of the program and not just their performance, they are more likely to see the evaluation as potentially helpful rather than threatening.

Factor 7: Inattention to Aptitude Treatment Interactions

Program evaluators, like researchers, are often guilty of regarding gifted students as all alike and ignoring the aptitude instruction interactions which may be occurring within a given program. Perhaps the difficulty in finding control groups has so overwhelmed the design questions that this issue has not had the attention it deserves. For, even when we are able to identify comparison groups, the evaluation process is hampered in identifying clear program effects by the great variability within each of our groups. As Gallagher (1990) has pointed out, the variability in abilities, outside factors affecting the children in the group, teacher instructional competencies and many other undetermined factors may, in fact, outweigh or interact with the effects of the program. Also, the model traditionally adopted assumes that one instructional program is equally good for any gifted student that has been identified. The programming strategies, the instructional activities and the evaluation strategies used have all assumed that the Procrustean bed can be used effectively in gifted programs. What in fact may be the case is that certain programming strategies and curriculum are effective for certain gifted students having certain characteristics, but not effective for others. Evaluation designs have not allowed us to separate out these effects. We have not examined the possibility that what we describe as the "same" instruction is really quite different from each individual child's perspective, and thus, has quite different effects depending on the child.

Potential Solutions to the Variability Problem

One statistical possibility relating to Gallagher's concern that the variability within the groups may wash the effects of programming, is time to reconsider the use of the .05 significance level as the indicator of program effect and begin to look at effect size as a more meaningful indicator of program influence (Borenstein, Cohen, Rothstein, & Pollack, 1990; L'Hommedieu, Menges & Brinko, 1990; Tillitski, 1990; Rosenthal, 1990;).

It is also time to consider using qualitative evaluation strategies in conjunction with quantitative strategies in determining the effects of programs on individual children (Fetterman, 1988a,b). Evaluation strategies must provide the opportunity to describe the ways

in which gifted children with certain characteristics interact with the experiences provided for them, the teachers they interact with, the way in which program are delivered to them, and the outcomes they experience. Qualitative studies are needed to determine what works for which individuals under which conditions—what are the other intervening factors which influence success and how does the program interact with them? Models of qualitative analysis in the area of gifted are offered by Fetterman (1988a) and Barnette (1984).

Factor 8: Indicators of Success and the Instrumentation Issue

Two closely related issues in evaluating programs for the gifted are the issues of the selection or construction of instruments that will yield reliable and valid data for answering the evaluation questions asked and the determination of indicators of success acceptable to the audiences of the evaluation. In the United States, the predominant use of standardized, paper and pencil achievement instruments to evaluate educational outcomes (student) has been criticized because of the over-reliance on multiple-choice format resulting in narrowness of range, invalidity in assessing the goals of gifted programs, and potential ceiling effects.

In addition, it is important to recognize that grade equivalency, one of the scores most commonly used as a criterion indicator, has little meaning for academically gifted students. The concept of grade equivalency is based on differences between the scores of average students across grades, not the scores of gifted students.

Although some standardized paper and pencil measures of critical thinking skills and creativity have been effectively used in evaluating programs for the gifted in the United States and other countries, these measures are usually limited in scope and address only a small number of the many goals of gifted programs. Locally developed instruments are often too curriculum specific and lack evidence of reliability or validity. Finally, in programs which are individualized in nature, it is nearly impossible to identify one instrument that will assess the myriad of goals which might be part of the educational programs of even a small number of students.

In the selection assessment tools, the audience for the evaluation, especially the decision makers must be considered if the evaluation is to have any impact. What kind of data will these individuals consider believable evidence of program impact?

Potential Solutions to the Instrumentation and Indicator Issue

If a program which is based on acceleration is the focus of evaluation, then out-of-level testing is one potential solution to the outcome measure issue. Archambault (1984) has offered guidelines for out-of-level assessment.

However, care must be taken at certain grade levels to ascertain that the format of the test does not interfere with performance. For example, in testing second graders on upper level forms of the Iowa Tests of Basic Skills, the National Research Center on the Gifted and Talented (U.S.A.) found that the format of answering on separate answer sheets is inhibiting to performance.

When using the available tests of other process skills *as they match* the goals and objectives measured, caution must be exercised in order to ensure that we do not limit outcome measures only to those types of assessments for reasons described above: narrowness of domain assessed and the many outside factors which may influence performance.

The use of product and performance assessments is becoming much more prevalent in the United States. Although essay and oral exam has long been the predominant assessment approach in other countries, this movement in the United States has taken on a broader conception including performance on laboratory and simulation tasks. Current attention to the development of such instruments is based on a belief that they are more direct and authentic appraisals of desired educational outcomes and that their use also has positive consequences for teaching and learning including

higher expectations of enhanced student learning not just of basic skills, but also of higher-order thinking skills such as problem presentation, reasoning, judgment and synthesis. Assessments of performance, by virtue of focusing not just on what students know but on what they do and the way they do it, also promises to facilitate the process of learning-by-doing as well as the development of generic skills for written and oral communication, executive planning, interpersonal acumen, and other enabling competencies (Messick, 1992, p. 1).

Considerable attention has been given to addressing the technical qualities of all such instruments. Messick (1992) points out that evaluators are obligated to demonstrate that "performance assessments are evaluated by the same validity criteria, both evidential and consequential, as are other assessments. Different psychometric models might be employed, . . . but such basic assessment issues as validity, reliability, comparability, and fairness still need to be uniformly addressed" (p. 2).

Evaluators within the field of gifted education need to draw on the technology which is being developed for general assessments of this type to improve instrumentation. In the area of validity for example it is important to ask:

Are we looking at the right things in the right balance?

Has anything important been left out?

Does our way of looking introduce sources of invalidity or irrelevant variance that bias the scores or judgments?

Does our way of scoring reflect the manner in which domain processes combine to produce effects and is

our score structure consistent with the structure of the domain about which inferences are to be drawn or predictions made?

What evidence is there that our scores mean what we interpret them to mean, in particular, as reflections of knowledge and skill having plausible implications for educational action relative to personal or group standards?

Are there plausible rival interpretations of score meaning or alternative implications for actions, and if so, by what evidence and arguments are they discounted?

Are the judgments or scores reliable and are their properties and relationships generalizable across the contents and contexts for use as well as across pertinent population groups?

Do the scores have utility for the proposed purposes in the applied settings?

Are the scores applied fairly for these purposes?

Are the short- and long-term consequences of score interpretation and use supportive of the general testing aims and are there any adverse side-effects? (Messick, 1992, p. 3)

Of course, the last question relates specifically to one of the primary aims in program evaluation: to provide decision-makers with information which they may use in judging the appropriateness and effectiveness of an educational program and its curriculum. If the decision-maker is to believe the evidence presented, then he or she must be receptive to the information, believe in its validity and accept the type of evidence presented. Therefore, it is important to choose assessment instruments in which the decision-maker has confidence of validity or to provide that validity argument to him or her. The best way to determine which indicators will be convincing to the evaluation audience is to ask! Evaluators often struggle with complex designs and analyses, and they often spend inordinate time gathering data from every possible source using every possible instrument only to present reports that are incomprehensible or not "believable" to the decision-maker, and therefore, considered unimportant to the school board or to the superintendent or the program administrator. It is critical to ask questions like: What will convince you that this program is effective or ineffective? What evidence will you accept of program effects? What do you need to know to determine whether your money is being well spent?

Answers to these questions may lead to the conclusion that the most effective and convincing evidence will be gathered by qualitative methodologies. It is easier for the lay-person to understand the "stories" of children and their parents than for them to understand a multivariate analyses of variance. The presentation of products, the presentation of testimony, the documentation of influences on individual successes and failures often provides more convincing data than statistical reports. A balance must be struck between quantitative and qualitative presentations based on the indicators which will be of most impact.

Factor 9: Evaluation Utilization

Of course, all evaluation efforts are for naught if no one uses the evaluation data for change. Further, continued perceptions that time and energy have been expended to no useful end will diminish the likelihood of further efforts to gather evaluative data. Evaluation reports are sometimes overwhelming in size and difficult to process because of their complexity, sometimes unheeded because they are too threatening, sometimes unheeded because the decisions affecting the gifted program were made prior to receiving the report (sometimes even prior to asking for an evaluation), and sometimes unheeded because they are too technical and jargon-loaded to be useful to decision-makers.

Potential Solutions to the Utilization Issue

Tomlinson, Bland, and Moon (in press) classified factors which affect program utilization into evaluation context factors and evaluator control factors. Evaluator context factors are those factors relating to the environment in which the evaluation takes place and, although out of the evaluator's control, are factors to be considered. As an example, Mathis (1981) points out that the use of evaluation information and data is often selective and used to political ends.

Evaluator control factors address first the utility of evaluation and those authors reiterate the first guideline of the Joint Committee on Standards for Educational Evaluation: Don't bother to do an evaluation if no one is interested in the findings and don't ask evaluation questions about areas which are not open to change. Some evaluator control factors suggested in the literature suggest several general principles to be considered: avoid the use of research jargon; overuse of data interacting with other factors such as technical language, report length and inclusion of negative results may have a negative impact on audience reaction and understanding, client prefer qualitative rather than quantitative data; quick turn-around and client-centered feedback and involving clients directly with data collection and analyses increases utilization; frank dialogue throughout the evaluation process increases chances findings will be used; and timeliness of reporting and substance of the report (multiplexity of data gather methods) relate to utility (Tomlinson, Bland, & Moon, in press).

In a series of case studies of gifted program evaluations, Tomlinson, Bland, and Moon (in press), and Callahan (submitted for publication) found two key factors which promote use of evaluation findings—will and skill. Specifically, utilization was more likely when: (1) evaluation of programs for the gifted was a part of a division-wide policy requiring routine evaluation for all program areas, (2) systematic written plans were in place delineating steps and procedures for ensuring implementation of findings, (3) multiple

stakeholders were consistently involved in planning, monitoring, and reviewing the evaluation process and its findings, (4) stakeholders played an active role in planning for and advocating before policy makers for program change based on evaluation findings, and (5) key program personnel were knowledgeable about gifted education, program evaluation, the political process in their divisions, and the interconnectedness of the three.

From the review of the general evaluation literature and the literature in the field of the evaluation of gifted programs, Tomlinson, Bland, and Moon provide the following guidelines for producing evaluation which have potential utility. While these guidelines are presented as a summary of utilization guidelines, they represent also a guide to the general principles which have been reviewed in this chapter.

Make evaluation procedures a part of planning from the earliest stages of program development (including clear program descriptions and goals).

Ensure that evaluators are trustworthy and knowledgeable of both gifted education and evaluation.

Provide adequate funding and time for appropriate evaluation procedures to be followed.

Clearly identify all audiences who have an interest in or need for evaluation results and involve them in the process.

Ask evaluation questions which are well focused to provide information about the goals, structures and activities of the program being evaluated—questions which will aid in making significant program modifications.

Use multiple data sources (e.g., teachers, parents, students, administrators, school board members) in order to understand the values of varied groups of stakeholders.

Develop evaluation designs which address complex issues of measurement (including qualitative strategies, and quantitative methods such as time-series design, using students as their own controls, etc).

Avoid reliance on traditional standardized measures which offer little promise of reflecting academic growth in gifted learners.

Use a variety of data gathering methods designed to reflect the unique structure and goals of programs for gifted students (e.g., out-of-level testing, portfolio assessment, product rating with demonstrated inter-rater reliability, etc.).

Describe fully procedures for data collection and interpretation so that audiences understand processes which were followed and conclusions which were drawn.

Disseminate to all appropriate audience reports which are timely and designed to encourage follow-through (pp. 18–19).

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PART V

Other Components of Nurturing Giftedness and Talent

Teachers of the Gifted

ALEXINIA YOUNG BALDWIN

University of Connecticut, Storrs, Connecticut, U.S.A.

Introduction

Although the Terman studies set into operation an international interest in the needs and nurturance of the gifted child, the literature has, for six decades, been almost devoid of research on the unique or desired characteristics of the teacher of the gifted—the person who can cause the most effectively planned program to fail or the most dismally planned program to succeed. As Nelson and Cleland (1971), have succinctly stated, “It is the teacher who sets the environment which inspires or destroys self-confidence, encourages or suppresses interests, develops or neglects abilities, fosters or banishes creativity, stimulates or discourages critical thinking and facilitates or frustrates achievement” (p. 439).

A review of the available literature revealed a series of lists based on speculations about teachers of the gifted but there were few empirical research studies that could distinguish the characteristics necessary for a teacher of the gifted from those desired for all teachers. Therefore, there are many questions about the uniqueness of the teacher of the gifted that continue to persist. The most frequently asked questions are:

(1) Should the teacher of the gifted be highly gifted, if so what should the IQ score be?

(2) How extensive should the knowledge of the teacher of the gifted be?

(3) Should the basic characteristics required to teach gifted elementary grade students be the same for gifted students at all levels?

(4) What type of educational background should the teacher of the gifted have?

(5) What is the difference between a teacher of the gifted and a good teacher of all the other students?

(6) What specialized training should teachers of the gifted have?

Just as Dunkin and Bidler (1974), Callahan and Renzulli (1977), Gaze and Berliner (1979; cited in Sisk, 1989) have stated: “Little specific documentation exists to prove that good regular classroom teachers do not also make good teachers of the gifted, but considerable data does support the notion that nothing matters in the school more than the teacher”.

The plethora of variables that must be factored into any research design in order to give a definitive answer to

the questions as listed above has been the primary cause of the dearth of empirical research in this area. There have been generalizations, propositions and theories but few of these have been tested.

According to Mandell and Fiscus (1981) “Not every teacher should teach gifted students”. Proponents of education of the gifted would ordinarily agree with this statement but in the United States where there is an increasing push for heterogeneous grouping of students, it is becoming increasingly clear that teacher training programs or institutes must provide inservice and preservice teachers the appropriate training to meet the needs of the gifted.

Of the behaviors taken from empirical research and various theoretical beliefs and assumptions, a large percentage were related to those behaviors acquired through teacher training programs on education of the gifted or on a specific content area. These behaviors can be easily evaluated and quantified whereas other variables that might constitute the uniqueness of the teacher of the gifted are evaluated using subjective analyses with too much room for speculation. The findings and recommendations of a cross-section of these authors will be discussed in this chapter in an attempt to clarify the issues and make recommendations for further research. The relationship of this concern to the general research on teacher characteristics and teacher training will be discussed.

Progression of Research Focus

During the decades preceding the fifties, much of the attention of scholars was focused on identification, organizational accommodations and relevant content for the gifted. Those few researchers who were concerned about the teachers of these students were focusing their research on certification standards, the teacher's ability to identify the gifted and behaviors that various groups considered indicative of the teacher of the gifted. For example, Mackie and Dunn (1953) focused on certification requirements and reported in their research that only one state—Pennsylvania—was setting certification standards for teachers of the gifted. Pengato and Birch (1959) focused on the professional skills of the

teacher and emphasized the importance of their ability to identify the gifted. These authors felt that too often teachers selected the hard working student instead of the active, noncompliant student who might really be the most gifted. At that time, they advocated a more comprehensive testing process to eliminate the biases teachers would have. Davis (1954) generated a list of behaviors from a questionnaire which respondents filled out regarding their perception of the teacher of the gifted. Davis' findings along with several earlier writers in this area and era generated a list of behaviors which included the following qualifications: free from jealousy and selfishness, enthusiastic about learning, unusual proficiency in teaching a particular subject, wide interests, flexibility, fairness and impartiality, sense of humor, interest in people's problems and good disposition.

From the literature it is clear that in the decades that followed this beginning interest in teachers of the gifted, an increased focus on the role and qualifications of teachers as participants in all aspects of programs for the gifted student occurred.

General Teacher Education Research Concerns

Just as it is impossible to discuss curriculum and instructional strategies for the gifted without looking at those elements in general educational strategies, it is impossible to look at the teachers of the gifted without viewing data regarding the entire teaching profession.

According to Cronbach and Suppes (1969) most teacher education research is decision oriented or applied. Much of it is also focused on what educational experiences teachers should have as inservice or preservice students. It is significant that the latest *Handbook of research on teacher education* (1990), does not include any research data or ideas concerning the desired behavior or characteristics of teachers. It has been suggested instead by Yarger and Smith (1990) that the domains of inquiry for research in teacher education be classified as antecedent conditions, processes and outcomes and that the focus should be the relationship among them. Studies that focus on the relationships among these domains can be called linking studies such as: those linking antecedents with processes, those linking antecedents with outcomes,

those linking processes with outcomes and those linking antecedents with processes which are in turn linked to outcomes. This relationship is illustrated in Figure 1. This approach allows the researcher to take account of the many variables that can affect the conclusions and generalizability of these conclusions.

Definitions of Domains

Antecedents are institutional, faculty and student characteristics that influence the direction of the process of teacher education. The teacher training experiences of the teacher, types of courses in education of the gifted, college or university's support for this area, the academic department in which the training takes place are examples of antecedent variables that face researchers. Processes on the other hand are associated with the delivery of the program and although this domain appears to be an antecedent, it is more specifically related to the way the program is structured or how it is delivered (workshops, regular university or college courses etc.). Outcomes can be used to judge the success or failure of the teacher education efforts. The multiple linking process can provide a basic construct for further research in the training of teachers of the gifted.

If the researcher accepts these domains as a viable approach to discovering information about the teacher of the gifted, the next step is to review the type of methodologies that might be used.

Possible Research Methodologies

It has been suggested by Yarger and Smith (1990), that various research methodologies be reviewed for the ability of the method to give the researcher the information desired. They outline the following methodologies and point out their strengths and weaknesses.

NARRATIVE STUDIES

These studies consist of descriptions and provide no information on validity or reliability. They do, however, provide the reader with rich information regarding a program and possible options within this program.

CASE STUDIES

These studies are more organized and generally focus on a specific topic. They can also be descriptive as well as provide the researcher with the ability to generate hypotheses. Case studies can provide in-depth descriptions of teacher education phenomena.

SURVEYS

This process is used quite frequently in research related to teachers of the gifted. Surveys are designed to sample

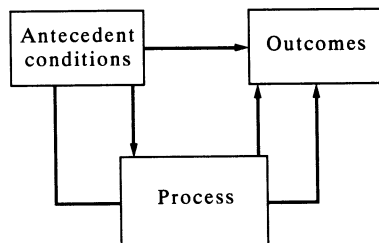


FIGURE 1. Relationship between antecedent conditions, processes and outcomes.

large and important populations in areas that have importance for that population. Many limitations are to be taken into consideration: sampling size, instrument design, return rates, response rates, social acceptance and many other technicalities.

CORRELATIONAL STUDIES

This methodology assists the researcher in establishing a relationship between two or more variables for instance, the relationship between the IQ score and the teacher's ability to work successfully with gifted students. This type of study does not present causal relationships but it can promote clear and testable hypotheses.

CAUSAL EXPERIMENTAL STUDIES

These are technically the most sophisticated methodologies in research in teacher education. Because it is difficult to control the variables in teacher education—a condition required in these types of studies—true experiments could only occur in a laboratory setting with limited generalizability.

Each of these research strategies requires stable constructs from which to work. As Hoge (1988) has suggested, the field of education of the gifted lacks the stable constructs necessary for generalizable studies. Language is an important variable and one of the problems of defining giftedness. It hampers the true meaning desired for a reasonable construct. This weakness compounds the problem of research on teachers of the gifted.

Since much of the research on teachers of the gifted has focused on characteristics of the teacher without reaching firm answers to the questions listed at the beginning of this chapter, perhaps in the future the analysis of data secured from research on the educational experiences and backgrounds of these teachers will provide more definitive answers to these questions. The antecedent variables that will influence the research on behaviors of teachers of the gifted include not only those variables to be found in a regular classroom but those that involve the variations in organizational patterns (pull out, whole class, variation in time per week); state regulations; populations being served; funding source; and teacher training in education of the gifted, to name a few. Processes are usually noted in the literature as problem-solving activities; higher level objectives and questioning which originate with the upper levels of Bloom's taxonomy of educational objectives; independent study; product development; inventions; etc. Compacting, a process of moving the student past those items they already know so that they can become involved in concepts that are appropriate for their ability level as designed by Renzulli and Reis (1985) is a process that should be part of the teacher's repertoire of strategies. Wendel and Heiser (1989) found that instructional strategies used by effective teachers of gifted junior high students, included the

use of probing questions during discussions; the use of humor to let their students know that they care and respect them; and encouragement of students to become personally involved in learning and to do so in creative ways. Outcomes, the last of the series of domains, are too often judged by increments of grade points that students acquire during the program. There are too many additional variables to be considered for dependence to be placed upon grade point averages as a judge of teacher success. Performance assessment which is being recommended by the National Board for Professional Teaching Standards (1992), includes a wide range of behaviors to be observed and processes to be used in determining the outcome of a teacher's interaction with students; the assessment is guided by preassessment goals for students. If a clear distinction between those goals for gifted students vs those for all other students can be made, then it is highly possible that outstanding performances by teachers of each group of students could give researchers some idea of the qualities that distinguish the teacher of the gifted from other teachers.

The foregoing recommendations for research techniques have focused on the difficulties to be faced in acquiring empirical data on teaching behaviors and particularly those of teachers of the gifted. Heller (1991) highlights this difficulty when he states:

The present situation of basic research is characterized through two competing paradigms: the psychometric paradigm vs the paradigm of cognitive psychology or cognitive science. In opposition to many critics of the psychometrical approach I am in the opinion, that these two paradigms are not contradictory opposites but ought to be seen in supplementary function. Both are indispensable. . . This statement is even more valid for applied research, e.g., for the solution of practical problems of giftedness. . . Differential cognitive psychology on the other hand, is supposed to yield important insights about talent—adequate social learning environments, i.e., social environments, which facilitate gifted individual's personality development" (p. 1).

Present Research Trends and Perspectives

Maker (1982) has suggested that we approach the analysis of characteristics of the teacher of the gifted by classifying the behaviors into philosophical, personal and professional categories. These categories can be defined as follows:

Philosophical—the way teachers view education, life-time ideals and beliefs, feelings regarding education of the gifted and the conception of the scope of giftedness (Maker, 1982).

Professional—the type of training experience a teacher of the gifted should have. This training can be related to specific content, client, or grade level (Sisk, 1989; Baldwin, 1977; Maker, 1982).

Personal/innate quality/personality—inborn quality of interaction with others—disposition (Sisk, 1989).

Although the lists of characteristics generated from the various authors' perceptions and research data were not classified according to Maker's suggestion, each list contains behaviors that can be classified in this manner.

The research of Bishop (1968) which has been referred to most often, reported on those characteristics which the subjects of his study said were present in successful teachers of the gifted. He studied more closely a randomly selected group of thirty teachers from this original group and determined that they were experienced, of superior intellect and mature individuals. Additionally he determined that these teachers were creative, had high personal achievement needs and tended to be student-oriented.

Although the lists generated by Bishop and others indicated that the teacher of the gifted must be creative, Gowan and Bruch (1971) great proponents of creativity, theorized that there was a missing ingredient in the hypothesis as stated: that creative persons will show creative behaviors that are measurable in the classroom and that the teacher's creative classroom behavior will inspire creative behaviors in the students. In other words, the theory that A causes B which in turn causes C was not necessarily valid. Their research was intended to find the missing ingredient. From the results of this study, they concluded that the ingredients that make a teacher effectively creative are more than just being a creative person. Those ingredients were, high energy, self confidence, intellect, originality of thought and freedom from hasty, impatient behavior.

According to Zabel, Dettmer and Zabel (1984), stress, burnout and attrition from teaching continue to be important issues in education. High energy levels for the teachers of the gifted have been included in several lists regarding the behavior of teachers of the gifted. If the research by these authors is any indication of the status of the burnout factor among gifted teachers then high energy is indeed an important factor. These researchers studied the prevalence of burnout in special education. Since education of the gifted was listed under special education in the state where this research was conducted, gifted teachers were included in the sample. A random sampling of 601 teachers including 97 teachers of the gifted (although this $n = 97$ is a relatively small sample) revealed quite interesting findings. The researchers were examining relationships among the independent variables of level of teaching responsibility and the three dependent measures of emotional exhaustion, depersonalization and sense of personal accomplishment. The data from their research revealed that teachers of the gifted appeared to be at higher risk of emotional exhaustion compared to teachers of other exceptionalities excluding emotional disturbance and hearing impairment. Although levels of emotional exhaustion differed with various organizational patterns, depersonalization seemed much lower among teachers of the gifted.

Burnout among teachers of the gifted was also noted by Swicord (1987). She has attributed this burnout to the excessive demands on the teachers' strength, energy and resources. Data from this author's article coincides with that of Zabel et al. (1984). They also point out the importance of high energy and flexibility as characteristics of the teacher of the gifted. As Swicord points out, the myriad of organizational permutations of gifted programs and the "adjunct" status many programs have, require high levels of ego strength and flexibility in planning strategies.

In Story's (1985) literature review for her study, she found that the characteristic most often used to designate the successful teacher of the gifted was "facilitator of learning". In an effort to verify this and other characteristics, Story used an ethnographic research approach in which direct observations and interviews were used to discover characteristics of successful students which would in turn validate the teacher as a facilitator of learning. Her observations were of teacher interactions with students involved in independent studies. The characteristics listed below emerged from her study. Each one includes several descriptions of teacher behavior that are quite similar to those general characteristics listed by other authors.

(1) Teachers of the gifted provide for positive and close physical relationships which support learning for gifted children.

(2) The quality and quantity of verbal interaction is a key factor in successful teaching of gifted children.

(3) Teachers of the gifted are flexible with their use of time and scheduling according to students' needs.

(4) Teachers of the gifted are process oriented with children's creative productivity the ultimate goal.

(5) Teachers of the gifted provide or suggest appropriate environmental supports based upon children's independent study interests.

(6) The teacher of the gifted displays "gifted behavior" as brought to bear upon his/her professional responsibilities (p. 157).

Although Story's research was focused on teachers and students involved in independent study, her findings will be a significant part of the continuing dialogue regarding the teachers of the gifted.

Whitlock and Ducette (1989) used a technique of job analysis in an attempt to provide a useful model that characterizes the superior teacher of the gifted. The McBer method (McClelland, 1973) was used to distinguish average teachers of the gifted from outstanding teachers of the gifted and out of this research came a competency model. According to these authors' findings the outstanding teachers of the gifted had significantly higher ratings on six competencies: enthusiasm, self confidence, facilitator role, application of knowledge, achievement orientation and commitment. Other competencies determined from this study were personal flexibility, empathy, openness, motivation of students, building program support and advocacy. In this study, building program support was not significant at the 0.05

TABLE 1

Rank (Order of the Ten Highest Rated Competencies By the Outstanding and Average Teachers.

Item	Rank	Order
	Outstanding	Average
Likes gifted children	1	1
Ability to respond flexibly to the spontaneous needs of children	2	17
An advocate for gifted children	3	16
Emphasizes and looks for strengths in children	4	6
Ability to develop a gifted program appropriate to the needs of a particular community	5	36
Friendly, warm, and accepting	6	24
Willingness to experiment with the unknown	7	20
Ability to admit error	8	5
Appreciates the uniqueness of individual gifted children	9	3
Encourages children to develop and present their own ideas	10	2
Ability to adapt materials (creatively and imaginatively) for the individual child	15	7
Ability to accept students' sense of humor	21	9
Fair (just)	23	4
Possesses and models joy in learning	26	8
Likes him/herself	33	10

From Outstanding and average teachers by Whitlack, S. and DuCette, J. (1989) *Gifted Child Quarterly*, 33 (1).

level on the Mann-Whitney although it was close. Table 1 gives more information on the rank order of these competencies.

Silverman (1980) compared strategies of master teachers of the gifted with those of novice teachers of the gifted. She found that the greatest difference was in feedback techniques. Master teachers tended to be non-judgmental allowing much room for interaction with the student and they were also more divergent in class planning and student interaction.

A study by Howell and Bressler (1988) on learning styles of teachers dovetails Silverman's research on strategies. They used the *Teacher style inventory* developed

by Silver and Hanson (1981) where teachers ranked their responses to four behavioral descriptions (sensing-thinking, sensing-feeling, intuitive-thinking, intuitive-feeling) in each of ten categories: classroom atmosphere, teaching techniques, planning, preferred qualities of students, teacher/student interaction, classroom management, appropriate behavior, teacher behavior, evaluation, goals. Further, teachers were asked to rank order preferences of descriptions of the four categories. These researchers found that intuitive thinking and intuitive feeling were associated with teachers of gifted students. This finding is reflected in some behavioral characteristics that have been listed earlier in this chapter.

Although Tuttle and Becker (1980; cited in Ferrel et al., 1988) referred to characteristics often listed as simply "laundry lists" of characteristics that were based more on intuition than on grounded research. Ferrel, Kress, and Croft (1988) on the other hand have attempted to quantify their beliefs. Their study as designed was a "first step at an attempt to quantify the method of selecting teachers for the gifted program who [would] have a chance at succeeding in working with gifted children" (p. 138).

The *Teacher Perceiver Interview* (TPI) was used to compare teachers in the regular program with those teachers in a full day program for the gifted. The descriptions of the TPI themes can be seen in Table 2.

TABLE 2

Descriptions of SRI Teacher Perceiver Inventory Themes

Theme	Description
Mission	Sees education as the foundation for all that comes later in a young person's life. This teacher wants to be a part of helping children to grow and maintain or improve society.
Empathy	Perceives the emotion of the moment and responds directly to the emotion. This teacher understands and accepts students' emotions on a cognitive level without trying to solve the problem for the student.
Rapport drive	Sees him or herself as a warm friendly person who students like. This teacher works purposefully to build a positive working relationship with the students, which the teacher perceives as beneficial for the students.
Individualized perception	Gets to know the individual needs and interests of each student and builds or adapts the educational program based on these needs and interests. Different activities are provided so that students can express their individuality through their work.

TABLE 2 continued

Descriptions of SRI Teacher Perceiver Inventory Themes	
Theme	Description
Listening	Spontaneously listens to others and facilitates the speaker by accepting what is said. This teacher perceives that the answer to the problem lies within the speaker and that talking will benefit the speaker.
Investment	Wants students to learn and sees any lack of student success as his or her concern. This teacher's satisfaction in teaching derives from student learning rather than his or her own performance.
Input drive	Is excited about own learning and uses the new things learned to help others. This teacher is always seeking out new knowledge, learning from everything surrounding, including the students.
Activation	Sees success in learning as a key variable for helping students to learn. This teacher builds a wide repertoire of techniques to motivate learning and get students involved in wanting to learn.
Innovation	Is looking for and trying new or different ways to approach learning in the classroom. This teacher focuses her or his creativity on helping students develop creativity and to become actively involved in learning.
Gestalt	Is well organized with a drive toward completing tasks even at a perfectionist level. This teacher transfers the need for closure to students but does so by working from where the student is.
Objectivity	Responds to the total situation, getting facts first before reading a conclusion.
Focus	Has personal role models and goals which help him or her to move in a purposeful direction professionally. A major part of the goal involves teaching and this teacher sees teaching as a life-long career.

From Teachers of gifted children by B. Farrell, M. Kress and Croft (1988) *Roeper Review*, 10 (3).

The researchers found that there were six themes which differentiated between the two groups: focus, gestalt, innovation, mission, rapport-drive and investment. Three of these themes—gestalt, innovation, rapport-drive—were themes found in the literature regarding teachers of the gifted. The other three themes were not found to be common in the literature; however, they should be considered in further research strategies. The authors suggest further that instrumentation which includes additional items found in the literature regarding teachers of the gifted be used on a broader sample.

Starko and Schack (1989) have suggested that self-efficacy is a characteristic to be considered crucial for the teacher of the gifted. These teachers must have confidence in their ability to use strategies that might be unique in dealing with gifted students. This suggestion seems plausible since it is clear that ability levels and personality traits among a group of gifted children can be quite diverse. In my opinion, self-efficacy is a crucial characteristic for teachers of the gifted to have.

Karnes and Parker (1983) reviewed the criteria used in various institutions that had programs for educating teachers of the gifted. Their recommendations for state certification of these teachers were based on "the prevailing philosophy that teachers for gifted program[s] should be practitioners of excellence in scholarly endeavors as well as in teaching performance" (p. 19).

Rogers (1983) has suggested further that teacher training programs should help teachers become familiar with metacognitive experiences because "teachers of gifted children who can think efficiently and consciously monitor their own learning will be able to facilitate those executive processes in their gifted students" (p. 21).

A survey of giftedness as viewed by professionals in developing countries revealed several criteria for teacher selection and professional development needs (Baldwin, 1989). These criteria included high scores on specified tests, or special ability in a content area. All other criteria were set by the government in charge and came mainly from politicians or other high levels of influence. It was also found that teacher training institutions do not train teachers specifically in education of the gifted. The data from this survey were secured from Ghana, Kenya, Uganda, Indonesia, Nigeria and Oman.

Discussion

If all of the behaviors that have been generated throughout the years to designate the teacher of the gifted were listed, several pages would be used. This points out the wide range of ideas as well as the difficulty that faces a researcher. Maker's suggested categorization of all of the many behaviors as philosophical, personal and professional appear to be a logical step; however, it would be hard to separate the professional attributes from the personal ones. In an effort to test this theory, a small study was conducted using experienced persons in the field of the gifted as judges. A list of behaviors were given to the participants and they were asked to serve as judges and classify under one of the three Maker categories, forty-six behaviors that were culled from the literature. The results of this small study showed that the judges all agreed that 7% of the behavior should be listed under philosophical, 19% should be under professional and 43% should be under personal. This left 31% on which the judges could not agree. The split opinions were between the professional and personal categories (Baldwin, 1992).

TABLE 3
Classification of Behaviors Desired for Teachers of the Gifted

<i>Philosophical</i>	<i>Personal</i>	<i>Personal/professional split</i>
Aware of philosophical insights as related to teaching gifted	High energy level	Competency/interest in learning
Favor education of the gifted	Self confidence	Process oriented
Accurate conceptions of giftedness	Warm, outgoing nature free from negativism	Curious/excited about learning
	Intelligent	Facilitator
	Original thinker	Adaptable to stress and exceptional behavior of gifted students
	Enthusiastic	Positive attitudes towards students
	Good sense of humor	Well educated
	Powers of analysis and accumulation	Broad interests
	The attribute of intuition	Well organized
	An inquiring mind	Understands psychological impact of impatient behavior
<i>Professional</i>	Self discipline	Builder of program support
Professional training in education of gifted	A tendency toward perfectionism	Motivator of students
IQ of 128 or above	A tendency toward introspection	Process oriented
Exemplifies a need for achievement	A tendency to resist external authority	Achievement orientation
Well versed in subject	Free of hostility and a need to punish	
Able to stimulate students	Creative	
Knowledge of instructional strategies	High verbal skills	
Provides positive and close physical relationship with students	Displays gifted behaviors	
Flexible with use of time	Empathy	
Provides proper environmental supports	Flexible	

This small study has highlighted the focus that many studies and assumptions have displayed regarding behaviors that are unique for teachers of the gifted. This focus appears to be on the personal attributes (e.g. warmth, ego strength) and professional (e.g. training, knowledge etc.). The least number of variables were listed under philosophical. Table 3 includes characteristics used for the study and their classification as they were judged.

The findings of this small study prompt other questions that should be proposed for further research.

(1) *Is a particular philosophy or belief necessary for an excellent teacher of the gifted?*

Ward (1989-1980) has suggested in his proposition "that the person designated to teach the gifted should, by personal initiative as well as by institutional requirement, have attained a body of insights leading toward a philosophical perspective upon life and extending at some depth into crucial human issues—to the end that the student may study with profit the man [person], his [her] values and his behavior" (p. 115).

(2) *Should the professional training be extended to those teachers who are not specialized teachers of the gifted?*

The professional development of teachers at the tertiary or university levels is an important aspect in the

development of appropriate behavior for teachers of the gifted. This is, however, dependent upon certification and legislative or government approval of programs. Parker and Karnes (1984) found that in the U.S.A. there were 101 colleges in 38 states that had graduate degree programs with concentrations in education of the gifted. Passow (1983) on the other hand found from data secured from 35 countries that institutional arrangement to develop excellence and nurture talent was extremely varied and just as controversial. He found that in most western countries, the behavior to be developed for teachers of the gifted was quite similar. Van Der Westhuizen (1988) of South Africa has recommended a program design for preservice teachers which includes many of the variables that have been listed above but he has added attitude as another variable which he acknowledges is for all teachers.

In order to support the growing importance of teacher training, a guide for the development of modules of increasing content and depth to be used in countries that are in the process of developing programs for teacher training is suggested. This approach is particularly useful in areas where resources and staff are limited. The suggested emphasis and content for the modules on each level are listed below (Baldwin, 1986).

Level I—awareness, definition, characteristics.

Level II—awareness, definitions, psychology of needs, identification, teaching strategies.

Level III—philosophy, definitions, psychology of needs, identification, curriculum development, teaching strategies.

Level IV—historical perspectives, rationale for defense of programs, administrative strategies, psychology of needs identification, analysis of assessment protocols, curriculum development, teaching strategies, models, evaluation, advocacy strategies.

(3) *What is the unique ingredient in programs that train teachers of the gifted?*

The illustration in Figure 2 combines the recommendations for teacher training as noted by the authors listed in this chapter (Baldwin, 1989).

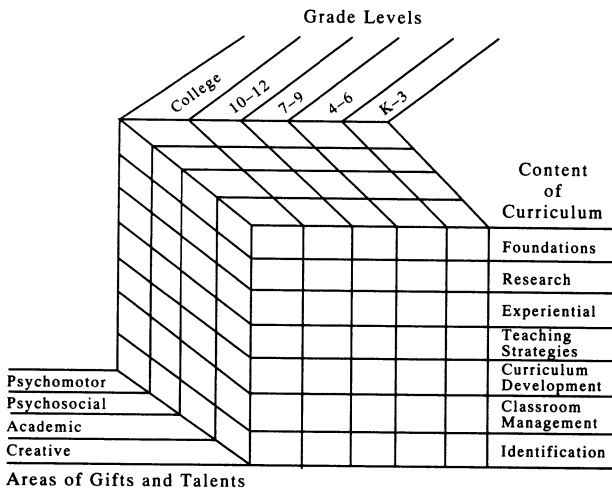


FIGURE 2. Recommendations for teacher training.

Conclusion

The word “teacher” refers to one who is able to show how, to provide lessons, to provide knowledge and insight. This teacher might be a mentor, a parent, a sibling or a peer. For each of these teachers of the gifted, the many qualities associated with personal characteristics and knowledge of content apply. It is important to note that extensive knowledge of the subject field does not necessarily mean that the possessor of such knowledge will be able to mold it and present it in palatable and efficient form to immature, if intellectually gifted minds (Gallagher, 1985).

The use of qualitative research such as that conducted by Story (1985) will help us get close to describing the unique quality of the teachers of the gifted. It will be important for terms to be well defined and control of the many variables be considered before the accurate designation of these behaviors and the evaluation of their benefit to gifted students is done. Behavior cited

from historical or contemporary documents includes excellent qualities for a good teacher of all students; however, there is still too little evidence in the literature that can give the absolutes about those qualities best suited for teachers of the gifted. The range of learning style preferences, cultural differences and organizational patterns is so wide that generalizations will be difficult to make. That unique quality which is different from that required by all teachers remains the ubiquitous challenge for future research.

Whereas the focus of this chapter has been on the teacher of the gifted, the student who comes in contact with that teacher is the most significant concern of all the research and assumptions about education of the gifted child. As we move forward in finding the answers regarding teachers of the gifted, meeting the needs of the gifted child is the ultimate goal.

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Counseling Needs and Programs for the Gifted

LINDA KREGER SILVERMAN

Gifted Child Development Center, Denver, Colorado, U.S.A.

Introduction

What does it feel like to be gifted? Mined as a national resource, ignored in the name of egalitarianism, flaunted for their achievements, chastised for not living up to their potential, taunted by their peers when they work too hard, laughed at when they care too much, silenced when they see too much: to be gifted is to be *vulnerable*. A young child with intense emotions and heightened awareness of the suffering and perils in the world feels helpless and afraid. Who is there to turn to who really understands? Counselors are needed who comprehend the complex inner lives of the gifted as well as their difficulties living in a world in which they feel alien. Developmental counseling is not a response to problems: it is a sensible, systematic way of preventing them from occurring. Gifted children need the support of trained counselors to ensure their emotional well-being and to enable them to actualize their potential in the service of humanity.

Historical Roots

Leaders or Lunatics?

The first recorded attempt to differentiate individuals with extraordinary skills and abilities appears to have been in 1115 B.C. in China (DuBois, 1970). Candidates aspiring for government offices were required to take proficiency examinations in various disciplines. The Chinese government continued to seek scholars to serve as political leaders for 2000 years. Identifying and grooming gifted individuals for leadership positions has been a recurrent theme throughout history: in ancient Greece as well as in the Roman and Turkish Empires. During the seventeenth, eighteenth and nineteenth centuries, little attention was given to the development of gifted leaders in the Western world with one exception: Thomas Jefferson proposed a bill early in the nineteenth century to identify and educate gifted students at public expense. Jefferson recognized that giftedness would perish if not recognized and cultivated, and that the talented poor were the most vulnerable (Hildreth,

1966). Jefferson hoped to mine the talents of these youths for the good of the state.

Systematic cultivation of gifted leaders gave way to a growing interest in child prodigies throughout Europe. Unfortunately, many of these children were perceived as freaks of nature, a view which remained prevalent well into the twentieth century. Explanations of creative genius in adults were similarly tinged.

The genius differs in *kind* from the species, man. Genius can be defined only in terms of its own unique mental and temperamental processes, traits, qualities, and products. Genius is another psychological species, differing as much from man, in his mental and temperamental processes, as man differs from the ape (Hirsch, 1931, p. 298).

This attitude became generalized so that all children with special abilities were seen as abnormal. In the nineteenth century, Quetelet's doctrine of *l'homme moyen* declared the average man nature's ideal and deviations in either direction nature's mistakes (Boring, 1950). Exceptional talent was ascribed to unnatural forces and those who possessed it were rejected rather than nurtured.

The amazing capacity which men call genius lies so obviously beyond the range of average men as to seem supernatural to them. The contemplation of genius thus came to be accompanied by a kind of superstitious awe, and the notion gained currency that people of genius constitute a separate species. . . . [This] superstition . . . may also result in persecution of the genius and even in his destruction by the multitude (Hollingsworth, 1926, pp. 3-4).

By the end of the nineteenth century, Lombroso (1893) in Italy and Nisbet (1893) in England were claiming that genius and insanity are biologically linked. Their "proof" was based on certain illustrious persons (e.g., Byron, Joan of Arc, Keats, Mozart, Poe, Shakespeare, Socrates) who exhibited "degenerate qualities," including originality, fondness for special words, left-handedness and stammering (Hirsch, 1931, p. 281). Nisbet (1893) even warned parents that discussing their children's giftedness with them could

lead to the transmission of insanity. Thus, early conjecture about the psychological makeup of the gifted could be used to justify their persecution.

A few decades earlier, in 1865, Sir Francis Galton began the scientific study of genius (Hollingworth, 1926). He also has been credited with providing the first comprehensive list of characteristics of gifted children (Hildreth, 1966). A child prodigy himself, as well as a genius in his later years—Galton's most important contributions occurred after his 50th birthday and continued until he was past 80 (Terman, 1917). Galton (1869) saw genius as a difference in *degree* rather than in kind. Shortly after the turn of the century, Alfred Binet supplied the method by which these degrees of difference could be measured (Binet & Simon, 1905), thereby enabling giftedness to be detected in childhood and the claims of Lombroso and Nisbet to be refuted. Binet, like Galton, had an intense interest in prodigies, studying children with extraordinary talent in mathematics, chess, writing, and other areas. Ironically, he maintained that these children are qualitatively different from the rest of humanity (Hildreth, 1966).

The study of giftedness in children (not just prodigies) began in earnest at the beginning of the twentieth century, with William Stern's (1910) work in Germany, Lewis Terman's (1914) in California and Leta Hollingworth's in New York (Garrison, Burke, & Hollingworth, 1917). Terman and his colleagues' detailed description of the development of giftedness over the lifespan clearly made the greatest impact on world thinking about this population. Their longitudinal data on the social, emotional, moral and physical development of over 1400 gifted children (Terman, 1925; Terman & Oden, 1947, 1959) largely put to rest the myths of insanity and degeneracy. But it was Leta Stetter Hollingworth who studied the rich inner milieu of gifted children and laid the groundwork for counseling this population.

The Contributions of Leta Hollingworth

Leta Hollingworth (1886–1939) was the first counselor of the gifted (Kerr, 1990). In addition, as the first clinical researcher of this population, she was “the first to contribute evidence indicating that gifted children do have social/emotional needs meriting attention” (Colangelo, 1991, p. 273). While others concentrated on the achievements of gifted children or groomed them for leadership positions, Hollingworth navigated the interior of giftedness—the vast unexplored territory of the psyche. She mapped the critical developmental issues with which atypical children have to contend. She listened compassionately to the children and to their parents. She listened intently—as a marine biologist might listen to whale songs in hopes of decoding their hidden meanings—until the deepest layers of their experience were revealed to her. They shared with her their loneliness, their need for precision and fairness,

their impatience with superficiality and foolishness, their desire to find like minds, their love of beauty, their early grappling with good and evil, their fledgling attempts to build a philosophy of life, their search for their place in the universe and their delightful sense of humor—which she called their “saving sense” (Hollingworth, 1940a, p. 274). The richness and enduring quality of her insights attest to the depth of her compassion and perceptiveness, as well as her enormous investment of time as a researcher. She remains unparalleled as the “greatest counselor to the gifted and talented” (Kerr, 1990, p. 178).

The eminent Carl Rogers was one of Leta Hollingworth's students, and his client-centered therapy is thought to have been a derivation of Hollingworth's deeply respectful “child-centered therapy” (Kerr, 1990, p. 180). Rogers once remarked that he learned as much from *who* Leta Hollingworth was as from *what* she taught him. Her niece, Margaret Overton, wrote: “She believed that life was very precious, *talent* was a blessing to be nurtured and shared for the good of others, and that *people* were to be cherished and helped” (Overton, 1975). Hollingworth lived her philosophy.

As one of the earliest scientist-practitioners, Leta Hollingworth carefully documented both her clinical observations and the effects of her interventions. She “pioneered research and development in naturalistic settings—in functioning classrooms and schools” (Passow, 1990, p. 135), employing tapescripts of classroom interaction, psychographs, and photographic records. In addition, she conducted 30 cross-sectional and longitudinal studies, the most famous of which, *Children above 180 IQ* (Hollingworth, 1942), still remains the only comprehensive study of children in this IQ range. Her original research included investigations of personality development, social adjustment, playmates, leadership, effects of special class placement over time, comparison of the sexes on mental traits, early intellectual development, adult status, and the relationship between general intelligence and special talents. Her standards for research would be deemed exemplary even in modern times (Benbow, 1990).

Leta Hollingworth's research contributions must be viewed as a model to be aspired to even today. Although there are clear exceptions, the general research contributions in the field of gifted rarely have approached the standards she set. Her research questions, which were varied, were addressed with scientific rigor. She even used control groups to evaluate her findings. . . . Moreover, many of her papers were published in the best journals (Benbow, 1990, p. 214).

It is also worth noting that Hollingworth taught the first course on the psychology of giftedness at Teachers College, Columbia University, in 1922–1923, and wrote the first comprehensive textbook: *Gifted children: Their nature and nurture* (1926). Julian Stanley (1990) credits her with having inspired the international

talent searches, as she conceived of the notion of “above-level” testing.

From her research, Hollingworth (1940a, 1942) concluded that children in the 130–150 range have an “optimal” level of ability that permits adjustment to school and society. Beyond this range mutual rejection tends to occur, which can lead to psychological isolation of highly gifted children. She observed that the majority of children above 160 IQ play little with other children “because the difficulties of social contact are almost insurmountable” (Hollingworth, 1939, p. 588). They much prefer “to play with others of *like mental age*” (Hollingworth, 1926, p. 136).

Early interest in origins and destinies, Hollingworth (1931) noted, is one of the conspicuous symptoms of intellectual acumen. “Who made the world?” “Where did I come from?” “What will become of me when I die?” “Why did I come into the world?” (p. 11). She discovered that children do not begin to require logically coherent answers to these questions until they reach the mental age of 12 or 13. Religious ideas and needs also originate whenever these children develop to a mental level of 12 years. The higher the IQ, the earlier the child develops a pressing need for an explanation of the universe. Children she tested who scored above 180 IQ desired a systematic philosophy of life and death at the age of 6 or 7.

Hollingworth developed the first comprehensive program to serve the emotional needs of the gifted; it is the only one which has been studied for its long-range impact on the students involved. Her program of “emotional education” (Hollingworth, 1939, p. 585) was designed to assist the children in dealing with a specific set of issues she had gleaned from her research. These “special perplexities in the life of a gifted child” (Hollingworth, 1942, p. 255) are the direct result of their deviation from the norm. Although Hollingworth only listed five or six of these issues in any one article, collectively she addressed 11 specific concerns:

- finding enough hard and interesting work at school
- adjusting to classmates
- being able to play with other children
- not becoming hermits
- developing leadership abilities
- not becoming negativistic toward authority
- learning to “suffer fools gladly”
- avoiding the formation of habits of extreme chicanery
 - conforming to rules and expectations
 - understanding their origin and destiny from an early age
 - dealing with the special problems of being a gifted girl

(Hollingworth, 1926, 1930, 1931, 1939, 1940a, 1942).

A detailed description of how Hollingworth dealt with each of these issues is presented elsewhere (Silverman, 1990b). Space permits only a brief summary here of her major findings.

Solutions to the social and emotional problems that beset the gifted, Hollingworth (1930, 1940b) observed, could be effected most readily when they were placed in full-day programs with children of similar abilities. The design of her programs included fast paced instruction; teaching basic skills in half a day (now known as “telescoping” or “compacting”); a challenging academic curriculum which motivated the students to work hard; study of the history and evolution of civilization; biographical study (bibliotherapy) to expose the children to gifted individuals who had sustained effort against odds and contributed to society; introduction to modern languages and literature; independent study and small group projects; extensive classroom discussion; student-designed curriculum around broad themes of knowledge; interdisciplinary studies to allow students to experience the interconnectedness of the world; teaching the children how to handle the apparent foolishness of others with patience and love; helping them learn to balance candor with tact; and training in the fine art of argumentation, including “argument with oneself,” the art and etiquette of polite disagreement with others, and public debate (Hollingworth, 1939, p. 585). Infused throughout this program was a beautiful set of human values: basic respect for humanity, awareness of our global interdependence, and commitment to service.

Studies completed after students were enrolled in this type of program for a period of three years revealed that the students did just as well in their academic subjects as those who had studied nothing but academics, but in addition they developed a love of learning through their self-directed learning experiences, and they were *happier*, having found friends and true peers—some of them for the first time in their lives (Hollingworth, 1930, 1940b). Follow-up studies indicate that Hollingworth’s program had a profound, lifelong impact on the students’ achievement, friendships and values (Harris, 1992; White 1990). Harris (1992) asked some of these individuals, almost 70 years later, “From your point of view, what constitutes success in life?” “The replies . . . quite evidently mirrored the curriculum. Their answers were strongly focused on societal connection, awareness and sensitivity to others as elements inseparable from self-actualization, and definitions of success” (p. 102).

No discussion of Hollingworth’s contributions would be complete without mention of her lifelong crusade against the entrenched belief in the innate intellectual inferiority of women. Galton (1869) had established *eminence* as quintessential evidence of giftedness, and the fact that there were so few eminent women constituted “proof” in educated circles of women’s inferior intelligence. Hollingworth argued that the paltry number of eminent women was due to sociological rather than biological limitations of women, and that these factors also affected the achievements of other less advantaged groups in society.

Those who investigate eminence agree . . . upon the following facts. An overwhelming majority of illustrious persons have had fathers who were far above the average in social-economic conditions. . .

. . . One possible interpretation is that education and opportunity are the prime determinants of achievement, since nearly all the great men have been born in comfortable homes, of parents in superior circumstances. If opportunity were indeed the prime determinant of eminence, then we should expect those who belong to socially inferior categories to be virtually excluded from it. This is just what we do find, since the uncultured, the poor servants, and women are very seldom found to have achieved eminence (Hollingworth, 1926, p. 11).

In contrast to the strong hereditarian positions of Galton and Terman, Hollingworth staunchly supported the role of opportunity in society. She distinguished between ability and achievement. What a person *can do* may depend on congenital equipment, but what he or she actually *does do* probably depends on the environment (Hollingworth, 1926, p. 14). Thus, Hollingworth provided a philosophical foundation for contemporary views of the importance of nurturing giftedness.

Early Research and Programs in the United States

During the last decade of Hollingworth's career, the concepts she had sown began to blossom. Paul Witty (1930), who "was actuated to study gifted children by the work of Leta S. Hollingworth" (p. 38), published a study of one hundred gifted children with IQs ranging from 140 to 183. Like Terman and Hollingworth, Witty found his subjects primarily well-adjusted, free from nervous disorders, and exceptionally honest as compared to a control group. The children in his sample were somewhat more solitary and sedentary in their play than average children. He concluded that special class placement was necessary for optimal development of the students. This was echoed by Merle Sumption (1941) in her follow-up study of 328 gifted children who had been placed in the Cleveland Major Work classes. Her study revealed "significant differences in attitudes, behavior and ideals" (p. 163) that were direct outcomes of placement in the Major Work program. The major benefit attributed to the classes by Sumption's subjects was the opportunity for social relationships, which was the first stated goal of the program. Sumption's study also established the need for vocational guidance of gifted students.

In the early 1930s, John Gowan and John Rothney developed the concept of "differentiated guidance for the gifted" while studying together under the direction of John Brewer and Truman Kelley at Harvard University Graduate School of Education (Gowan, 1982). The idea still was considered radical in the 1960s (Gowan, 1979).

Rothney went on to found the Guidance Laboratory for Superior Students at the University of Wisconsin-Madison in 1958. The Guidance Lab served as a model of direct service to gifted youths and their families, a training facility for counselors, and a laboratory for research of this population until 1985. Its major focus was high school students. Gowan developed an intensive summer demonstration and training program for teachers and counselors at San Fernando Valley State College in Northridge, California, from 1961 until 1972. Groups of elementary-aged gifted students received creative instruction in the basic subject areas from master teachers while being observed by classroom teachers pursuing advanced coursework in education of the gifted. A counselor receiving advanced training in counseling the gifted was assigned to each class.

Another individual who contributed specific counseling strategies was Ruth Strang (1945, 1951). Strang recommended that in large schools a group of professionals should be trained as teacher-counselors in order to provide individual guidance to a greater number of students. These teacher-counselors would work under the direction of specially prepared full-time guidance counselors. She emphasized the importance of gifted students developing a sense of social responsibility and recommended that they explore the meaning of their lives. Strang recognized the importance of parent involvement in the educational and counseling processes.

Although the pioneers and their successors were prolific in contributing their insights to the field, serious attention was not given to the counseling needs of the gifted in the United States until the 1980s (Colangelo, 1991). Colangelo (1991) now predicts that in the years ahead "counseling and psychological issues will become one of the distinguishing features of the growing movement in gifted education" (p. 274).

A New Perspective of Giftedness

Traditional definitions of giftedness, linked to achievement or the potential for achievement, provide little insight into the phenomenological realities of the gifted, nor do they inform counselors. A new definition has been proposed which focuses on the emotional development of gifted individuals and emphasizes the important role of the counselor. This perspective builds upon the insights of Kazimierz Dabrowski (1964, 1972) and Jean-Charles Terrassier (1985).

Giftedness is *asynchronous development* in which advanced cognitive abilities and heightened intensity combine to create inner experiences and awareness that are qualitatively different from the norm. This asynchrony increases with higher intellectual capacity. The uniqueness of the gifted renders them particularly vulnerable and requires modifications in parenting, teaching and counseling in order for them to develop optimally (Columbus Group, 1991).

Although there are some distinct differences between *asynchrony* and Terrassier's *dyssynchrony*, Terrassier's conceptions help set the stage for this new way of looking at giftedness.

Dyssynchrony

Terrassier (1985) coined the term "dyssynchrony" to refer to the psychological and social ramifications of the uneven development of gifted children.

Gifted children often suffer from a lack of synchronicity in the rates of development of their intellectual, affective and motor progress, which has its effect in a number of aspects of their lives, and its results in turn produce further psychological problems. (p. 265)

Dyssynchrony has two aspects: internal and social. Internal dyssynchrony refers to disparate rates of intellectual, psychomotor, language and affective development. One of the most frequent imbalances occurs in the rates at which gifted children master writing as opposed to reading. Many gifted children read before school age; however, Terrassier contends that "the concomitant problem with children who read so easily is their exceptional difficulty in learning to write" (p. 267). The problem appears more often among boys than girls. Terrassier also finds reasoning ability "always in advance of a gifted child's language ability" (p. 267). Nonverbal tests, such as the Performance section of the Wechsler Intelligence Scale for Children (WISC) or the Raven's Progressive Matrices, apparently yield much higher scores for French children than verbal assessments (160–170 vs 130–140).

Terrassier suggests that there is often a large gap between intelligence and emotional maturity. Anxieties and fears may overwhelm the child when "his sharp intelligence provides him with anxiety-provoking information, which he is unable to process appropriately" (p. 268). Several types of defenses may come into play at this time, such as intellectualization. Children who intellectualize their feelings are at risk of becoming neurotic; some expressions of boredom may actually be a form of depression.

Social dyssynchrony is more obvious than internal dyssynchrony. It can be defined as the discrepancy between the speed of the mental development of the gifted child and that of his or her classmates. Terrassier suggests that understimulated gifted children may be working three to five years below their potential. To emphasize this point, he has devised a "school quotient" composed of the student's "school age" (determined by grade placement) divided by his or her mental age, which graphically depicts the extent to which these children are "retarded" in their academic development (p. 270). The situation is exacerbated by what Terrassier calls a "Negative Pygmalion Effect" (p. 273), in which a teacher who is ignorant of a student's real potential sets

age-appropriate expectations for him or her and then the student accommodates to those expectations—never revealing greater capacity. Then, of course, the teacher assumes the child is not advanced. Terrassier suggests that the Negative Pygmalion Effect applies to about two-thirds of gifted children in French public education.

Social dyssynchrony is also evident in the expectations imposed upon the child by parents and other children, who "often expect the gifted child to behave according to his age" (p. 271). Under-expectations from parents and other children creates "social pressure for the gifted child to conform" and can "make it difficult for him to discover and accept his precocity" (p. 273). Underachievement frequently results. In addition, the child's intelligence may become a source of socially induced guilt as he or she attempts to accommodate to the social norm. Dyssynchrony is evident in gifted children's choice of older friends for indoor games and conversation, and children their own age and size for outdoor games.

Terrassier stresses that dyssynchrony is not a pathological condition, but "a description of the actual conditions in which many gifted children develop; in most cases, their problems are the result of maladaptation between society and education" (p. 272). The concept of *asynchrony*, which has much in common with its precursor, actually developed independently of Terrassier's work and the similarities were only noted later.

Asynchrony

The Columbus Group definition (1991) emerged in reaction to the increasing emphasis on products, performance and achievement in American thinking about giftedness. In the United States, it had gradually become politically incorrect to think of giftedness as inherent within the child and safer to talk about its external manifestations. Experts were recommending that "gifted children" be replaced with "gifted behaviors," "talents in different domains" and "gifted program children." Something vital was being missed in these popular formulations: the child.

JENNIE

One particular child recently had come to the attention of several clinicians and practitioners. "Jennie" had gone through what appeared to be a "positive disintegration" in Dabrowskian terms (Dabrowski, 1964) at the tender age of 4½. Jennie's ordeal was a direct result of her giftedness; yet, none of the contemporary American conceptions were beneficial in understanding her or helping her and her family. Martha Morelock (in press) has captured Jennie's experience in an extensive case study; excerpts of this study are presented below as they illustrate the basic concepts of this new perspective of giftedness.

Jennie had been complaining that there was nothing for her to do at her Montessori School. One day she was uncharacteristically quiet all the way home from school, and then announced she wasn't going back. She went upstairs, put on the television and record player, took out a third grade math book and proceeded to do the problems, and initiated a conversation with her mother—all at once. It seemed as though she were trying to make up for not getting enough stimulation at school. That night Jennie had her very first tantrum, crying uncontrollably and hitting her mother until she wore herself out. Her mother felt Jennie was reacting out of frustration to schoolwork that wasn't complex enough for her. This episode "marked a major turning point in the qualitative tone of Jennie's cognition. . . ." (Morelock, in press, p. 24). Jennie's mother reports:

When she awakened the morning after the tantrum, it was almost as if everything took on a new and different meaning. . . . She went through a period of about three weeks where she was looking at everything and saying, "Well, where did we get that from? . . . And where did *this* come from?" (p. 25).

Jennie appeared confused. She kept asking where things like the computer and the refrigerator had come from and how long they had had these things. Then she began asking about the universe and how life began. She seemed to be "going back to the very beginnings. And with the ocean, it wasn't like she wanted to know about the ocean, it was *how the ocean was created*" (p. 25). One night while bathing Jennie, her mother realized what Jennie was really trying to find out.

I said, "Gee, Jennie, when you were asking about the computer and how long we've had this and how long we've had that, you meant how long have they been here *on earth*." And she turned away from me and her voice started getting really choked and her eyes teared up and she took about a minute and all of a sudden, she went, "Yes, Mommy," and her voice shook and she started to cry. She was so frustrated (pp. 25–26).

Jennie had difficulty getting to sleep at night throughout this phase. One question led to another endlessly. She seemed to be trying to trace back from generation to generation how knowledge is passed on. For several nights in a row she began to ask about God and death.

She was very upset because she *wanted* to believe in God and that everybody goes to Heaven, but in her mind, it wasn't rational enough for her. She'd say, "Well, does God love everybody?" And it'd be "Of course, Jennie. He loves everybody." "Well, where do the *bad* people go? Don't *they* go to Heaven? If God *loves* everybody, then *all* people would go to Heaven. . . ." (p. 26).

And she'd lay at night with tears in her eyes and not wanting to cry, cause she was so self-controlled, knowing that *she* could die at any time. Cause she knew her own mortality. . . . You'd say to her "Oh you're gonna be fine, of course." "You're gonna live and I'm gonna be a Nana and . . ." And she'd say, "Well, nobody knows for sure what's gonna happen, Mom. Nobody knows for sure. You can get in an accident and nobody knows really when they're gonna die. It's nice if everybody lives to be old, but that's not always what happens, cause children die sometimes" (pp. 26–27).

After this three-week period of questioning, Jennie became very quiet and immersed herself in fantasy play. During this time there was an incredible leap in her reading ability. She went from second grade readers to *Mathilda*, *Charlotte's Web* and *Little House on the Prairie*. Sometimes she would read two books in a day. Her thought processes mirrored her reading ability: she had shifted to a new level of thought. Jennie had been tested on the Stanford–Binet Intelligence Scale (Form L-M) almost a year earlier and had scored in the high 140s. After this period of inner turmoil, she was tested again and achieved a score of 176. The psychologist described Jennie's dramatic increase as a "cognitive leap" (p. 17) and attributed her emotional turmoil in part to the speed with which this cognitive leap had taken place. Jennie's experience underscores the need for an internal view of giftedness.

As Jennie grappled with the sudden onslaught of increased abstract capacity, she was forced to deal with the emotional repercussions of her own thought. Thus, in Jennie's mind at the age of 4, God could not possibly be a loving God if he would refuse Heaven to anyone. And the terrible realization of her own mortality could not be softened by her mother's reassurances because "Nobody knows for sure; *children* die sometimes." In spite of her impressive capacity for abstract thought, Jennie was only 4. Her emotional needs, like those of other 4-year-olds, included a trust in the strength and reliability of her parents and in the predictability of a secure world. However, her advanced cognitive capacities . . . left her emotionally defenseless in the face of her own reason (pp. 37–38).

Regardless of Jennie's potential for recognized achievement in the world, she obviously has needs in childhood directly related to her giftedness that must be addressed. Her powerful cognitive/emotional life could easily be misunderstood by counselors with no training in the unique developmental issues of the gifted.

THE MANY GUISES OF EMOTION

Jennie's experience is dramatic, but apparently not that rare or exceptional in highly gifted children. Hollingworth (1931) had noted the early concern with

"origins and destinies" (p. 11) of this population, and Terrassier (1985) as well:

In my experience, gifted children are concerned at a very early age about what can be called "the problem of limits"—limits of life such as birth, death, God, and the universe. When expressed as early as 3 or 4 years-old these concerns only contribute to the parents' perplexity (p. 271).

However, Terrassier perceived the anxieties wrought by such questions as indicative of the "emotional immaturity" of the child (p. 268). The problem lies in the imprecise terms available to us to describe the emotional realm.

To understand Jennie and other highly gifted children it is necessary to differentiate between *emotional needs*, *emotional development* and *emotional immaturity*. Jennie had the emotional needs of a 4-year-old. She had some age-appropriate rather than "immature" emotional reactions. But her emotional development was *qualitatively different* from other 4-year-olds due to the impact of her greater cognitive awareness. Individuals who are highly emotional are often considered "immature" in societies in which emotion is typically repressed. Sensitive gifted boys, for example, cry easily; in the United States this is often seen as a sign of "emotional immaturity" and used as a reason to hold them back in school.

Sommers (1981) introduced the term *emotional range* (p. 555), which may help to clarify these distinctions. In her study of cognitively advanced college students, Sommers found a high level of "emotional responsiveness" (p. 560). She attributed this responsiveness to "advanced cognitive organization" (p. 560).

All of the cognitive skills that were found to be related to the ability to respond with more emotions are marks of a highly organized awareness—an awareness that might be governed by a well-structured system of values, oughts, and beliefs, but not by momentary excitements (Sommers, 1981, p. 560).

Therefore, the heightened emotional sensitivity and responsiveness often documented in the gifted (Clark, 1992; Gershaft & Broyles, 1991; Roedell, 1984; Whitmore, 1980) is directly related to their advanced cognitive development. Jennie demonstrates emotional intensity rather than emotional immaturity, which is a positive sign of potential for advanced emotional development, according to Dabrowski's Theory (Dabrowski, 1972). Other researchers have also found gifted children to be emotionally advanced on a variety of measures (Robinson & Noble, 1991). It is in this linkage of cognition with emotion that the concept of *asynchrony* diverges most from Terrassier's "dyssynchrony." Asynchronous development results in unusual "awareness, perceptions, emotional responses and life experiences" throughout the lifespan (Morelock, 1992, p. 14).

Comments on Dyssynchrony

Webster's (1979) dictionary defines "asynchronous" as "without coincidence in time; not synchronous" (p. 117). While there is no definition provided for "dyssynchronous," the prefix "dys" is defined as "hard, ill, bad, difficult" (p. 568). Asynchrony has less value judgment attached: it simply means "out of sync." And gifted children are, indeed, out of sync—internally and externally, as Terrassier has aptly described. Their hands and feet often cannot keep the promises their minds make. The unevenness of gifted children's development, especially that of the highly gifted, has been well substantiated (Altman, 1983; Delisle, 1990; Hollingworth, 1942; Gowan, 1974; Kerr, 1991; Kline & Meckstroth, 1985; Manaster & Powell, 1983; Munger, 1990; Roedell, 1989; Schetky, 1981; Sebring, 1983; Webb, Meckstroth, & Tolan, 1982). Hollingworth pointed out over 60 years ago:

To have the intelligence of an adult and the emotions of a child combined in a childish body is to encounter certain difficulties. It follows that (after babyhood) the younger the child, the greater the difficulties, and the adjustment becomes easier with every additional year of age. The years between 4 and 9 are probably the most likely to be beset with the problems mentioned (Hollingworth, 1931, p. 13).

She recognized that problems of right and wrong, and evil in the abstract, become troublesome for very highly gifted children because their awareness is so far advanced of their emotional control and physical powers.

Although Terrassier's (1985) main thesis is clearly supported, certain minor points in his description permit some different interpretations. Early readers do not always have difficulty with writing. Most gifted children have age-appropriate motor skills (Tannenbaum, 1992; Wright, 1990). It is possible that children with normal motor development will experience some frustration with the writing process, since their minds go so much faster than their hands. However, the writing difficulties described by Terrassier may actually be the result of motoric disabilities—particularly since he found this more often in boys than in girls. Significantly more boys than girls have been found who are both gifted and learning disabled (Schiff, Kaufman & Kaufman, 1981; Silverman, 1989). In the United States, primary grade gifted boys whose fine motor skills are weak are in danger of being held back in school. Gross motor difficulties cause problems socially for gifted boys, and these problems increase with age. The non-athletic, gifted youth is often among the least popular students in high school (Tannenbaum, 1983). This type of asynchronous development can have severe social consequences for males.

The pronounced discrepancy Terrassier encountered between language and reasoning abilities may be related to the fact that American tests were used (even if

translated into French). A French vocabulary test on French students (e.g., Binet's original test) probably would not produce such marked variation. A high correlation is found between language development and reasoning ability in American children, and highly gifted children do consistently better on verbal tests such as the Stanford-Binet Intelligence Scale (Form L-M) than on nonverbal assessments (Silverman & Kearney, 1992).

In a recent study of 20 highly gifted children with Stanford-Binet IQ scores ranging from 151 to 191, with a mean of 173, the Performance IQ scores derived from the WISC-III ranged from 99 to 144, with a mean of 120 (Silverman, Atkinson, & Camden, in preparation). The nonverbal IQ score dramatically underestimated the abilities of these children. Whether the nonverbal scores are significantly higher than the verbal scores, as in Terrassier's data, or significantly lower, this type of pronounced asynchronous development can prevent a gifted child from being recognized or served. Unfortunately, subtest scores tend to be averaged and placement decisions made on the basis of Full Scale scores rather than strengths in abstract reasoning abilities. Only 3 of the 20 highly gifted children in the WISC-III vs Stanford-Binet L-M study achieved Full Scale WISC-III scores in the highly gifted range (146, 148 and 150) and all three were below the lowest score on the Binet L-M (Silverman, Atkinson, & Camden, in preparation).

Terrassier indicated that dyssynchrony affects "many" gifted children (p. 272). It could be argued that the concept applies to *all* gifted children. From the time Binet and Simon (1908) invented the mental age, gifted children have been defined as those who reason more like older children than like their agemates. It would follow that uneven development is basic to the understanding of gifted children—a more universal principle than achievement. Although intelligence tests have been under serious attack in recent years, they do provide valuable information about the rate at which cognitive development (mental age) outstrips physical development (chronological age). The intelligence quotient can be thought of as an *index of asynchrony*, yielding at least a *minimal* estimate of the discrepancy between cognitive and physical development. The higher the child's IQ, the greater the asynchrony. Another type of asynchrony can be found in the discrepancy between the child's strengths and weaknesses. The greater the asynchrony, the greater the vulnerability of the child.

Vulnerability

Dyssynchrony implies vulnerability; asynchrony—the combination of cognitive complexity and emotional intensity—makes that vulnerability explicit. Vulnerability requires appropriate responses from parents, teachers and counselors. The Columbus Group definition is the first to acknowledge the emotional fragility of

the child and the important role that counselors play in fostering emotional development. With increased intellectual advancement comes increased vulnerability (Roedell, 1984).

... there is general agreement that highly gifted children are more susceptible to some types of developmental difficulties than are moderately gifted or average children. Areas of vulnerability include uneven development, perfectionism, adult expectations, intense sensitivity, self-definition, alienation, inappropriate environments, and role conflicts (Roedell, 1984, p. 127).

Certainly a child who is very dissimilar from agemates would be vulnerable in the social arena. And school systems are not set up to deal with children who are out of sync with grade level norms.

Kate, like every highly gifted child, is an amalgam of many developmental ages. She may be 6 while riding a bike, 13 while playing the piano or chess, 9 while debating rules, 8 while choosing hobbies and books, 5 (or 3) when asked to sit still. How can such a child be expected to fit into a classroom designed around norms for 6 year olds? (Tolan, 1989, p. 7).

But the most profound source of the child's vulnerability is internal asynchrony, as demonstrated in Jennie's case. The child may not have sufficient emotional resources to deal with the information brought into awareness by his or her advanced cognition. Gowan (1974) likened precocious cognitive awareness to premature rupturing of the protective placental shell during the prenatal period. Too early exposure to environmental realities can be as precarious in post-uterine as in prenatal development.

The impact of asynchrony is magnified by the intensity which is characteristic of the gifted. To understand this heightened intensity, we turn to Dabrowski's Theory, originally called "The Theory of Positive Disintegration" (Dabrowski, 1964, 1972).

Dabrowski's Theory of Emotional Development

Kazimierz Dabrowski (1902–1980) was a Polish psychologist, psychiatrist, philosopher, as well as an accomplished poet, musician, composer and playwright. His theory grew out of witnessing the best and worst of human nature in two world wars. He concluded that individuals who gave up their lives to save or comfort strangers had to be cut out of different cloth from those who were capable of extreme brutality. He differentiated five levels of development, ranging from pathological egocentrism to extraordinary altruism.

Dabrowski's theory shares many but not all of the suppositions of stage theories as outlined by Piaget (1960): (1) development consists of a series of structural

transformations; (2) each level represents a qualitatively different mode of relating to experience; (3) there is an invariant order to the levels; and (4) each level is a structural whole with a unique underlying organization. However, there are three departures: (1) progression from lower to higher levels is the exception, instead of the rule; (2) the levels are non-ontogenetic (not related to age); and (3) higher levels do not incorporate less evolved structures. Instead, a kind of inner dialectic is set up between the vestiges of a lower level and the emergent higher level, and the more integrated structure gains strength in the personality only as the less integrated structure dissolves.

According to Dabrowski (1972), development is influenced by three factors: heredity, environment, and the "third factor"—a sense of inner-directedness. "The third factor is the dynamism of conscious choice (valuation) by which one affirms or rejects certain qualities in oneself and in one's environment" (pp. 305-306). Heredity determines developmental potential. Environment acts either as an enabler or an inhibitor of the individual's attainment of that potential. The third or autonomous factor is an inner drive to make conscious choices in accordance with those principles highest in oneself. It appears at higher levels of development as a powerful internal force furthering development.

Since Dabrowski's death in 1980, his "Theory of Positive Disintegration" often has been referred to as "Dabrowski's Theory of Emotional Development," as he placed greater emphasis on the role of emotions than most other theorists. Advanced emotional development is the commitment to live one's life in accordance with higher order values. Potential for that development is largely determined by the strength of the individual's "overexcitabilities"—innate capacities to respond in a heightened manner to various stimuli. Jennie demonstrates potential for advanced emotional development by the depth of her emotional sensitivity, moral concern and cognitive awareness. The relationship of Dabrowski's theory to giftedness will be made clearer in the discussion of overexcitabilities. The levels are addressed first as they give meaning to the overexcitabilities.

Dabrowski's Five Levels of Development

Dabrowski (1964, 1970) proposed five levels of development: an integrated primary level of existence in which the individual is at the mercy of unconscious impulses, an integrated secondary level in which the personality ideal is attained, and three transitional states which represent phases of disintegration. Disintegration is the process by which instinctive modes of functioning deteriorate to enable higher order value systems to develop. As the evolution of the personality cannot take place without the dissolution of less evolved psychological structures, pain is attendant to psychological growth and maturity.

Disintegration occurs most frequently during puberty and when the individual faces crises.

LEVEL I

At Level I, individuals "are unaware of any qualities of life beyond those necessary for immediate gratification of their primitive impulses, and they act solely on behalf of their impulses" (Dabrowski, 1964, p. 4). They experience no guilt, shame or inner conflict, and there is little empathy for others. Egocentric motives—such as the drive for power, status, wealth—are unfettered by concern for other people; therefore, these individuals often achieve what they want in the world at the expense of others. In order for moral, social, intellectual and esthetic values to emerge, it is necessary for this primitive level of functioning to disintegrate. Unfortunately, there are many for whom that disintegration does not occur: they remain at this automatic level of functioning throughout their lives.

Example of Level I:

I rarely think of inner conflict in relation to myself. I presume such conflict means in the area of morals, etc. . . . I consider success in mainly a mundane way. That is, I consider success to be the accomplishment of certain goals in life, one of which is material possessions, i.e., car, house, clothes (Dabrowski & Piechowski, 1977b, p. 54).

LEVEL II

At Level II, the rigidity of the primitive structure begins to loosen, leaving the individual confused and uncertain. Internal conflicts shake the foundation of the psyche, laying the groundwork for the "birth and development of a higher psychic structure" (Dabrowski, 1964, pp. 5-6). Level II is marked by ambivalences (contradictory thoughts) and ambitemencies (changeable and conflicting courses of action). Because of their bewilderment, individuals at this level of development are easily led by those who seem more certain, but are usually less evolved than themselves (Dabrowski, in Piechowski, 1975). At Level II, values and attitudes tend to be stereotypical—introjected from the environment, rather than self-determined. Individuals are pushed and pulled in many different directions; their values are ingested whole and may contradict other beliefs. There is no inner hierarchy of values against which to evaluate conflicting beliefs. Therefore, many paths appear equally compelling.

Example of Level II:

I idealize women, my girl friends, mostly. I have feelings of exclusiveness and fidelity toward them, but at other times I feel dominated by primitive impulses.

I hate being directed by others, but often I feel no force within me capable of directing my actions (Dabrowski, 1964, pp. 7–8).

LEVEL III

Dabrowski's greatest contribution was in the delineation of "multilevel" development which constitutes the highest three levels of human experience (Dabrowski, 1964, p. 8). At Level III, vertical conflicts occur between higher and lower motives and the personality gains depth. Discontent, shame, and guilt are aroused as the individual begins to evaluate his or her behavior against an inner ideal. Tension is experienced between "what is" and "what ought to be" (Dabrowski & Piechowski, 1977a, p. 42). At the same time that inner conflict intensifies, empathy deepens and creativity emerges as a manifestation of personal growth, expressing the heroic struggle of human existence. A critical feature of Level III is "positive maladjustment: protest against . . . standards and attitudes of one's social environment which are incompatible with one's growing awareness of higher values" (Dabrowski & Piechowski, 1977a, p. 46). Intelligence becomes "a major force helping the individual to seize life deeply, wholly, and objectively" (Dabrowski, 1964, p. 13).

Example of Level III:

Along similar lines, it bothers me greatly when I notice myself passing up an opportunity to do good. . .

I feel a tremendous obligation to do all that I can for people (not an encumbering or begrudging obligation, but a moral, and therefore absolute, obligation which brings me joy. . .). However, I chastise myself for not seeking out people to help (as opposed to helping those with whom I am naturally in contact) nearly enough. . .

I feel anger towards myself when I catch myself feeling anger towards others. I despise the thought of doing wrong, acting in a cruel manner, or becoming angry towards anyone/anything besides myself. . . (Unpublished data).

LEVEL IV

At Level IV, the process of synthesis begins to occur and inner conflicts abate. Those conflicts that remain are "existential, philosophical and transcendental" (Dabrowski & Piechowski, 1977a, p. 53). There is congruence between an individual's ideals and capabilities, and an intensification of the inner hierarchy of values. The personality becomes organized under the unifying power of the personality ideal. The individual develops the capacity to observe the self and others objectively. Dabrowski called this "subject-object in oneself" (Dabrowski & Piechowski, 1977a, p. 49). This is a very high level of functioning in which the individual takes conscious control of his or her development.

Example of Level IV:

I think the quality of compassion is best for an ideal life. The ability to suffer with another, to understand their perspective, while honestly naming my own seems essential to building a good life. I see this attribute only being born of listening, love, a gentle yet firm discipline, an ability to wait, a curbing of untamed reactions yet requiring that one feel strongly with others. Such compassion remembers joy and sadness in a way that helps a person connect with others rather than standing in isolation from them. At the same time such compassion can only be born out of quiet reflection and a willingness to undergo disorientation from my way of seeing things and doing things. (Miller & Silverman, 1987, p. 224).

LEVEL V

At Level V, transformation is complete: the individual has attained the personality ideal. Secondary integration is marked by harmony, service, altruism, universal values, lack of inner conflict. There is profound empathy for others and a constant willingness to help. Obviously, very few attain this highest level in Dabrowski's hierarchy, and Dabrowski (1964) seemed to refer to it as a process of becoming rather than as a completely attainable reality. "Partial secondary integrations occur throughout life as the result of positive resolutions of minor conflicts. . . As secondary integration increases, internal psychic tension decreases" (pp. 20–21). Fortunately, some moral exemplars have described this highest level of existence. Peace Pilgrim illuminates our understanding of Dabrowski's Level V.

Peace Pilgrim (1982) gave up all her possessions except what she could carry in her blue tunic and walked more than 25,000 miles across America for nearly three decades teaching peace among nations, peace between people and how to attain inner peace. She had no religious affiliation and no organizational backing. Her message was simple: "This is the way of peace—overcome evil with good and falsehood with truth and hatred with love" (Peace Pilgrim, 1982, p. 26).

Example of Level V:

I became increasingly uncomfortable about having so much while my brothers and sisters were starving. Finally I had to find another way. The turning point came when, in desperation and out of a very deep seeking for a meaningful way of life, I walked all one night through the woods. I came to a moonlit glade and prayed. I felt a complete willingness, without any reservations, to give my life—to dedicate my life—to service. "Please use me!" I prayed to God. And a great peace came over me (Peace Pilgrim, 1982, p. 7).

After this realization, it took Peace Pilgrim 15 years of intensive preparation and inner seeking to transform her

willingness into action. Her description of the conflict between the "lower self" and the "higher self" (p. 8) is remarkably similarly to Dabrowski's conceptions:

Your lower self sees things from the viewpoint of your physical well-being only—your higher self considers your psychological or spiritual well-being. Your lower self sees you as the center of the universe—your higher self sees you as a cell in the body of humanity. When you are governed by your lower self you are selfish and materialistic, but insofar as you follow the promptings of your higher self you will see things realistically and find harmony within yourself and others (Peace Pilgrim, 1982, p. 8).

Other individuals who have been considered exemplars of Level V are Dag Hammarskjöld and Mother Teresa of Calcutta (Dabrowski & Piechowski, 1977a). Although the full attainment of secondary integration occurs only rarely, it is significant that Dabrowski's theory includes it as a developmental possibility. The theory gives psychological credibility to the highest of human experience. The acknowledgment of an ideal is the first step in its actualization.

Psychobiographical case studies of individuals who have attained higher level development (as analyzed by either Dabrowski's or Maslow's theory) reveal that all were gifted individuals (Brennan, 1987; Brennan & Piechowski, 1991; Grant, 1990; Piechowski, 1978, 1990a,b, 1992). However, intelligence is insufficient as a predictor of advanced development; there must be built into the personality an extraordinary capacity to respond emotionally and creatively. Dabrowski describes these capacities as "overexcitabilities."

Overexcitabilities

Developmental potential is determined by the person's original endowment of overexcitabilities, special talents and abilities (Piechowski, 1979). The term "overexcitability" (OE) has been translated from the Polish *nadpobudliwość* which means to be superstimulated (Falk & Piechowski, 1992, p. 1). The five overexcitabilities can be thought of as excess energy derived from physical, sensual, imaginal, intellectual and emotional sources. Only when these capacities for responsiveness are higher than average do they contribute significantly to developmental potential.

One who manifests a given form of overexcitability and especially one who manifests several forms of overexcitability sees reality in a different, stronger and more multisided manner. Reality for such an individual ceases to be indifferent but affects him deeply and leaves long lasting impressions. Enhanced excitability is thus a means for more frequent interactions and wider range of experiencing (Dabrowski, 1972, p. 7).

Psychomotor OE refers to excess physical energy,

workaholism, nervous habits (such as tics and nailbiting), rapid speech, love of movement, impulsivity and pressure for action. Sensual OE includes responsiveness of the senses, esthetic appreciation, sensualism, and enjoyment at being the center of attention. Imaginational OE is the capacity to visualize events very well, inventiveness, creativity, fantasy, and poetic, dramatic or artistic abilities. Intellectual OE includes probing questions, analytical thinking, reflectiveness, problem solving, interest in abstraction and theory. Emotional OE involves intense connectedness with others, the ability to experience things deeply, fears of death, embarrassment and guilt, and emotional responsiveness. The overexcitabilities are described in more detail elsewhere (Piechowski, 1979; Silverman, 1993b).

A considerable amount of research has been conducted on the overexcitabilities in gifted populations. The earliest study reported in the literature was executed by Dabrowski (1972) in Warsaw in 1962. He reported that all of the gifted children and youth studied showed strong manifestations of the overexcitabilities. High energy levels in the gifted have been noted by several researchers and clinicians (Schetky, 1981; Whitmore, 1980). However, in published research to date, Psychomotor OE has not been shown to differentiate gifted from average development in children, adolescent or adult populations (Gallagher, 1985; Miller, Silverman, & Falk, in press; Piechowski & Colangelo, 1984; Schiever, 1985). It must be integrated with other overexcitabilities before it becomes developmentally significant (Manzanero, 1985; Piechowski & Cunningham, 1985).

In the realm of Sensual OE, clinical data indicate that gifted individuals tend to have heightened sensual responses. Meckstroth (1991) suggests that gifted infants tend to react intensely to noise or wet diapers. Young gifted children often are fussy about sock seams and clothing of certain textures and require labels to be cut out of their clothes. Freed (1990) reports:

I have noted that children with IQs above 140 seem to have heightened sensory awareness. They taste more acutely, smell everything, observe more in their environment. They get so much information that they have trouble filtering it out. They are constantly bombarded by stimuli (p. 11).

However, here again the research has not yielded statistically significant differences in the Sensual domain between gifted children or adolescents and control groups (Gallagher, 1985; Rogers, 1986; Schiever, 1985). But a significant difference was reported in a study of gifted and unselected adults (Silverman & Ellsworth, 1980), in favor of the gifted sample.

In the areas of Imaginational, Intellectual and Emotional OEs, empirical studies support clinical observations. Gifted adolescents have been found to be consistently higher than their average peers in Imaginational OE (Gallagher, 1985; Piechowski & Colangelo, 1984; Schiever, 1985). Artists surpassed the

intellectually gifted in this domain and equalled them in Intellectual OE (Piechowski, Silverman, & Falk, 1985). It is not surprising that all gifted samples studied scored high in Intellectual OE. One of the earliest signs of Intellectual OE is intellectual curiosity:

Almost all of the gifted children were perceived by their parents as asking “probing” rather than simple questions. At the age of 18 months, one child wondered, “What is air? How high does it go? Why doesn’t it all float away?” A 3-year-old boy wanted to know how airplanes work and how people breathe. Another 3-year-old asked, “Will I still be me when I grow up?” Global and abstract issues occupied the minds of several of these youngsters. One child asked detailed, probing questions about politics, nuclear war, world peace, starvation, pollution, energy and so forth (Rogers & Silverman, 1988, p. 16).

The most important overexcitability in terms of developmental potential is Emotional OE. Gifted children, adolescents, and adults all exhibit high levels of Emotional OE (Gallagher, 1985; Piechowski & Colangelo, 1984; Schiever, 1985; Silverman, 1983; Silverman & Ellsworth, 1980). Some examples are presented from clinical files:

P [age 7] is quite sensitive to the feelings of others and has a well developed sense of justice. She befriends the outcasts in her class. She comments to me if she feels her teacher is not treating children consistently. . . . When she was 3 she burst into tears because I told her a snapdragon had “died” after being trampled.

A [age 4] is an exceptionally gentle and kind boy. I have never seen him hit or push and, in fact, have had to teach him that it is not good to let his little brother hit him. . . . He is extremely loving (e.g., he sings, “I’m so glad when Daddy comes home” every day to me). He daily praises my wife and I for taking care of his baby brother. He has an intense love of games and frequently seeks out adults to play with him. When he plays with his friends, he will help them find the best move in a game and deliberately lose—all the while telling his friend how good *they* are at the game. . . . He is easily upset if he believes someone else has been treated unfairly (e.g., was sobbing because someone had taken his friend’s toy—the friend was not crying).

These extraordinary levels of sensitivity and compassion do not disappear with maturity. A capacity for rich, intense emotions remain in the personality throughout the lifespan. Many adults, as well as children, who have deep feelings are called “too sensitive.” It is important for counselors to recognize that emotional intensity comes with the territory of giftedness; it is not a sign of dysfunction.

Piechowski (1992) addresses the need to “find and nurture human potential for altruism, self-actualization, and high levels of moral development” (p. 181):

We need tools for identification and cultivation of such potentials. Dabrowski’s theory of emotional development is such a tool; it is a theory of human transcendence toward a life inspired by universal ideals of human brotherhood, peace, service, and self-realization. The theory arose from his extensive clinical experience with gifted and talented children, adolescents, and adults. One of the basic characteristics of the gifted is their intensity and an expanded field of their subjective experience. The intensity, in particular, must be understood as a qualitatively distinct characteristic. It is not a matter of degree but of a different quality of experiencing: vivid, absorbing, penetrating, encompassing, complex, commanding—a way of being quiveringly alive (p. 181).

A Theoretical Framework for Counseling

Dabrowski’s Theory provides an excellent framework for counseling gifted adolescents and adults. Through this lens, intense inner conflicts can be seen as an integral part of the process of development rather than as pathology. Crises are reframed as the dissolution of old ways of being in the world and an opportunity for latent higher level values to emerge.

Perfectionism, a regular companion of giftedness (Hollingworth, 1926; Kerr, 1991; Manaster & Powell, 1983; Robinson & Noble, 1991; Roedell, 1984; Whitmore, 1980), can be seen as a tool for self-development. It manifests as dissatisfaction with what is and a yearning to become what one ought to be. There is an inner knowing that there is more to life than the mundane, and a desire to create meaning by doing the best one is capable of doing. Within the context of Dabrowski’s Theory, perfectionism is viewed as an early form of the drive toward self-perfection, to be valued and nurtured (Silverman, 1990a).

The excruciating sensitivity of the gifted can be understood as the roots of compassion in adult life. Empathic individuals fight for human rights because they can feel other people’s pain. The intensity of the gifted can be appreciated as the basis for passion and commitment in adult life. It takes passion to change the world (Kerr, 1985). The core personality characteristics of the gifted are captured within Dabrowski’s theory and the individual is seen as whole instead of damaged.

Ogburn Colangelo (1989) has provided the most complete description of the application of Dabrowski’s theory in counseling a gifted student, with tapescripts of actual counseling sessions and commentary about how the theoretical perspective has informed the counseling process. The theory tells the counselor what deserves attention in the therapeutic interchange; the counselor is then able to support those values, attitudes, emotions and behaviors that foster personal growth. Dabrowski’s (1970) emphasis on the emotional rather than intellectual function leads the counselor

to probe deeply into the feelings of the client. The counselor is guided by the theory in identifying the client's strengths. In the case described, the student wants to be a singer/song writer, while her parents want her to prepare for a more financially secure future.

"The counselor validates both sides of the conflict because (consistent with Dabrowski's theory) wanting to make those we love happy and ascertaining our own intrinsic values are both multilevel behaviors" (Ogburn Colangelo, 1989, p. 90). The counselor helps the student recognize that her conflict is healthy, since both desires are healthy. She also helps the student acknowledge her strengths: her sense of responsibility to her family, her awareness of her own talents, and her willingness to determine her own future. At no time does the counselor dismiss the negative consequences the student might face by following her own path instead of the one designed by her parents, nor does she attempt to solve the problem for the student. Instead, she listens, helps the student sort out the problem by herself, and gives her confidence in her strengths and ability to cope with the situation. The counselor acts as a nourisher of the student's emotional development.

Exposure to Dabrowski's theory, whether in the context of counseling sessions or in group discussions in a classroom, helps gifted students understand and accept themselves. When inner conflicts are perceived as developmentally healthy, resistance melts, and new sources of energy are mobilized for coping with difficult periods. Dabrowski's theory also helps make sense of the discrepancy between research on social adjustment of the gifted and clinical experience with this population.

Socialization vs Social Development

Socialization of the gifted has been a major concern since the earliest writings in the field. It was feared that brilliant children were doomed to live in social isolation and alienation.

A passion for perfection will make its subject solitary as nothing else can. At every step he leaves a group behind. And, when, at last, he reaches the goal, alas! where are his early comrades? (Alger, 1867, p. 144).

The genius is constantly forced to solitude, for he early learns from experience that his kind can expect no reciprocation of their generous feelings. . . (Hirsch, 1931, p. 303).

Socialization continues to receive more attention than this group's self-concept, academic progress or inner development. All provisions for gifted students—ability grouping, acceleration, pull-out programs, full day programs, special schools, homeschooling—are held suspect on the grounds that they will interfere with children's social adjustment. Ironically, the immense amount of research that has accumulated over the last 70 years indicates that gifted children tend to enjoy greater popularity, greater social competence, more

mature social relations, earlier psychological maturity, and fewer indications of psychological problems than their less gifted peers (Hollingworth, 1931; Janos & Robinson, 1985; Monks & Ferguson, 1983; Olszewski-Kubilius, Kulieke, & Krasney, 1988; Purkey, 1966; Robinson & Noble, 1991; Silverman, 1993c; Terman, 1925; Wright, 1990). In a comprehensive review of the literature, Robinson and Noble (1991) report:

Perusal of a large group of studies of preadolescent children revealed [that] . . . as a group, gifted children were seen as more trustworthy, honest, socially competent, assured and comfortable with self, courteous, cooperative, stable, and humorous, while they were also seen as showing diminished tendencies to boast, to engage in delinquent activity, to aggress or withdraw, to be domineering, and so on (p. 62).

Many of these studies were conducted with students who were enrolled in special classes or accelerated. Clearly, then, gifted children's socialization does not suffer when special provisions are made for their learning needs.

Social development of the gifted appears paradoxical. Research unequivocally indicates that gifted children have excellent social adjustment; however, clinical experience reveals that many of these well-adjusted young people suffer great loneliness and endure inner conflicts between their desire to fit in and their ideals (Silverman, 1993c). Their vulnerability is not reflected in the research. The paradox can be resolved with the assistance of Dabrowski's theory. The majority of studies address the question of how well gifted children relate to other students—how well they adapt to group norms, which is a Level II concern. Gifted students, particularly girls, frequently have excellent social skills, which may be practiced at the expense of their inner lives (Silverman, 1993c). Young people who are highly adapted may be beginning the process of personality transformation—striving to attain inner ideals, which is a Level III concern. Such students may adopt a happy-go-lucky facade with classmates, while experiencing intense inner conflict and self-doubt.

We are not "normal" and we know it; it can be fun sometimes but not funny always. We tend to be much more sensitive than other people. Multiple meanings, innuendos, and self-consciousness plague us. Intensive self-analysis, self-criticism, and the inability to recognize that we have limits make us despondent. In fact, most times our self-searching leaves us more discombobulated than we were at the outset (American Association for Gifted Children, 1978, p. 9).

The lack of precision in describing the emotional realm carries over into the social realm of experience. Terms such as *socialization* and *social development* are used interchangeably in the gifted education literature, but these actually may be very different concepts.

Socialization is defined as adapting to the common needs of the social group (Webster, 1979, p. 1723) or acquiring “the beliefs, behaviors, and values deemed significant and appropriate by other members of society” (Shaffer, 1988, p. 2). Gifted children do have the inclination to adapt to the group, but at what price? If one works very hard at fitting in with others, especially when one feels very different from others, self-alienation can result. In their desperation to belong, many “well-adjusted” gifted youth and adults have given up or lost touch with vital parts of themselves.

Social development is a much broader concept than socialization; it may be thought of as awareness of socially acceptable behavior, enjoyment of other people, concern for humanity and the development of mutually rewarding relationships with a few kindred spirits. Lasting friendships are based on mutual interests and values, not on age. Self-acceptance is a related goal, as people who like themselves are more capable of liking others. When framed in this way, social development becomes a precursor to self-actualization, whereas socialization is merely the desire to conform, which may inhibit self-actualization. In Dabrowskian terms, socialization would be a Level II goal, while social development would be a multilevel goal. If the aim for gifted children is social development rather than socialization, they need to be provided with true peers who are their intellectual equals, a program of humanitarian studies to enhance their awareness of global interdependence, and counseling for greater understanding, acceptance and appreciation of self and others.

Conclusion

The principal objective of a developmental counseling program is the full development of the Self so that it can express its uniqueness for the greater good. The aim is for gifted children “to live lives deeply imbued with immutable values, to have the wisdom to choose the path of integrity, the compassion to choose the path of service, and the moral courage to become their best selves in the face of a world that often settles for less” (Silverman, 1993a, p. 52).

Goals of counseling

- moral courage
- authenticity
- compassion
- altruism
- reflective judgment
- strong sense of self-efficacy
- responsibility
- self-actualization
- commitment to goals
- contribution to society
- sense of wonder

- global awareness
 - integrity
 - devotion to high ideals
 - ethical behavior
 - high state of moral development
 - creativity
 - advanced emotional development
 - autonomy
 - wisdom
- (Silverman, 1993a, p. 53).

Leadership often results from this type of self-development, a kind of leadership that requires more than just high intelligence. Leaders with higher level emotional development are people of integrity and responsibility, who combine high intelligence with deep feelings of emotional connectedness with others. Many gifted children have the developmental potential—the intellectual, emotional and imaginal overexcitabilities—to become this type of humanitarian leader (Dabrowski, 1972; Piechowski, 1991). Counseling programs and educational philosophies that attempt to get gifted children to fit in better with age peers are misguided and short-sighted. To serve humanity in the long run, a concerted effort should be made to identify gifted children as early as possible, educate them with others of similar developmental potential, and provide them with developmental counseling so that their potential for cognitive, emotional and moral leadership can be actualized.

Counseling is essential, because the journey to discovering that which is finest in oneself is precarious, and those who embark upon this journey sometimes falter and lose their way. Higher level development begins with an intense awareness of the gap between where one is now and where it is possible to be. It takes great personal courage to live in that gap and try to close it. The desire for self-perfection is painful and not everyone is willing to experience that pain. This is what separates the person of high moral commitment in adult life from the apathetic person who is comfortable with the way things are or adapted to the limitations that currently exist in oneself and the world. The counselor’s role is not to protect individuals from their pain, but to reassure them that they have enough inner strength to use that pain in the service of their development.

Emotional development is clearly as important as cognitive development and deserves equal consideration in educating the gifted. Education should not be limited to preparing students to enter the work force. Gifted children need their parents, teachers and counselors to nurture their emotions as well. Personal sensitivity is the root of compassion; perfectionism compels people to strive toward excellence and moral integrity; intensity gives rise to the willingness to fight for justice in adult life. These qualities are not to be “cured”; they are to be celebrated as signs of potential for moral courage, responsibility and humanitarian values. Our gifted children may be leading the world toward a more

humane society, one in which people respect and care about each other, and dedicate their lives to healing the suffering on this planet.

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Underachieving Gifted Students

NAVA BUTLER-POR

University of Haifa, Haifa, Israel

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In the preface to his *Genetic studies in genius*, Terman (1925) expressed the concern that: "Circumstances which affect the fruition of human talent are questions of such transcendent importance that they should be investigated by every method that promises the slightest reduction of our ignorance."

Similarly, as early as 1923, Hollingworth in her study of highly gifted children and Conklin (1931) in his investigation of giftedness in relation to school success, raised the question why some children of superior intellectual ability fail to reach satisfactory academic achievements.

In their follow-up study, Terman and Oden (1947) concluded that in spite of superior intellectual ability, many of their original sample failed to realize their full potential. In addition, comparison of the 150 men "most successful" in their occupations with the 150 who were "least successful", revealed that 90% of the first group had graduated from college while only 30% of the second group had finished college. Through interviews with the adult research subjects and their families, Terman and his associates were able to identify some personality variables that seemed to characterize those that failed to realize their potential. Retrospective analyses of their school history and records 20 years earlier identified the same characteristics: (1) inability to persevere; (2) lack of integration toward goals; (3) feeling of inferiority; (4) lack of self confidence.

Thus, Terman and Oden speculated that motivational variables and coping skills may explain why some children of superior intellectual abilities fail to realize their full potential. Recent studies confirm the association between motivational problems and underachievement (Whitmore, 1980; Rimm, 1986; Butler-Por, 1987).

The concern for the problem of talent waste expressed by Terman received further impetus after the Second World War, when a rapidly changing society faced with technological and social problems became increasingly aware of the need to make better use of its entire human manpower. The interest in the identification and development of talent and the widespread use of various aptitude tests within the school system focused attention on the discrepancy which frequently exists between

intellectual ability and actual school performance. Thus, one finds that the study of academic underachievement in the literature is often related to the problem of undetected talent in children of superior intellectual ability.

Furthermore, the literature indicates that many children of high ability not only fail to reach the appropriate level of their own ability in their school work, but often fail to attain the level reached by the majority of their peers. One problem is to identify giftedness in children who comply only to the minimal school requirements (Kellmer-Pringle, 1970; Tempest, 1974; Whitmore, 1980; Tannenbaum, 1984; Callagher, 1985; Rimm, 1986; Butler-Por, 1987; Khatena, 1992). Recognition of academic underachievement as a serious psychological, educational and social problem reflects:

The values of a culture which attempts to look beyond performance to potential; maintains a prolonged compulsory system of education; seeks to nurture and develop diversity of ability within and among individuals and concerns itself with maximum development of the individual. . . (Raph, Goldberg, & Passow, 1966, p. 1).

While it is impossible to determine the full scope of the problem since underachievement often remains hidden, when students for different reasons which will be discussed later on, choose not to reveal their abilities. Findings such as those of the Inner London Education Authority on primary and secondary education (Thomas Committee Report, 1984; Hargreaves Report, 1984) and the 1992 National Diagnostic Achievement Survey in Israel suggest that underachievement is widespread and prevalent in most classroom situations. When underachievement patterns of behavior persist, they create damage both to the individual who fails to reach full development and to society which is deprived of his or her possible contribution.

Definitions of Underachievement

Any discussion of the nature of underachievement is dependent on the definition used. However, defining

what is meant by underachievement in gifted students is problematic. Kornrich (1965) writes:

One might suppose that a definition of underachievement is a simple matter. After all, intuitively, does not the term directly suggest that a student is functioning less well than he or she could? But what is the meaning of "less well" and "could?" Is it less well in terms of a standard established by the student ("I think I could do better"); by the student's parents ("We know he could do better"); by the student's teacher ("He has more ability than he shows") or by an objective intelligence or aptitude test which predicts a certain level of performance?

These pertinent questions are raised in many research works dealing with academic underachievement. Gowan and Torrance (1972) suggest that difficulties in arriving at a clear definition may account for the failure to arrive at solutions to the problem of underachievement. Many investigators define underachievement as unfulfilled potential. Durr (1964) for example, defines the gifted underachiever as one who achieves below his potential, where potential is defined in terms of IQ and achievement in terms of teacher grades or achievement tests. Another definition is that of Bricklin and Bricklin (1967) who state that if a child is not accomplishing at a level commensurate with his intellectual ability, he is an underachiever.

The definition used by Raph, Goldberg, and Passow (1966) is more helpful. They define the gifted underachiever as one who not only fails to achieve the academic level of which is he capable, but is often also found to be lagging behind the achievement levels of the contemporaries of average ability. The same approach is used by Kellmer-Pringe (1970). Shaw and McCuen (1962) note that most research studies define underachievement as some discrepancy between ability and academic school grades and suggests that although the rationale for doing so is not usually presented, it probably derives from the social significance of school grades, their implications for the education future of pupils and the importance attributed by the school system to the personal judgment embodied in the grading process.

A difficulty in attempting to assess the contribution of some of the definitions used by researchers to a better understanding of the concept of academic underachievement is that one of the central terms used in most of the definitions, namely "the potential of the underachiever," cannot be adequately defined. Raph et al. argue that only if it were possible to assess potential with sufficient accuracy to predict performance for all individuals would such a definition become operationally meaningful (Raph et al., 1966).

The need to arrive at a more precise definition has prompted researchers to formulate operational definitions. For instance, Shaw defines a child as an underachiever if he/she is in the upper 25% of his class with respect to intellectual ability and falls below the

class average with respect to grades. Moreover, Shaw (1964) suggests:

If a more restricted segment of the population is used, we can be more sure we are dealing with underachievers when the difference between ability and academic performance is greater, as it could only be if only very high ability pupils were to be selected. Thus a student whose score on a scholastic aptitude test placed him at the 98th percentile and whose grades place him at the 45th percentile can with more certainty be identified as an underachiever (p. 327).

Tolor (1969) defined underachievement in terms of ability in relation to predicted achievement—one standard error of estimate below expectation based on intelligence quotient. Many researchers (Gowan & Demos, 1964; Crow & Crow, 1963; Gown & Torrance, 1971) have used variations of this definition. However, when one considers the expanding multidimensional concept of giftedness relating to high abilities in different domains (Guilford, 1967, 1988; Renzulli, 1979b, 1986; Gallagher, 1985; Tannenbaum, 1986; Sternberg & Davidson, 1986), definitions based solely on the intelligence quotient are inadequate. Contemporary discussion of the limitations of the IQ test in predicting high abilities and the nature of giftedness (Guilford, 1977; Sternberg, 1984b, 1988; Gardner, 1988; Khatena, 1992) indicate that any definition of the gifted underachiever must include the discrepancy between actual and expected levels of attainment, "not only as achievement below expected performance in school subjects but also as below expected achievement in terms of expressed talent potential and productivity" (Khatena, 1992, p. 235).

While researchers must attempt to use objective achievement measures, test scores must be treated with caution since they are not necessarily predictors of long-term performance (Thomas, 1984). It must be remembered that not all children at a given age are exposed to the same educational experiences. Furthermore, different causes at different times affect the gifted child's academic behavior (Butler-Por, 1987; Rimm, 1986). Zilli (1971) suggests that for research purposes one must arrive at an acceptable operational definition of academic underachievement in order to determine what factors in the gifted underachievers, personality and environment contribute to this failure to use one's potential.

The Identification of Gifted Underachievers

To identify gifted underachievers, it is necessary to establish the presence of a large discrepancy between the student's school achievements and some manifestation of the child's high potential such as intelligence, creativity, teachers' and parents' observations. However, since it is not possible to assess potential accurately,

investigators often define potential in terms of IQ scores and achievement on the basis of achievement tests and teacher grades (Raph et al., 1966).

An operational definition comprising all relevant information in the particular educational setting may be more useful. In a study of first graders aimed at ascertaining whether various definitions do in fact result in different children being identified as underachievers, Annesley found that teacher judgment yielded the greatest number of overachievers, whereas the regression method identified the normal achievers and the standard error measurement identified some of the underachievers. The findings suggest that the use of restricted definitions has pitfalls.

In light of the complex nature of underachievement, multiple criteria used by Bachtold (1969) may prove productive. Fine (1967) maintained that in studies concerned with highly gifted underachievers, teacher evaluations should be utilized. He argued that a sensitive teacher is in a position to recognize the pupils who do not disclose behavior patterns which allow them to be recognized as gifted by normal measurement procedure. However, if the definition of the discrepancy between ability measures and school grade average is adopted, one may find that owing to the subjective nature of "hidden values" incorporated in the teacher's awarded grades, the method may fail to select all gifted underachievers in the school situation.

The problematic nature of teacher identification of underachievement in gifted children stems from the difficulties encountered by teachers to recognize ability in children when it is not manifested in the usual school expectations and convergent behavior. For example in an English study, Tempest (1974) found that out of 72 children in the last term of the infant school listed by their teachers as gifted, only 24 had IQs of 127 or above, while seven of the nominated "gifted" had IQs below 110 and one "gifted" child had an IQ of 84! Tempest stressed that the seriousness of the problem is demonstrated by the example of two children who were not recognized as gifted by their teachers, although their reading age (as measured by the Schonell Word Recognition test) was six years above their chronological age!

Admittedly, it is more difficult to recognize intellectual ability in the gifted child who chooses to hide his ability by limiting his efforts and complying solely with daily school requirements. Some researchers have shown that such children who have behavioral difficulties, are often labeled, rightly or wrongly, as "emotionally disturbed." Kellmer-Pringle (1970) and Whitmore (1979, 1980), found that emotional problems and inadequate adjustment have frequently interfered with the ability of teachers to recognize high ability in such children. In a study of the role played by teaching methods in the treatment of underachievement in gifted children, Whitmore (1980) reported that as systematic identification progressed, it became evident

that many teachers failed to recognize intellectual ability in their young pupils and that a considerable proportion of the previously unidentified gifted were in fact underachievers.

The difficulties encountered by teachers in identifying underachievement in gifted children were also demonstrated where one might have least expected it, in the program for special classes for highly gifted children in Israel. While children are selected for the program on the basis of intelligence and aptitude tests, falling in the top 2% of their age group, teachers frequently insisted that certain children had been selected by mistake, were not at all gifted, could not meet the academic demands of the school, did not benefit from the special class and should be withdrawn from the gifted program (Butler-Por, 1987).

Teachers' failure to recognize the high ability of underachievers is understandable since their poor scholastic achievements are often not caused by inability to do better in school, but are the results of complex environmental and personality interactions which affect each individual child differently and are expressions of the child's conscious and unconscious choice. This "choice" also determines the behavior adopted by the child in order to maintain his underachievement (Roth & Meyersberg, 1963; Raph, Goldberg, & Passow, 1966; Whitmore, 1980; Rimm, 1986; Butler-Por, 1987; Gallagher, 1985, 1991). It is evident that teachers are unable to identify the environmental and socialization factors that influence the child's school behavior.

The following procedures have proved useful in identifying gifted underachievers in a classroom (Butler-Por, 1987).

- (1) Identification of discrepancies between cognitive abilities expressed in formulating questions and hypotheses—and normal school performance in the accomplishment of assignment, homework and test.
- (2) Identification of great differences between general and expertise knowledge derived from extensive reading at home and failure to complete reading assignments at school.
- (3) Comparison between the following of wide interests outside the school with the minimal effort invested in school projects.
- (4) Combined student and teacher evaluation of academic strengths and weaknesses, academic personal choices and effort invested in the different subjects.
- (5) Consulting parents, previous teachers and professional personnel at school, on student's learning habits and social behavior. A consistent drop in scholastic performance of approximately two years indicates that the student is underachieving.

By employing these identification procedures, teachers should do better in identifying their underachieving students. However, in order to be able to help students fulfill their potential, it is important that teachers understand the factors and personality characteristics which are associated with the onset of scholastic underachievement in gifted children.

The Onset of Underachievement: The Preschool Gifted Underachievers

Although underachievement in gifted adolescents has been attributed to the failure to provide appropriate socialization experiences and challenge and support in the early years (Fox, 1971; Whitmore, 1979, 1981; Karnes and Johnson, 1991), insufficient attention has been directed to the problem of the preschool gifted underachiever. It is understandably difficult to recognize intellectual ability in the preschool child who "chooses" for various reasons to hide his/her ability by complying to the minimal daily task requirements and adopting behaviors which provide no indication of her high potential. However, the recognition of the importance of the formative preschool years in the individual's life (Piaget, 1952; Hunt, 1961; Bloom, 1964) when the child develops understanding of his world and "the attitudes and habits that have a marked effect upon not only his current functioning, but his functioning in subsequent years as well" (Karnes, 1980, p. 1) has stimulated the concern for the issues involved in the onset of underachievement in young gifted children.

The need to consider the factors contributing to the onset and prevention of underachievement is reinforced by the literature indicating that poor levels of achievement can be noticed in infancy and that children begin to show their potential in their first three years (White et al., 1973, 1978). Recent studies support the importance of early identification and nurture of talent (Karnes & Johnson, 1991). In his analyses of child prodigies and their development, Feldman (1980, 1986) presents case studies of prodigies tracing their development to early childhood. These studies highlighted the important role played by significant adults in the development of the talents of young children and their motivation to learn and persevere. Similarly, Clark (1988), focuses on the importance of early learning and discusses the influences of cognitive development on the development of giftedness during prenatal, infancy and early childhood. Clark makes a strong case for the importance of optimal development in early childhood and provides suggestions for a nurturing environment from birth to five years old.

The need to investigate the factors contributing to the problem of "hidden" underachievement in highly gifted young children has been demonstrated during the process of interviewing parents of children who were invited to participate in the special classes for gifted children. The children who qualified for the program were placed in the top 2% of the child population on the basis of a battery of aptitude tests (Butler, 1976). Following the process of interviewing, the children were enrolled in the newly created special classes for highly gifted children within regular schools. Initially, the program consisted of 2nd, 3rd and 4th grades, which were gradually extended to include the entire school range—until the end of the 12th grade.

At the time it seemed baffling and intriguing that some parents claimed that their child was not gifted and that obviously a mistake has been made during the testing procedures and screening. When parents were asked to explain why they thought their child was not gifted, they described various underachievement behavioral manifestations such as: "From infancy we noticed that she could not do what his/her brother did at her age;" "He always behaves like a baby, very slow, cries when asked to do something;" "Not at all like his brothers!;" "She shows no interest in doing new things, she even does not like to go out and play with other children." It was evident that parents based their perceptions on the development and behavior of their other children. In addition, it is important to note that the sex typed role of parental perceptions were revealed in both the expressed and the more hidden values noted during the interviewing, when significantly more girls than boys were perceived by their parents as not "really gifted" and chose not to enroll their daughter in the program.

The analyses of the initial as well as subsequent interviews of the parents of children who qualified for the program of special classes for gifted children in Haifa were most illuminating. They indicated that certain home variables and situations may have negative effects on the development of the young child's abilities and on the personality characteristics associated with the onset of underachievement (Shaw & Alves, 1963; Raph et al., 1966; Whitmore, 1980; Rimm, 1986; Butler-Por, 1987). Furthermore, the interviews indicated that some constitute risk factors contributing to the onset of underachievement.

Gifted Children at Risk of Underachievement

An analysis of interviews of parents of gifted children who were invited to participate in a program of special classes for gifted children in Haifa (Butler-Por, 1991) identified the following risk factors:

Unwanted Children

Sad as it is, for various psychological or socioeconomical factors, some children are born to parents, unwanted. Parental poor health, single mothers' young age and difficult home circumstances which preceded the birth of the child, continues to jeopardize the child's healthy development. It is unlikely that the socialization patterns of unwanted children are capable of providing them with the psychological conditions to develop self-confidence, the intellectual stimulus and the experiences required for developing the motivation for learning. Children whose needs are not fulfilled are likely to adopt underachieving patterns of behavior (Whitmore, 1980; Butler-Por, 1987; Gallagher, 1991). "Unwanted" children display insecurity, inadequate social behavior, cautious appraisal of

environment or hostility (Shaw & Grubb, 1958; Raph et al., 1966). They tend to leave "the door open" for withdrawal, yet may when approached individually, reveal understanding and knowledge of concepts (Baras, 1990).

Rejected Children

Parents' rejection of their child may be conscious or unconscious. Unfortunately, parents may reject their child for reasons such as physical or mental disabilities, child's sex, perceived personality attributes which are not compatible with parents expectations. Negative perceived comparison of the child's development to that of siblings was found to be most prevalent among parents of children who were found eligible for the special classes gifted program (Butler-Por, 1991). Rejected children who are not receiving appropriate nurturing reinforcement and support are unable to understand what is happening to them and what is expected of them. They are unable to acquire coping skills, to gain confidence and build a realistic self-concept. They may adopt withdrawal or aggressive behavior, hostility, express high need affiliation, seek constant attention at home and at school. These characteristics which are associated with underachievement are also instrumental in hiding the child's real potential (Shaw & Grubb, 1958; Whitmore, 1987; Butler-Por, 1987; Gallagher, 1991).

Children of Divorced Parents

While divorce may constitute a risk factor for the adoption of underachievement behavior for some gifted children, there are many others whose development is not affected negatively. When the postdivorce period is dealt with constructively (Rimm, 1986) and both parents provide the child with support, show interest and enthusiasm in the child's achievements, interest and aspirations and communicate values that the child can identify with, the child should be able to overcome the crisis and sustain the motivation to do well at school. However, when parents are unaware of their child's problems at this sensitive time and the need to help him to cope constructively with his difficulties, the child is likely to become frustrated and disoriented. The failure to overcome these difficulties can result in adopting unproductive strategies as manipulative, aggressive or irresponsible behavior (Rimm, 1986).

Children of divorced parents may have serious problems with identification and parental modeling. In a discussion of the effects of divorce on the achievements of students, Rimm (1986) reports that power struggles between parents involving their children may result in the child's taking "the path of least resistance" often leading to underachieving practices.

Cross-gender identification, or identification with same sex parent while living with opposite sex parent

may cause identification and modeling difficulties and is likely to cause insecurity and resentment. The inability of children to satisfy their conflicting needs of approving of both parents may result in avoidance behavior at home and at school.

It is understandable that children who feel insecure, confused or betrayed, as some children in these circumstances feel, are unable to devote their mental energies to learning activities and find it difficult to maintain the level of achievements of which they are capable.

Highly Creative Children

Research findings have indicated that the unidentified and unrecognized giftedness of highly creative children places them at risk of underachievement (Butler-Por, 1987). The failure of parents and teachers to recognize the abilities of the highly creative child may lead to repression of the child's creative needs. Parental pressure to conform to convergent scholastic behavior

may lead the highly creative child to become outwardly conforming, obedient and dependent with damaging consequences to his concept of self. It may also lead to serious learning disabilities and behavioral problems. In preferring to learn by authority, he sacrifices his natural tendency to learn creatively. . . . As a result, he loses interest in and is resistant to learning (p. 289).

Highly creative children are characterized by reluctance to conform to the normative behavior. These traits often bring them into conflict with their parents and teachers. Moreover, their divergent style of thinking may not be recognized by teachers as legitimate expression of high level of thinking abilities (Getzels & Jackson, 1962; Torrance, 1972; Khatena, 1992). According to Torrance (1962a), society applies coercive influences on divergences and places pressure on all rounded performance. The inability of highly creative children to satisfy the demands of parents and school may lead them to choose to psychologically "opt out" and adopt underachievement behaviors.

The highly creative child's awareness of the failure of his/her own inadequate school performance, as well as the recognition of the failure of the home and school to satisfy and value his/her needs may lead to frustration, and emotional problems. Inadequate emotional adjustment frequently interferes with the ability of teachers to recognize scholastic capacity (Kellmer-Pringle, 1970; Whitmore, 1980; Butler-Por, 1987).

Thus the failure of the environment to fulfil the creatively gifted child's needs for more freedom of choice in thinking modes and selection of scholastic activities and learning experiences may result in underachievement which remains "hidden" since the child's high abilities are not expressed.

Gifted Girls

The risk of underachievement for gifted girls still prevails despite the reported decrease in some studies of gender differences in mathematics and science (Linn & Hyde, 1989). For example, Hyde and Fennema (1990) in a meta-analysis of studies which investigated the gender differences on tests of achievements in mathematics and aptitude as a function of the selectivity of the sample concluded that "The more highly selective the sample, the larger the gender differences favoring males" (p. 4). It is important to emphasize that gender differences exist not only in the sciences, but in other subjects as well.

In a recent update on gifted females Callahan (1991) concludes that "there is certainly convincing data that suggests that this particular group of gifted students is still facing inequities, they are still not achieving at the levels we would expect and they are not choosing career options commensurate with their abilities" (p. 284).

Callahan's conclusion supports the findings of the consistent low proportion of girls in the program of special classes for highly gifted children in Israel initiated in 1973 (Butler, 1976). Since then, without exception every year when a new class is opened boys heavily outnumber girls. Invariably the girls' drop out process follows a similar pattern (Butler-Por, 1987):

(1) On completion of the testing procedures consisting of a battery of tests administered in two stages and teacher's evaluation, the top 2% are invited to participate in the program. At this stage boys generally outnumber girls by about 3 or 4 to 1.

(2) The second stage involves a meeting and interviews with parents and children. At these meetings the objectives of the program are explained and parents are invited to enroll their children in the gifted class. When parents fail to enroll their child it is usually their daughter. Sex-typed values and the reinforcement in girls of social behavior, conformity, docility as well as sex role characteristic of love of children, gentleness, and understanding identified by Bem (1974) was evident in these meetings. It influenced the decision of some parents not to enroll their daughter in the gifted program and may well have contributed to some of them adopting an underachieving role in society (Davis & Rimm, 1985).

(3) The third stage of dropout occurs at the transition between the elementary and secondary school. At this stage the reinforcement of sex-typed attitudes at home and society (Timm, 1988), the influences of peers (Tannenbaum, 1986), the inability to fulfill conflicting social and scholastic needs and the home-career conflict which becomes more relevant in adolescent girls who begin to identify with their role in adult society all contributed to the failure of girls to strive towards achieving the level of academic excellence of which they were capable (Gallagher, 1985; Butler-Por, 1987).

The lower expectations from and aspirations of parents for their daughters often coupled with covert and overt differential scholastic reinforcement was also

revealed in a cross-cultural study of educational values considered important for girls and boys in Israel (Butler-Por, 1985). The findings of this study indicated that parents rated academic and professional achievement oriented values much higher for boys than girls. The sex differentiations were also noted both in the expressed and the more hidden values, during the interviews that were held. For example, when parents complained that the school was failing to develop the intellectual abilities of their child, greater concern was expressed for boys. It is interesting to note that sex role perceptions were also prevalent among the kibbutz research population, revealing the discrepancy between ideology of equality between the sexes and actual value related behavior (Butler-Por, 1985).

These findings add to the understanding of the results of Horner's study (1968) of fear of success in women and of the ambivalence of women towards academic success. Moreover, Horner's results suggested: "that fear of success is more salient among women who are highly able, highly motivated to achieve and competitively successful than for those less able, less motivated to achieve, and less successful" (Horner, 1974, p. 109).

The relationships between ability and motive to avoid success found by Horner (1968) in graduate women, may have important implications for the understanding of the phenomenon of underachievement in girls at school who, as a result of their inability to reconcile their need to attain academic recognition with the negative attitudes to learning which prevail in their environment, may be faced with a conflict which they are unable to resolve, and consequently may not only express fear of success, but also practice it.

An investigation of a broader spectrum of negative attitudes to success in terms of both developmental effects in perceptions of success and cultural norms was undertaken by Butler and Nisan (1975). Their sample consisted of 391 subjects of both sexes of two age groups (12 and 17), and two social strata (advantaged and disadvantaged). Their findings for the high school sample were similar to those found for undergraduates by Horner (1968). 64% of the girls aged 17-18 expressed fear of success imagery, as opposed to 10% of the boys. As the girls were in fact academically successful and on the verge of graduating from high schools of good academic standing, the authors concluded that the results indicated some conflict between their actual success and their fear of success. Content analysis of their responses suggested "that this fear derives from perceived contradictions between the female role and academic success" (p. 266).

Interestingly, the hypothesis that girls begin to exhibit fear of success after the onset of adolescence, "when the girl becomes more sensitized to the expectations attached to the female role" (Butler & Nisan, 1975, p. 267), was only supported for the advantaged girls whereas the disadvantaged girls scored high on fear of success even in the elementary school, suggesting that

disadvantaged girls may tend to accept their female role at a much earlier age.

Furthermore, considering that high scores of fear of success were obtained from a sample of girls prior to their being drafted into the army in a state (Israel) which professes to hold an ideology of equality between the sexes, the authors concluded that their findings "seem to suggest that an egalitarian ideology is no guarantee that equality will actually be realized in the perceptions of its members" (p. 267).

Similarly, in a British study of able children and their families, Hitchfield (1973) found that parents revealed a tendency to underrate the abilities of their bright girls. There is also evidence to suggest that in highly gifted elementary school girls whose parents held sex stereotyped attitudes towards their daughters, underachievement was also characterized by fear of success (Butler-Por, 1987). The gifted girl may be more aware of the conflict's sources and thus more frustrated in her inability to resolve it. This conflict can be most detrimental in view of the findings that parents differentiated in their perceptions of their children's abilities between boys and girls: whereas the accomplishments of sons were attributed to ability, those of daughters were attributed to effort (Parson et al., 1982). Since it has been argued that attribution to effort does not contribute to a stable notion of one's abilities (Freize et al., 1978) and that stereotypic perceptions of differential abilities and interests are in evidence before children begin school (Johnson & Lewman, 1990), care must be taken to prevent sex stereotyped attitudes within the family and in early childhood educational frameworks in order to combat the negative societal influences contributing to the onset of underachievement in gifted girls.

Culturally Different Gifted Students

The consistent low number of culturally different students (i.e., minorities and poor) who have been identified as gifted and are participating in gifted programs demonstrates that culturally diverse children are at risk of becoming underachievers.

Karnes and Johnson (1991) maintain that Head Start programs have "made great strides in improving and expanding services to average children and to the 10% of the Head Start population who are diagnosed as handicapped. However, the children who remain underserved, who are not being stimulated or challenged in ways that foster their full development are the bright/gifted/talented—the top 10% or 20% enrolled in Head Start programs" (Karnes & Johnson, 1991, p. 277). The problematic issues of identification of talent in culturally different students discussed in the U.S.A. National Report on Identification (Richert, Alvino, & McDonnel, 1982) are relevant to the problem of cultural underachievement in most industrial countries. For example, the report makes the point that identification practices tend to underrepresent the underachieving

minority gifted children, who rather than being inherently disadvantaged, are put at a disadvantage when measures of academic achievement are used exclusively or are given significant weight in the identification processes (Richert, 1985; Khatena, 1992).

Passow (1982) has argued that what is needed is: "A real commitment on the part of educators and society at large to the concept that talent is not the prerogative of any racial or ethnic group, any social class or any residential areas. It may lie untapped in some situations under some conditions, but no population has either a monopoly on or absence of talents" (p. 31).

The literature and current research on intelligence and the assessment of intellectual capacity indicate that the intelligence test provides an incomplete view of abilities (Sternberg, 1986; Treffinger & Renzulli, 1986); and suggests that the search for the alleviation of the problem of cultural underachievement should be directed to the following areas.

CULTURAL VALUES AND SOCIALIZATION PRACTICES

It is difficult, as Getzels (1969) has argued, to identify high intellectual abilities in children who have been socialized in cultures and subcultures whose values and cognitive experiences differ from those of the dominant culture. The pertinent question that should be raised is, which of the socialization factors seem to contribute to the onset of underachievement in differently cultured children?

Passow (1982) identified three environmental factors which contribute to cultural underachievement:

- (1) Experiential deprivation;
- (2) Limited language development; and
- (3) Socioeconomic or racial isolation.

Socialization factors and cultural characteristics have an important role in enhancing the child's ability to develop his potential. Frankenstein (1970, 1984) for example, maintained that Middle Eastern disadvantaged children are characterized by concrete dichotomized associated and affective thinking. Since these characterize their culture, he postulated that their parents socialization patterns could not provide the learning experiences that are conducive to developing abstract and critical thinking. He concluded that since the parents are unable to assume the educative role of providers of cognitive and social stimulus, teachers should fulfill this role. Based on these principles, Frankenstein devised special programs designed to develop abstract and cognitive abilities in culturally different children.

DIVERSIFICATION OF IDENTIFICATION CRITERIA

Current professional literature indicates that accurate assessment of abilities requires the collection and evaluation of data from different sources (Frasier, 1991). The need to expand the identification practices is

of particular significance for the identification of talent in culturally different students, in view of the recent research on intelligence and the assessment of intellectual capacity, indicating that an intelligence test provides an incomplete and narrow picture of abilities (Gardner, 1983; Sternberg, 1986; Treffinger & Renzulli, 1986). Studies conducted with children in different cultures indicated the inappropriateness of the conventional intelligence measures of the identification of high ability in differently cultured children in general and for detecting underachievement in gifted differently cultured children in particular. In a discussion based on studies conducted with Inuit (Eskimo) children Wilgosh et al. (1985, 1986, 1990), notes that even in the preliminary screening of giftedness culturally different children may be missed in that they may perform poorly on the standardized IQ tests. And may be identified as low-achievers because of similar inherent biases in favor of the majority culture built into the content and norms of standardized achievement tests. Similar findings were reported by Adams and Wallace (1989) relating to the identification and the development of potential in Black South African children.

It is important to emphasize that the criteria for identification of talents in culturally different children should include nontest data such as observations and individual reports (Khatena, 1992), and nonverbal creative measures (Torrance, 1974; Khatena & Torrance, 1990a, b). In addition, identification should consider the impact of cross-cultural experience and intercultural interaction which have been found to be significant in contributing to the development of creative abilities in Arab children in Israel (Mari, 1979).

SCHOOL RELATED FACTORS

The problem of detecting high potential in differently cultured children has been shown to be affected by three inter-related educational factors:

- (1) absence of differentiation,
- (2) labeling and low teacher expectations and
- (3) incompatibility between learning experiences and educational needs.

Often the educational programs aimed to enhance the scholastic development of culturally different children fail to differentiate among them and tend to perceive them as a homogeneous population. This results in stereotyping their characteristics, focusing only on the variables in which they differ from those of the dominant culture. Most programs are based on enrichment for the entire differently cultured population in a class in order to help them reach higher levels of cognitive thinking (Passow, 1980).

While different countries recognized the need to "bridge the educational gap" between the student population of the culturally different and dominant cultures, lack of a differentiated approach results in the need to label them in order to implement the educational policies adopted. However, studies indicate that the

labeling process leads to lowering the expectations of the teacher which lowers the child's scholastic expectations, a process which inevitably results in underachievement (Rosenthal & Jacobson, 1968; Rutter et al., 1979; Smilansky, 1981; Butler-Por, 1987, 1992).

Since often the programs are not designed to discover and develop potential, they are frequently not appropriate for developing the abilities of the gifted culturally different children who are considered as "the most disadvantaged within this already disadvantaged community" (Smilansky, 1981, p. 273).

A most significant contribution to provide systematic and appropriate educational experiences is provided by Feurstein's (1980) *Instrumental learning program* which is a structured entity devised to help students to develop the concepts and different styles of thinking within the context of the different fields of knowledge. This program constitutes an efficient diagnostic tool for teachers capable of identifying difficulties and abilities, thus contributing to the reduction of underachievement among differently cultured children.

Children with Learning Disabilities

Gifted students with physical or emotional disabilities are often not identified as gifted since their learning disabilities conceal their potential (Yewchuk & Bibby, 1989). Khatena (1992) suggests that the underachievement of gifted students with handicaps may be mistaken for the performance of less able students. In a review of the needs of disabled gifted students Van Tassel-Baska (1991) pointed to the need to develop alternative identification methods of the disabled potentially gifted since the general practices of identification of gifted children focusing on individual testing of various intellectual variables are not appropriate. She maintains that "the abilities profile of these individuals is atypical in respect to strengths when compared to classic conceptions of giftedness" (p. 246). A discrepant pattern of abilities seems to characterize a learning disabled gifted child. Dykstra (1990) argues that children with great academic deficiencies in one area, mathematics or reading for example, yet have strong intellectual functioning, are able to compensate for their deficiencies and should do well academically. However, he concludes that the gifted disabled students at risk for underachievement are the more prevalent cases of children who have high intellectual functioning, specific academic deficit which is coupled with an executive processing which negatively affect their study habits and organizational abilities.

An additional factor impeding the detection of abilities in children with learning disabilities is the uneven pattern of behavior which characterizes most underachievers. The frustration of their unfulfilled needs may be expressed in withdrawal, lack of interest, or disruptive and aggressive behavior.

Research suggests that children labeled as "under-achievers" should be tested for learning disabilities

(Hanford et al., 1987; Silverman, 1989). Teachers are often not trained to identify some forms of learning disabilities.

Emotional disabilities affect learning and can lead to learning disabilities (Pringle, 1970; Whitmore, 1980; Ford, 1989). In their study of gifted high school underachievers Raph et al. (1966) indicated that underachievement resulting from learning disabilities relates to context areas. When the underachievement is severe in one area, it negatively affects other areas. The researchers concluded that different abilities are needed for the mastery of different areas.

The need to identify and program for potentially gifted handicapped children in order to prevent underachievement is emphasized by the fact that very few of these children are identified (Van Tassel-Baska, 1991; Khatena, 1992). Whitmore (1982) suggests that both giftedness and learning disabilities are impeding identification of children as gifted learning disabled. It is important to identify underachievement in young disabled gifted children (Whitmore, 1980; Karnes & Johnson, 1987; Suter & Wulf, 1987). Karnes (1974) utilized multidimensional techniques and evaluation data for preschool physically handicapped children for the acceleration of promising young handicapped and talented project.

Finally, one can readily agree with Van Tassel-Baska (1991) that in order to develop the potential, and thus prevent underachievement of gifted children with learning disabilities, there is a need for collaboration of all educational resources and services so as to increase the knowledge of the problems of potentially gifted handicapped children, raise their expectations and structure appropriate educational programs capable of fulfilling their potential.

The Causes and Characteristics of Underachievement

Underachievement has many causes which affect each student differently. Though various characteristics are associated with underachievements, the dynamic and complex nature of the problem requires the understanding of the different factors contributing to the gifted students' failure to attain the level of achievement that they are capable of. Three main factors have been associated in the literature with achievement:

- (1) Home and parental variables,
- (2) Personality characteristics, and
- (3) School related factors.

Home and parental variables. The capacity to enjoy learning and the motivation to invest effort in academic work in order to do as well as one is capable of, depends greatly on the ability of parents and significant adults to fulfil the child's needs and of the home environment to provide socialization experiences which reinforce the satisfaction the child derives from his/her or her accomplishments (White, 1950).

On the basis of the developmental theories (Maslow, 1954; Piaget, 1958; Erikson, 1963; White, 1985), Butler-Por defined the following emotional, social, and motivational needs which constitute prerequisites for the development of intrinsic joy and motivation for learning as follows (Butler-Por, 1987, p. 11).

Trust in others and self,

Initiative,

Autonomy,

Self confidence (White, 1985),

Curiosity (Vygotski, 1978; Lehwald, 1988),

Mastery and competency learning (White, 1959),

Challenge and stimulus (Whitmore, 1980; Khatena, 1992),

Awareness and respect for individual differences (Matyushkin, 1988),

Supportive home attitudes (Raph et al., 1966; Gallagher, 1985; Butler- 1987).

Home factors contributing to the onset of underachievement dependency socialization patterns. Gifted children thrive on self-directed and independent exploration. Research has shown that very young gifted children's exploratory activities were most intense in children whose parents encouraged independency (Lehwald, 1988). Gifted children are critical of excessive control. Parents who fail to encourage and reward independent behavior may produce immature and dependency behavior responses in the child (Baumrind, 1967, 1972). While such behavior may have originated by the desire to fulfil parental expectations, they could lead to adopting a syndrome of behavior resulting in underachievement. For example, child rearing practices encouraging dependency are often accompanied by parents accomplishing the child's tasks before any effort is exerted so that the child is not able to take initiative and gain self-confidence (Rimm, 1986). The gifted child may choose to avoid the conflict stemming from the need for self-initiated activities and the desire to comply with parents wishes by concealing his abilities and becoming an underachiever.

Inadequate model for identification. Identification and modeling processes play an important role in the development of the child (Bandura, 1967). Identification with a parent is an important source of security for the young child. It also enables the child to "take on" the parent's competency and adequacy (Mussen et al., 1979). Since the gifted child is often very perceptive and critical, parental identification is more likely to be problematic. For example, the aforementioned discussion on the risk factors for underachievers demonstrated that sex-typing parental identification may lead to underachievement (Rimm, 1986).

Parental expectations. Unrealistic parental expectations may contribute to the onset of underachievement in the gifted children. When parents expectations are too low, the student's self perceptions may tend to match that of her/his parents', whereas, when parents' expectations are too high, the pupil may feel that it is useless to try to cope with demanding learning

experiences since she/he will not be able to satisfy the parents' high expectations. The student's fear of failure, when persistent, is internalized, resulting in behavior manifestations which hide high potential (Atkinson and Raynor, 1974; Butler-Por, 1987).

Excessive parental pressure. Constant pressure on children to attain high achievements and speeding up children's development or thrusting them into an adultlike world of rules and schedules too early, may have negative effects (Suransky, 1982). Parents behavior may be the result of either both or one of the parents' deep frustration caused by their own feelings of inadequate self realization. Their behavior in these circumstances is more difficult to change (Raph et al., 1966).

Parental attitudes. Parents' attitudes and educational values play a significant role in shaping their child's attitudes to learning (Rimm, 1986). Parson et al. (1982) indicated that children are influenced more by their parents' beliefs about their abilities than by their own past performance. Parents convey their perceptions of their children's abilities in various messages about the importance of achievement oriented activities. When parents attitudes are not consistent it is impossible for their children to internalize achievement oriented value and behavior. When parents express negative attitudes to academic pursuits, their children have no incentive to function according to their capabilities.

Home climate and support. A secure and emotionally stable home is most important for the cognitive development and functioning of the child. White (1985) indicated that "a child who is comfortable with adults, and who does not treat them primarily as fear objects or purveyors of authority . . . has the expectation that they are anxious to help, that they are interested in what he is doing and that they are more capable than himself (p. 65). When the child is deprived of family support due to a poor relationship between parents and inadequate home interactions, he is also unable to satisfy the needs, discussed in the previous sections, which constitute the prerequisites for enjoying learning. These factors may have a detrimental effect on the development of the personality variables which determine the child's ability and motivation to do well in school.

Characteristics of Underachievers

An analysis of the literature concerned with the study of characteristics of underachievers indicates that mainly two aspects have been investigated: (1) the study of specific personality variables and how they affect scholastic underachievement, and (2) the study of behavioral characteristics of underachievers.

Since underachieving students, like all students, differ from each other not only in their home background, but also in their own way of coping with their problems, one cannot expect all underachievers to have the same characteristics. However, certain key personality and behavioral characteristics have been associated in the

literature with underachievement (Raph et al., 1966; Whitmore, 1980, 1987; Rimm, 1986; Butler-Por, 1987; Redding, 1990; Gallagher, 1991).

Personality Characteristics

The relationship of certain family factors with the onset of underachievement discussed in the previous section suggests that certain family dynamics and socialization patterns may have detrimental effects on the development of the child's personality. The following personality characteristics have been identified by researchers as affecting the scholastic achievements and motivation of gifted underachievers.

SELF CONCEPT

DeLisle's (1990) study of underachieving gifted students suggests that underachievement in gifted students is closely related to the development of the self-concept. The self-concept of the student is shaped by all the positive and negative messages received from meaningful individuals in the student's environment. Thus the child perceives both his/her successes and failures as they are perceived by parents and family. Research has indicated that when the child internalizes mostly negative responses from the people who are important to him, the low self-concept which he or she acquires provides no reason to believe that his or her efforts would result in overcoming scholastic difficulties. The low image may mask actual capabilities and eventually leads to underachievement (Fink, 1962; Shaw & Alves, 1963; Raph et al., 1966; Gallagher, 1985).

In contrast to the findings of many studies that low self-concept characterizes gifted underachievers, Ziv's (1977) study of highly gifted underachievers in Israel found that when parents had high perceptions of their child's abilities but did not value the school, the gifted underachiever still had a high self-concept.

LOCUS OF CONTROL

The personality variable of "Locus of Control" perceived by Rotter (1954) as a motivational factor is of particular relevance to understanding the behavior of the underachiever. Gifted underachievers have been described as students who blame others, or "bad luck" for their school failures and feel that they cannot control their school situation (Shaw & Black, 1960; Raph et al., 1966; Whitmore, 1980; Butler-Por, 1987). Laffon et al. (1989) report that gifted underachievers tend to attribute their academic failures to external forces outside themselves. The failure of gifted underachievers to develop a sense of control and self-efficacy deprives them of the intrinsic motivation to pursue their scholastic goals (Bandura, 1989).

Need Achievement and Fear of Failure

The need and motivation to attain high achievements is conveyed to the child by parents' attitudes to achievements (McClelland, 1958). However, when parents manage to convey the idea that failure should be avoided, the child perceives that failure is a threat. Fear of failure becomes dominant and conflicts with the ability and need to achieve. The child often resolves this conflict by selecting tasks which are far too easy, or assignments that are too difficult for most children and thus failure to accomplish them does not constitute a threat (Atkinson & Raynor, 1974). When such behavior persists it interferes with the students motivation to try to cope with learning experiences which are appropriate for their capabilities and may lead to underachievement (Whitmore, 1987).

Need Affiliation

Underachieving patterns of behavior in gifted students can stem from unfulfilled social needs. In the process of attempting to fulfill his social needs which are very personally important, the gifted student adopts strategies which are of no help in securing friends (Schneider, 1977). A study of the personality characteristics of highly gifted and average ability elementary school students indicated that affiliation needs were most prevalent in gifted underachievers (Butler-Por, 1987). The emotional consuming process and the frustration involved in attempts to meet social needs absorbs the student's mental energies, and may result in scholastic underachievement.

Fear of Success

It has been shown previously that underachievement may be the result of the student's inability to fulfill conflicting needs. Fear of success has been associated with the ambivalence of academic success in women (Horner, 1968) and adolescent girls who begin to identify with the traditional role in society and perceive scholastic success as threatening to their female status. Fear of success was also found in younger children of different cultures in Israel (Butler & Nisan, 1975). Moreover, there is evidence that in gifted girls whose parents held antiacademic sex stereotyped attitudes toward their daughters, fear of success appeared much earlier (Butler-Por, 1987). It is possible that the young gifted girl is more aware of the conflict's sources and thus more frustrated with her inability to resolve it. It has been demonstrated that parents differentiated their perceptions of their children's abilities—the accomplishments of their sons were attributed to ability, those of the daughters were attributed to effort (Parson, 1982). It is important to invest effort to prevent sex-stereotyped

attitudes within the family and in all educational frameworks in order to combat the negative societal influences contributing to the onset of underachievement in gifted girls.

Furthermore, the findings that fear of success was also evident in culturally different boys suggests that for the disadvantaged boy "there seems to be some conflict in his own perceptions of success which is seen as desirable but unattainable" (Butler & Nisan, 1975, p. 269). Since these attitudes resemble those expressed by some underachievers (Raph et al., 1966), the relationship between fear of success and academic underachievement may be a result of similar conflicts.

Behavioral Characteristics of Underachievers

Whitmore (1980) has comprised a check list of traits which characterize gifted underachievers, suggesting that if a student exhibits 10 of the characteristics, further evaluation should be conducted to determine whether the child is a gifted underachiever. The characteristics identified include: daily work frequently poorly done and incomplete; large gap between oral and written work; superior understanding and retention of concepts when interested; excellent general knowledge; highly imaginative and creative; poor test performance, achieving at or below grade level expectations in one or all the basic skills; persistent dissatisfaction with work accomplished; avoiding trying new activities to prevent imperfect performance; evidences self-criticism and perfectionism; shows initiative in pursuing self-selected assignments at home; has a wide range of interests and special expertise; low self-esteem and tendencies to withdraw or behaves aggressively in the classroom; shows sensitivity in perceptions of others and life in general; tends to set unrealistic self-expectations; dislikes practice work, drill or memorization; easily distracted; unable to focus concentration and efforts on tasks; has poor attitudes towards school; resists teacher efforts to motivate or discipline behavior; has difficulty in peer relationships (Whitmore, 1980).

Teachers of highly gifted underachievers who were involved in an intervention program with their gifted underachievers (Butler-Por, 1987) identified the following characteristics in their students, many of which support Whitmore's findings:

- (1) Read extensively at home and in class, usually under the desk, but resent set reading assignments;
- (2) Possess a wide "store" of general knowledge, but meager output in assignments and homework;
- (3) Excellent oral expression, but poor written expression;
- (4) Careless and inadequate execution of homework and academic assignments;
- (5) Great competence in areas they are interested in, but no interest in school;

(6) Avoidance behavior expressed in non participation in class, lack of initiative in undertaking new assignments, and high rate of tardiness and absences from school;

(7) Express dissatisfaction from self and their achievements;

(8) Aggressive and disruptive behavior in class, yet very cooperative during individual meetings with the teacher.

(9) Manipulative behavior;

(10) Poor social skills and peer relationships;

(11) Gifted underachieving girls characterized by lower academic expectations and aspirations and high fear of success.

In a study of learning characteristics of gifted high school underachievers and achievers, Redding (1990) found differences in learning styles when performance of the two groups was compared on achievement subtests requiring either analytical convergent or holistic divergent cognitive processes. The gifted underachievers preferred and did better on holistic tasks and did not do well on analytical tasks which involved detailed computational or convergent problem solving cognitive processing. On holistic tasks, such as reading comprehension and vocabulary, gifted underachievers were equal to achievers. The author concluded that because underachievers may have learning styles and study skills which hinder performance on regular school tasks, but which may be beneficial for tasks requiring higher processes of thinking and creativity, their actual grades do not reflect their true potential. As Whitmore's (1980) study has shown specific factors within the school situation contribute to gifted children becoming underachievers, supporting Kowitz (1965) who argued that the underachiever is often "a rebel against the education regime, who has chosen a path of passive nonresistance to instruction" (p. 473). The role of the school in reinforcing or reducing underachievement in gifted students is discussed below.

School Related Factors

Since underachievement is mainly manifested at school, efforts to deal with the problem must consider school factors. Moreover, as the school is the only place which embraces nearly the whole student population, it also has the greatest potential for deterring and preventing underachievement (Moulin, 1970). An important longitudinal study has demonstrated that the school plays a significant role in enhancing the motivating for learning and the achievements of its students, even when they initially have low academic achievements and behavior problems (Rutter et al., 1979). The literature suggests that three factors within the school situation are conducive to the onset of underachievement in gifted students: (a) Curriculum and teaching methods, (b) attitudinal factors, and (c) teacher variables (Freeman, 1985; Gallagher, 1985; Kellmer-Pringle, 1970; Raph et

al., 1966; Rimm, 1990; Tannenbaum, 1984; Whitmore, 1980; Butler-Por, 1987).

These three aspects are interdependent and relate directly to the fulfillment of the gifted child's needs. When one considers the prerequisites for developing motivation for learning in the home discussed previously, one can perceive the school has an important role in fulfilling these needs within the learning situation.

Curriculum and Teaching Methods

From an analysis of factors contributing to underachievement in gifted students, Zilli (1971) argues that inappropriate curriculum content and teaching methods which fail to maximize intellectual development may result in underachievement. Gifted students become frustrated with routine and repetitive skills and curricula material that they have already mastered. Students who fail to find stimulation in school opt out of the learning situation, develop antischool attitudes and prefer to stay at home. These aspects were supported by a high proportion of absenteeism among gifted underachievers (Raph et al., 1966; Whitmore, 1980). In a study of young elementary school gifted underachievers Whitmore (1980) found that the curriculum and the traditional teacher-centered teaching methods do not take into account the fact that gifted children possess much of the knowledge taught in school and have expertise knowledge in additional areas that they are of interest to them. In addition, they understand complex concepts and are capable of formulating hypotheses. Since these abilities are not utilized in the traditional classroom situation, boredom and lack of motivation for learning soon sets in. Whitmore concludes that these factors were responsible for much of the underachievement of the gifted students in her study. Similar findings were reported for older gifted underachieving students (Butler-Por, 1987).

Attitudinal Factors

The findings of studies concerned with school attitudes indicated that underachievers generally express negative attitudes to school (Frankel, 1960; Tannenbaum, 1962, 1983; Raph et al., 1966, Rimm, 1990). Though it is not possible to determine whether the negative attitudes to school are the cause of poor academic performance or are the outcome of the underachiever's school experience, the literature indicates that poor attitudes to school of the gifted underachiever are affected by parental attitudes, peer attitudes and the failure of the school to stimulate the gifted student by providing relevant learning experiences and appropriate teaching methods.

In a comparative study of gifted and average ability underachievers, Ziv (1977) found that gifted

underachievers invested more effort in nonschool activities. He concluded that negative parental attitudes toward the school as an educational institution were related to the underachievement of gifted students and that the negative attitudes of the gifted underachievers and their parents to school may have developed as a result of disappointment from the school which failed to cater to their educational needs.

The relationship between attitudinal factors and academic performance assumes increasing importance during adolescence. Research findings have indicated (Coleman, 1965; Tannenbaum, 1962, 1983) that since peer identification and acceptance constitute central motives at the secondary school level, negative attitudes towards school and academic achievements contribute to scholastic underachievement. Other studies indicated that commitment to academic success was perceived as a social handicap particularly by female students of high potential (Butler & Nisan, 1975; Butler-Por, 1987). Rimm (1990) suggests that anti-intellectual attitudes in the school atmosphere that sets high priorities for sport or social status rather than high intellectual attainment, as well as antigifted attitudes, constitute high risk school environments for adopting academic underachievement.

Teacher Variables

In addition to the factors discussed above, the literature suggests that teachers may convey values and expectations which antagonize and alienate gifted students and contribute to adopting underachieving behavior. Thomas (1973) indicated that the conformity demanded by many teachers leads gifted students to adhere to the academic expectations of teachers which may be well below the levels of achievement of which they are capable. Thus, the teacher inadvertently becomes instrumental in the student's underachievement. Hudson (1966) found that teachers' demands to conform to their expectations are particularly repugnant for creating gifted students who may consequently lack the interest and motivation to invest effort in their learning in order to reach the academic achievement of which they are capable. The risk of underachievement for creative gifted pupils is emphasized by various researchers (Torrance, 1972; Davis & Rimm, 1985; Butler-Por, 1987; Kyung-Won & Feldhusen, 1990; Khatena, 1992).

The failure to set appropriate educational goals and expectations for gifted pupils is due to the failure of teachers to recognize their high abilities. Demos and Mosaka (1972) found that underachievement began to take root as a result of the teacher's inability to estimate the student's high abilities. These findings were supported by various other researchers (Getzles & Jackson, 1962; Kellmer-Pringle, 1970; Tempest, 1974; Whitmore, 1980; Butler-Por, 1987). The failure of teachers to identify the gifted student may explain their failure to recognize the gifted underachiever. Thus the

gifted underachievers are deprived of the educational experiences, the reinforcement and feedback, the help and encouragement which are essential in bringing about the change and improvement in their scholastic situation (Raph et al., 1966; Whitmore, 1980; Patrick, 1990; DeLisle, 1990).

Academic underachievement is clearly a complex problem caused by a variety of factors which may affect each gifted student differently. Furthermore, there is evidence that failure to detect and treat the problem may have lasting deleterious effects. What can be done to help underachievers? The following section will discuss the methods that have been utilized to help underachievers to overcome their difficulties and improve their academic achievements.

Intervention Treatment of Academic Underachievement

This section will be devoted to the consideration of some of the approaches used for the purpose of alleviation of the behavioral and scholastic problems of gifted underachievers. A survey of the literature concerned with the treatment of underachievement indicates that two major strategies have been utilized: (1) Counseling and (2) school centered intervention

Counseling

Since underachievement is often associated with the home dynamics, counseling is sometimes conducted in a group situation involving the underachiever and his parents. Though this method can result in improved communication and acceptance within the family (Perkins & Wicas, 1963), it is not always effective for improving school achievement (Davis & Rimm, 1985). Effective counseling should involve the teacher. Rimm (1986) advocates a trifocal model to cure underachievement involving the underachiever, the parents and the teacher—all concentrating on the central problem of the underachiever. Butler-Por has identified three categories, each characterized by one of the following central traits:

- (1) Dependent conformers and nonconformers;
- (2) Dominant conformers;
- (3) Dominant nonconformers.

Group counseling has been used to improve peer relations and motivation to overcome behavior and achievement problems. While counseling sessions sometimes resulted in improved social relations, the process mainly brought out into the open individual emotional problems which students were not capable of resolving (Baymur & Patterson, 1965). However, when group treatment focused on specific academic goals, some improvement in scholastic achievements occurred. For example, in a study which expected each group member to assume responsibility for his or her behavior and schoolwork,

positive changes were reported (McHolland, 1971). While these methods can be effective for a short duration with secondary school gifted underachievers, younger students need the teacher's help in setting goals and providing on-going reinforcement and approval (Whitmore, 1980). Furthermore, since underachievers not only differ in their problems but also vary in their coping activities, individual counseling focusing on specific problems, should be more effective in helping the underachiever student to understand the connection between feelings of frustration, behavior problems, and school performance (Zilli, 1971; Whitmore, 1980; Gallagher, 1985). It is important that the classroom teacher be consulted so that the counselor's work can be extended by the teacher, reinforcing the student's accomplishments and encouraging further efforts.

School Centered Intervention

The limited success which has been achieved by counseling methods in improving the academic achievements of underachievers (Gallagher, 1985) suggests that intervention should relate to the learning situation in school. Educational intervention has mainly involved modification in classroom organization, the curriculum and teaching methods and remedial instruction in specific areas.

One of the most important attempts to cure underachievement by changing the classroom structure and modifying the curriculum was investigated by Raph, Goldberg, and Passow (1966). The program was conducted at a New York City high school for the duration of three years and consisted of three educational strategies, initiated in a sequence: (a) homogeneous grouping tutored by a specially selected teacher; (b) curriculum and teaching methods modifications; and (c) teacher tutoring.

The first intervention strategy grouped all identified tenth-grade underachievers for the purpose of daily sessions of 2 hours with a specially selected teacher. The first period was devoted to educational aspects, the second one was utilized for teaching study skills. At the end of the year this group showed greater improvements in behavior and scholastic achievements than underachievers in the control group which received no treatment. However, when the supportive provisions and teacher were changed in the following year, the progress was not sustained. The second strategy provided a special program in geometry, on the assumption that if underachievers experience success in a field in which they had previously failed, they would improve their performance in other subjects. While all students showed interest in learning topics that were not an integral part of the curriculum, their general school achievements, at the end of the semester did not improve.

The third strategy utilized the teacher in the combined role of tutor in needed learning skills and individual counselor. In evaluating the three methods the

researchers concluded that while the study provided important insights of the problems of underachievers and the significant role of teacher commitment, it also indicated that intervention initiated at the senior high school level showed little promise of success since, for many of the students, underachievement had become too deeply rooted to be changed.

A different method for intervention at the secondary school level integrating gifted underachievers with gifted achievers in a Canadian high school was reported by Christopher (1989). The program based on positive peer models provided learning skill development, remediation, curriculum enrichment and supportive counseling.

The need to identify gifted underachievers and initiate intervention at the elementary school stage was demonstrated by Whitmore (1980). The intervention program was conducted in a school in California as part of the Cupertino Extended Learning Program. As systematic identification progressed, it became evident that a proportion of gifted children were not identified by their teachers, who advocated that they should be kept in the same grade for an additional year since they had emotional problems. Subsequently an intervention program was designed. Gifted underachievers were placed in a special class which aimed to develop them emotionally and cognitively, creating an educational environment which produced opportunities for improving learning habits and skills, utilizing an imaginative curriculum and teaching methods, and emphasizing:

- (1) A classroom climate without threat of failure, encouraging freedom of expression;
- (2) child centered approach;
- (3) good teacher-pupil relationships; and
- (4) support of peer group.

The evaluation of the program indicated that underachievers improved their self-concept and sense of control, school attendance, work habits, realistic goal setting, self-evaluation, school achievements, and social behavior.

The intervention programs discussed above, make it clear that the role of the teacher as a change agent in reversing underachievement is most important. In order to fulfil this role the teacher needs to understand the nature of underachievement and the specific problems of the individual underachieving gifted student.

In the light of the individual nature of underachievement Butler-Por (1987) investigated an intervention program which involved 72 highly gifted and average ability underachieving elementary school students, based on the individual approach of Glasser's Theory of Reality Therapy (Glasser, 1965). Glasser maintains that significant improvement can only be achieved when both the student and the teacher are involved in planning the process of change and undertaking personal responsibility for bringing about the desired changes.

The intervention was based on the following sequence:

(1) The teacher was provided with a diagnostic profile of each underachieving student in order to facilitate understanding and acceptance of the student and enable the teacher to recognize the need for change;

(2) A preliminary meeting between the student and the teacher in which the need for change was recognized and joint responsibility for effecting change was accepted. During this meeting those intentions were operationalized in the form of a contract by which the pupil set tasks for the coming week in learning, social or behavior domains and chose those "rewards" in terms of teacher's help or preferred assignments and responsibilities, which served as reinforcers.

(3) Subsequent weekly meetings were devoted to evaluation and reinforcement of tasks accepted the previous week and to setting new tasks and "rewards" for the coming week.

(4) A final meeting was held in which the teacher and the student evaluated the success of their joint efforts and agreed that progress could be maintained without further structured individual meetings.

Thus, the student accepted responsibility for maintaining progress, while the teacher accepted responsibility for encouraging the progress within the class. The findings of the study indicated that most underachievers improved significantly in their academic achievements and social behavior as well as on some of the psychological variables. In addition, the increased confidence in their abilities increased the recognition that learning could be satisfying, and enabled these students to develop intrinsic motivation for learning which was expressed in their choice of "rewards" and in their scholastic behavior in class.

Furthermore, findings indicated considerable improvement in the teachers' attitudes towards their gifted underachievers and in the positive environment that they created in class. This aspect was supported by DeLisle (1990) who maintained that teachers who are effective in reversing underachievement recognize the student's weaknesses and strengths as well as social emotional and intellectual needs that should be catered for in a "safe" environment in which mistakes are considered to be an integral aspect of the learning process both for students and the teacher.

It is important to emphasize, as Raph et al. found, that for some gifted students underachievement has become "a way of life." In order to help them to break the cycle of failure, teachers must recognize that the process of intervention requires time and perseverance. It has to be systematic and goals and assignments should be specific thus enabling the student to receive ample feedback of his/her ability to accomplish them successfully.

To conclude, this article has discussed the complex factors which contribute to the onset of underachievement in gifted students and the means by which their problems may be dealt with. However, the consideration of the different aspects emphasized the need for further research in the unresolved and serious problems relating

to gifted students at risk of underachievement particularly the identification and development of potential in culturally different, female and disabled gifted student population.

Finally, in spite of growing awareness that potential lies untapped in different cultures and all classroom situations, Gallagher (1990) pertinently argues that "recent policy actions taken by many states have combined to almost define gifted underachievement out of existence. The requirement that students must evidence gifted performance in order to qualify for gifted programs would seem to defeat some of our key objectives to enhance the performance of those students who possess great talent, but little motivation" (pp. 223-224).

In order to combat such tendencies it is important to increase public and professional recognition that unrealized potential is damaging both to the individual and to society. Furthermore, teacher education institutions must become committed to fulfil a significant role in preparing educators and student teachers to identify and develop the abilities of children and to work effectively towards reducing academic underachievement in general and among gifted students in particular.

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Parents and Families in Nurturing Giftedness and Talent

JOAN FREEMAN

Institute of Education, University of London, U.K.

Introduction

Families vary greatly in composition—from isolated one-parent units in big cities, to large families which are well integrated within a local community; from African families where children are cared for by several “mothers” to large polygamous families where the father is shared, as well as residential homes for children without parents. The effects of the family touch all areas of life, such as how people can spend their time, how much they feel in control of their lives, and how children are encouraged to behave. It is not an easy matter to separate the effects of interactions between children and their parents from those with the wider culture, because each family provides its own unique mini-culture, “translated” and adapted from that of the greater society. This special context not only provides a guide for the children’s development, but also largely defines the opportunities in which all the family members can exercise their abilities. As far as we know, human parenting is not driven by instincts; every individual mother and father decides what to do, based on their own culture, experience, and hopes.

Due to its mediating role in a culture, the family “belief system,” or what is taken as “common sense” in one home, may bear little relevance to what is taken equally for granted by a neighbor. In his studies of creative people, David Perkins (1981) found that they were able to produce great works, not solely as a result of their talent, but as a function of their values and beliefs, demonstrated individually in terms of originality, knowing, and independence. Reuven Feuerstein (1990), using the Vygotskian theory of the family’s mediating role, described it as crucial to the promotion of giftedness. However, because there is still so little reliability in predicting that particular children, even in the most ideal circumstances, will be gifted adults, one could argue that it is only a belief system that the relative number of gifted children could be increased with the right nurturing.

The cultural idea that widespread individual excellence should be promoted is a relatively recent phenomenon, and is not yet prevalent world-wide. It came out of Germany in the late nineteenth century as part of the Protestant renaissance, a change

brilliantly described by the philosopher Isaiah Berlin (1991):

It took the form of the glorification of the individual, the national and the historical, against the universal and the timeless; of the exaltation of genius, of the unaccountable, of the leap of the spirit that defies all rules and conventions, of the worship of the individual hero, the giant above and beyond the law, and an assault upon the great impersonal order with its unbreakable laws, and its clear assignment of its own place to every human function and group and class and purpose, which had been characteristic of the classical tradition, and had entered deeply into the texture of the western world, both ecclesiastical and secular.

Individual Differences Within Families

Most studies of the effects of the social environment on children’s development examine wide factors that are supposedly similar for all the siblings in the family; these include the impact of social class, marital conflict, or pressure to perform. But a child is neither a passive nor an unbiased recipient. The rapidly growing field of behavioral genetics, which spans molecular biology and the social sciences, is offering a new view of environmental mechanisms in human development (Plomin, 1990). There are indications that the most influential environmental factors may be those which are different for siblings in the same family. These are termed *non-shared environmental effects*, and might, for example, include variations in how each child is differently treated by the same parent, peer relationships, school treatment, and when they are older, differences in their marital and occupational experiences.

Additionally, siblings may differ in the quality of the intrauterine environment, or in pre- or postnatal exposure to such biological environmental circumstances. Thus, there may be social or biological mechanisms which increase the differences between experiences which siblings have in the same family. Research in child development, such as that by Freeman (1983), shows the effects of significant but

not exclusively genetic factors. This pointed out that due to differences in their home environments, gifted children—who scored in the top 1% on the (relatively culture-free) Raven's Matrices test of intelligence, sometimes scored at a very much lower level on the Stanford-Binet test (contaminated by learning) when their environmental support was poor. It was concluded that genetic and environmental influences on IQ are unlikely to be in the same proportion for all children, but are instead a "sliding scale," which is not equal across the spectrum of ability: the brightest children are relatively more able to extract benefit from whatever environment they are in, and so do even better on most tests of achievement, such as of IQ.

The contentious area of the relative proportions of genetic and environmental influences on IQ scores has been considerably researched during the last half century, notably among populations of twins. Concordances are generally higher in monozygotic than in dizygotic twins, with closer correlations between biological than between adopted relatives. Whilst deciphering the relationships of the influencing factors still involves considerable dispute, twin studies have provided powerful evidence for the strong and independent role of the genes, notably on intelligence. The Minnesota study, begun in 1979, is by far the largest of these, having now enrolled 105 sets of both identical and nonidentical twins from around the world; and has achieved wide publicity because of the striking similarities observed in reunited twins. The findings indicate that about 70% of the IQ is accounted for by genes—the strongest correlation found for any characteristic. Genetic influences also appear to account for about 50% of personality differences, and about 40% of differences in personal interests. Environment, which these researchers recognize may not be shared by children from the same family, accounts for the other differences. They conclude that a child's life-long personality and behavior are largely established at conception, although parents can influence the development of traits (Bouchard, Lykken, McGue, Segal, & Tellegan, 1990).

Evidence for the effects of genetic influences on IQ scores has been found in problems of vision (Williams, Sanderson, Share, & Siva, 1988). Eleven-year-olds with refractive errors were compared with a normal group for IQ and reading levels, and found to have significantly better verbal and performance IQs; it was concluded that the differences were not explicable by circumstance. In a much bigger study, IQ scores and educational levels were compared for 5943 myopic and 9891 nonmyopic 18-year-old men who were being drafted for military service in Denmark (Teasdale, Fuchs, & Goldschmidt, 1988). The men with any degree of short-sight had significantly higher test scores (about 7 IQ points) and educational levels than all the others. One explanation is that this could be due to them having had to peer more closely for reading, which would increase their concentration.

There is also support for this view in the development of giftedness from *The study of mathematically precocious youth* (Benbow, 1987). Extreme mathematical reasoning ability—a critical component of mathematical talent—was considered to have six biological correlates: "left-handedness, allergies, myopia, and gender (i.e. being male), and possibly hormones and bi-hemispheric representation of cognitive functions." Extremely high verbal reasoning was reported to share these same biological correlates, except for gender. Further support comes from a Czech follow-up study on high intelligence in both monozygotic and dizygotic twins, which found that high intelligence was influenced much more by hereditary than by exogenous factors, and that intellectual level varied during children's development to adulthood (Drabkova, 1990).

In order to study family interaction effects on different siblings in a family, it would be necessary to define the individual difference between the siblings (in families of at least two siblings) and the relationship of these differences to simple family structural variables. Only then would it be possible to distinguish the environmental variables which are likely to be important in developmental differences. These could be relationships with the parents, as in the study which showed considerable consistency in parents' differential treatment of their children (Abramovitch, Pepler, & Corter, 1982). There are also the differences in the way siblings see themselves as being treated by the family, and peer group relationships can also be different for children in the same family (Csikszentmihalyi & Larson, 1984).

To some extent, these differences are attributable to recognized variables such as birth order, age spacing, and gender. Speed of reaction may also be an innate ability which shows itself in many facets of behavior that can affect relationships, etc., and which are regarded as an important if not vital aspect of intelligence (Eysenck, 1985). There has also been considerable evidence of the ability of even young children to shape the interactions with their families (Lerner & Spanier, 1978); Scarr and McCartney have suggested that to some extent, people make their own environments (1983). Long-term research (Reiss, Plomin, & Hetherington, 1991) has shown that children may identify with one parent and strive to follow the path of that example, differentiating themselves from the other siblings, and so accentuating different parent-child relationships.

Studies in various parts of the world have concluded that better nutrition leads to an improvement in children's IQ scores, correlated with increases in their head size and height (Lynn, 1989). Clearly, the better-nourished child will function more effectively at a biological level, and this can be expected to support a higher level of mental functioning; it could make the difference as to whether or not giftedness will develop in bad circumstances. This effect is recognized for instance in Brazil and some areas of the U.S.A., where feeding very poor children is an important part of school life; indeed, some children's motivation is to come to school

to eat. However, other aspects remain contentious, such as the effect of breast milk as distinct from cow's milk on premature infants, which was originally considered to increase IQ, although the most recent findings indicate that it is not the constitution of the milk, but rather the socio-emotional act of breast-feeding which provided the benefits (Doyle, Rickards, Kelly, Ford, & Callahan, 1992). In Britain, there is still much scientific dispute as to whether or not vitamin supplements can improve the IQs of well fed-children (Benton & Roberts, 1988). Experimental and control groups of children were asked to take tablets daily, some being placebos and others containing vitamin and mineral supplements; the researchers used a double-blind approach, so that neither they nor the children knew who took what. After eight months, no change was found in the children taking the placebo, but those who had taken the supplements had increased their non-verbal intelligence by 9 points.

Due to the fact that each child's situation is different, both in genetic potential and in the way each one reacts to their different experiences, none can be made to perform better than their inheritance will allow. Although under-achievement is always possible, outstanding individuals do appear unexpectedly in families of low cultural level. It will probably never be possible to predict such spontaneous changes in family patterns, because the deciding conditions are extremely complex; for example, one out of every five children carries a new gene mutation inherited from one of the parents.

Detailed studies of gifted children as they grow up at home are rare. In America, Feldman (with Goldsmith 1986) spent ten years following-up just 6 young boys, described as prodigies; he used a term from biology, "rare elements," to describe unrecognized events which are vital for gifted development. In a historical case-study of outstanding individuals such as Darwin and Piaget, Gruber (1981) saw a similar combination, and referred to such creative achievers as people in "networks of enterprise," i.e., they have many things going on at the same time. In a four-year research project, Benjamin Bloom and his team (1985) looked back at the lives of 120 young men and women who had reached world-class levels of accomplishment. The subjects told them that no matter what their initial gifts, those high levels of achievement were due to a long and intensive process of encouragement and teaching, usually combined with long hours of practice under parents who drove them hard. Although several crucial factors which appeared to help the potentially gifted to achieve highly have emerged from such studies, we do not know what the effect of similar parenting behavior would have been on other children, as there were neither comparison groups of families, nor any more intimate view of their lives—in fact, most of the Bloom interviews seem to have been done by telephone.

Discovering exactly how different kinds of influences are received by different kinds of children is also extremely difficult. Parental divorce, for example, might either cause a temporary halt to a child's development or

have life-long effects. Although the potential for talent may be present at birth, for most children it will not "automatically" emerge over the course of time, unless the right conditions are present. Furthermore, without an eagerness to learn, children of high potential will not put in the thousands of hours of work that are needed to develop their talent to a level of recognizable achievement (Elshout, 1993).

All mental abilities, such as thinking, although dependent on maturation of the nervous system, also need teaching; in this, they are unlike others, such as posture or sphincter control, which simply "unfold." The greatest interference with normal maturation is probably caused by starvation which, whilst preventing bodily growth, also prevents intellectual development. Both the duration of starvation and the child's stage of development while this is taking place affect the eventual outcome. Interferences in nervous maturation may also be caused by genetic disorders, poisons, diseases, or physical injury. Because both mental and physical growth are adversely affected by poverty, it is vitally important to remedy its effects as early as possible in a child's life. Extreme rates of maturation, whether fast or slow, are always difficult for a child, though the effects are considerably cushioned by the support of a loving and secure family relationship.

American research has found that measurements of certain aspects of learning in the first three years of life provide reliable indicators of life-long attributes, such as advanced physical control, which can predict gymnastic talent (Lewis & Louis, 1991). The strongest early indicator, which can be traced from the age of three months, is verbal ability, but spatial and nonverbal signs are also valuable indications for future talents. These researchers found that the greatest overall intellectual stability was at the extremes of the IQ range—both gifted and low—and suggest that this intellectual development is qualitatively different from that of individuals with more average scores. Indeed, the parents of the exceptionally high IQ children in the follow-up study by Freeman (1991a, and see below), compared with those of more average IQ children, reported very early signs of exceptional concentration, memory, and talking. Clearly, early infancy is the time when family sensitivities and influences are the most vital means of developing potential giftedness.

Children in very poor circumstances may need more than their families to help them reach a high level of functioning, however. In a longitudinal study of a group whose life circumstances were traumatic, Werner and Smith (1992) coined the term "resilient" children for those who managed to come through it to a happy and competent adulthood, compared with their age-mates who went on to sustained emotional problems. An important feature which distinguished these successful children was that they were "engaging"—able to command the attention of adults in their lives, especially someone outside the immediate family circle. Both Feldman and Bloom's studies described the

same phenomenon in the development of talent. But in addition, the cluster of protective characteristics found by Werner and Smith included above-average intelligence, robustness, and sociability, together with an external support system of responsive schools, religion, and youth groups.

Direct Family and Parental Influences

The earliest education is based on human communication of all kinds; the right experiences during the first two years, especially speaking and listening, are crucial to the development of high-level abilities. There is no lack of evidence that children's eventual intellectual development and outlook are dependent on the style which parents use in caring for them; from the beginning, the development of the urge to learn is tempered by opportunity. The perceptual responses of even tiny babies to shapes and noises can be related to the type of care they receive, which in turn reflects the care which their mothers were given themselves as children and are now passing on to their own. Harlow's (1958) observations of monkeys were the basis for work which showed how both animal and human behavior patterns are learned and transmitted over generations. But of course, the baby's individual responses are important. For example, girl babies seem to have more sensitive skins than boy babies, responding more positively to stroking, which reinforces the parent's pleasure in doing this, so that baby girls may receive more soothing attention of this kind; similarly, heavy babies often respond less quickly than thin ones, which must affect parental responses to them, and they seem to continue in this way as children.

All long-term studies on the development of talent have shown the cumulative effects of family attitudes (e.g., Bloom, 1985; Freeman, 1991a; Heller, 1991). In general, as children get older, there is a widening gap in average intelligence scores between those from differently supportive homes (Mascie-Taylor, 1989). A child's capacity to do well in life is heavily dependent on encouragement from parents, as well as on the type of home and neighborhood, and on the academic record of the school.

The Use of Language

Advanced language is probably the first thing to look for in assessing a potentially high intellectual level; it has an enduring quality and underpins many other later competencies, including mathematics. Recent evidence is showing that infants are able to manipulate language correctly, both in its comprehension and its production, earlier than had previously been thought. In intellectually gifted children, this is followed by the high-level cognitive ability to reflect upon and control language

using metalinguistic abilities—a reflective attitude to the comprehension and production of oral and written language—which is different from ordinary verbal communication, (Gombert, 1992).

In a summary of research on very early verbal ability and its outcomes, Fowler (1990) concluded that an advanced level of language in infants depends heavily on stimulation and practice from adults, such as being read to and talked with from the time of birth. Looking at the early lives of recognized gifted adults, he found that they had enjoyed an enormous amount of verbal stimulation, both spoken and written. Radford, too, in his survey of exceptional early achievers, found that although some appeared to come from homes of low socio-economic status, these homes were all lively, stimulating, and often highly verbal ones (Radford, 1990). Howard Gruber (1989) uses his "evolving systems approach" to explain high level creative work; this is a complex process in which the artist shows purpose, chance and insight, all of which are dependent on circumstances.

In very poor countries, literacy is often the key to the promotion of giftedness. Having a literate family both improves a child's chances of going to school, and encourages familiarity with the written word. But it can be unfortunate that education is identified with status, self-esteem, and empowerment, because not all members of the family are seen as having the same needs or rights. For example, where womens' lives are restricted to the home, they may be denied literacy; spoken communication is thought to be enough for them, all other communications with the wider (male) society being filtered through to them by their male relatives—in Bangladesh, only one in five women can read. But literacy for women has proven value: in an area of high illiteracy, where one group of mothers were taught to read and a control group was not, it was found that women with even a little education produced healthier and cognitively brighter children (Hundeide, 1991). Yet in societies which are repressive to women, they are the least likely to be educated. Such information suggests that the education of poor females should take precedence over that of poor males, certainly if the potentially brightest children are to emerge.

In his "socio-historical" approach, the Russian psychologist Vigotsky described every child as capable of taking on "ready made" parcels of culture as tools of thought, part of the cultural birthright (see Wertsch, 1990). He regarded speech as the most important mediator of developmental change. Successful teaching or mediation for learning enables children to experience a sense of mastery, so that they feel they have some control over the learning situation, rather than simply accepting information.

The parents are cognitive mediators with a special relationship. One particular aspect is the ability each of the participants has to interpret feedback from the other instantly, so that the necessary corrections can be made to keep the interaction moving in the desired direction. The dialogues of mothers and children are particularly

concerned with deciding what to do next, and then judging how well it is done. The cognitive functions most closely linked to family social relationships are the executive regulators—the way we plan, monitor, and check the outcome of problem-solving. Close friends of children, who spend more time with them than other children do, are also cognitive mediators, in that they help each other to understand the world. The system works because adults have learned it and share the same cultural assumptions, as described by Vigotsky's student, A. R. Luria:

Children develop language—a ready-made product of sociohistorical development—and use it to analyze, generalize and encode experience. They name things, denoting them with expressions established earlier in human history, and thus assign them to certain categories and acquire knowledge. Language mediates human perception, resulting in extremely complex operations: the analysis and synthesis of incoming information, the perceptual ordering of the world, and the encoding of impressions into systems . . . and thus serves as a basis for highly complex creative processes (quoted by Pickering and Skinner, 1990, p. 184).

But even within a strongly literate cultural tradition, one cannot make the assumption that parent-child relationships have a similar nature. Adult development is as important as child development: some mothers are aged 16 and some are 45—for this and other reasons, their mental and educational development may be quite different. The interaction between parents and gifted children is not just between them as individuals, but also between their cognitive capacities and needs, which change with age. For example, physical contact is most important in the first year of life, conversation and responsiveness in the second, responsiveness to the child's talk in the third, and from then on, more variety of contacts with a range of other adults. From the age of five, maternal responsivity is less important, but parental encouragement and the availability of a range of play materials and learning experiences remains salient. For example, a London study found that as children were learning to read, those who read out loud to their parents at home had markedly higher reading attainments than those who did not. This could not be explained by any factor other than their reading aloud (Tizard, 1985).

Interaction

Things that parents do together with their children have a far-reaching effect on the child's understanding: games, chatter, stories, working together, even arguments can be a stimulating means of fostering the child's intellectual growth. However, since the interaction operates in both directions, the problem for research is how to establish what results in what.

A highly verbal and demanding child, for example, can affect parents' behavior by stimulating them to have more conversation and read more stories aloud. On the other hand, parents who talk to children a lot are themselves verbal people.

Parents who have themselves been brought up in culturally impoverished circumstances may lack familiarity with easy verbal communication, which affects their children's intellectual growth. Cultural disadvantage usually brings three main psychological handicaps in the areas of perception and attention, verbal and intellectual abilities, and motivation. Those parents who, for example, give orders more frequently than explanations, are less likely to discuss daily events with their children. Where the children's questions are ignored or rejected, and play-material and psychological "permission" to play is scarce, their development will be accordingly narrowed, and bright children may have to develop complex strategies to get any verbal interaction from their parents. The intellectual poverty of children from unstimulating homes is already noticeable by the age of five years. Perceptual deficiency in children who are not talked with is shown by the fact that they recognize fewer objects and situations; not only are their interests limited, but they are less able to describe them.

It is not so much money as parental attitude which is important; strictly economic differences between families have little effect on children's achievement when attitudes are similar, except in extreme cases. Although those who live in poor overcrowded conditions often have other children around to see to their early needs for stimulation, when they begin to move and need opportunities for exploration, their perceptual development can be set back by the environmental disadvantages. In the same way, when a child begins to speak, it can be difficult in these circumstances to find opportunities to talk with adults. Yet in contrast, we also know that specifically designed care can have great positive effects on children who had previously been deprived of the most essential human experiences (Clarke & Clarke, 1976).

By adaptation from the study of animals (e.g., by Lorenz, 1965), it has been proposed that there are specific times in development when a child is sensitive to certain influences. Danger points in physical development were revealed at the time of the thalidomide tragedy—if the mother took the drug at a specific stage in the development of the fetus, the baby could be born with deficiencies related to that time. But the general existence of critical periods for cognitive development in human beings is less sure, although foreign language learning does seem to be affected in this way. Since attempts to acquire another tongue after 15 years of age are very much less successful than earlier learning, it is important to start language teaching as early as possible. In general, however, the benefits of good learning experiences in the early years can be lost if subsequent experiences are bad, and conversely, there can be substantial recovery if early bad experiences are followed by good ones in middle childhood.

Maria Montessori designed a system of early childhood education using the similar idea of “prime developmental times” (Montessori, 1964). She wrote that should those special times be used well, then good learning will happen, but if not, the moment may pass and the child may not have the chance again. Tinbergen showed that an infant duck’s attachment to its mother had to be made at a critical time, while the same was shown by experimental work with baby monkeys and different kinds of substitute mothers (Harlow & Harlow, 1965). Intellectual progress is “at risk” between 7 and 36 months, because that is a period which is particularly sensitive to lack of good stimuli. In the United States, Burton White concluded that probably not more than one in ten children get sufficient educational input at that time for the fulfillment of their potential (White, 1985).

It may be that some stages of development may be critical but others merely sensitive, as when a child is rather more open to learning. Precise information on the effects of differing amounts of deprivation at these times is lacking, however. Finding that children were more receptive to color, shape, sound, and texture between 2 to 6 years than at other times, Montessori believed that if a child is taught something too early, this may result in a dislike for it; too late, and the child may have already have lost interest.

Imitation

The ability to imitate is extremely important in learning, and without it, the gifted would not reach their full potential. So fundamental and universal is this human ability that its absence in newborns is a sign of retardation. It is the way children learn in a nonliterate society, success being followed by the rewards of praise and further responsibility from older people.

Imitation is not only a means of learning; it is also an emotional bonding process which begins from the first day of life, with the two-way imitative “conversations,” which mothers and babies enjoy. Mothers introduce their babies into their culture, such as one would do for a verbally helpless foreigner, establishing a “dialogue” with him. To do this, she is sensitive to what her baby initiates, as well as suggesting and demanding certain behaviors from him. She encourages the activities of which she approves and discourages those she considers inappropriate, trying to extend the baby’s grasp of what is appropriate by being sensitive to signs, which she can reinforce, that he is understanding what is wanted of him. It is not just physical behavior that she is molding, but a conceptual learning system. The mother–baby dialogue is most certainly a two-way process, its success depending on the sensitivity and tolerance of both parties. The normal child becomes a novice version of the adults in his family, while the mother, by putting into action her *assumption* that the child is creatively intelligent, acts as a skilled applied psychologist.

These social interactions continue throughout infancy, well before babies begin to produce words, which is usually at the age of about a year, and they can be started by either of the pair, or with others in the family. For example, mother looks at baby and baby catches her eye; then she leans forward and says “Who’s a lovely baby then?” Baby purses his lips and coos. She copies. He does it again. And so on, until interest fades. The style of the mother–baby relationship can be set within the first few weeks, and is very much influenced by this earliest social life.

Babies initiate as well as imitate, making their own mark on their world. For example, those babies who are demanding receive special family attention and resources, and if these demands are of an appropriate nature, they can stimulate the infant’s intellectual development. But this option is not open to all babies—interaction is the key. It is only in families where the parents are good communicators that the baby’s demands are likely to be beneficially effective. This implies a specifically active role for the baby, but one which positively involves the parents too. It is open to question, though, whether demanding babies are always those with the potential for high ability, and whether parents should stimulate passive babies into demanding more, on the grounds that this will encourage intellectual development.

By seven to nine months old, all the basic emotions can be detected in a baby, each being important through the way in which it builds intellectual behavior. On the other hand, emotional deprivation, which may occur at any level of society, can severely damage both personal and intellectual development. It takes considerable energy for a child to remain emotionally balanced in an unstable psychological situation, where it is correspondingly harder to focus on a specific endeavour, to concentrate, and to be competent. This diversion of energy can even be observed in physical maturation; when an infant is unhappy, she can drop back in her rate of learning to walk because of the psychological demands involved. Language development can also suffer, the child falling back into an earlier style of communication until the acute stage is over. Whatever a child’s level of ability, when this emotional instability happens early in life, it can put a brake on learning how to learn. The results may be seen in school, where even children of high potential who are suffering emotionally do not reach the high levels of attainment that might have been expected of them.

In most societies, mothers not only provide a baby’s introduction to the prevailing culture, but are the prime mediator in its experiences of the outside world. It is their mediating role which Feuerstein believes has the greatest importance for children of very high ability (Feuerstein, 1990). Babies are highly sensitive to the kind of care they receive; by two weeks old they will respond to the mother’s characteristics, such as voice and smell, and by six weeks will become distressed if the social contacts between them are even slightly

disturbed. Between three and six months a baby starts to discriminate between the expressions on people's faces, and from three to nine months will search for clues from other faces. Very early development is also very rapid.

The mother's emotions influence this mediation, which can significantly affect the intellectual growth of the baby. Even infants of ten weeks can recognize the difference between happiness, sadness, or anger in the mother. Her happiness encourages them to explore, joy in one producing joy in the other, whereas her distress causes them to withdraw, her sadness producing sadness or anger. The implications are profound. A negative emotional atmosphere inhibits good learning, but positive emotions have an encouraging effect. Any condition that causes stress to infants increases their need for their mothers, and decreases their urge to explore. What is more, when toddlers experience a series of anxiety-arousing experiences, the effect is cumulative. Sensitive parents are aware of times when the baby's attention begins to diminish, and change their behavior to keep its interest, such as a change of voice or holding the toy in a different light. Infants cared for in this way are more likely to persist with their own explorations later on—especially as the tasks become more complex.

Roles

Learning life's complex roles is part of the socialization which all children undergo in all cultures. Social roles are similar to dramatic parts, and although the player may not realize it, keeping up a role is generally a two-way process, even in childhood. It involves teaching by adults, as exemplified by the admonition to a small boy not to cry because that is what only girls do, which affects the development of the way he sees himself in the eyes of others.

A child's position in the family, be it first, second, or fifth, can have a considerable effect on role-expectations. First-born and only children strive harder to please their parents because they identify more strongly with them, and in addition to having higher IQ scores, they usually achieve more than their siblings throughout life. Even their leisure-time pursuits often have an educational aspect. There are also recognized personality characteristics for each child's position in the family. First-born and only children are more likely to be more concerned with the effect they have on adults, and to be more responsible; the second-born is more easy-going and has more friends; the third-born is often more difficult to live with; while the fourth is often babied and so learns to be more dependent.

The Promotion of Motivation

Motivation to learn and to act is directly affected by the family, as it molds the child's earliest outlook; in this, the major emotional influence is probably self-esteem,

starting in infancy, when good feelings about themselves enable babies to take some control over their behavior and expectations, and to associate learning with pleasure. Lehwald (1990) concluded that the major base of future problem-solving behavior at a gifted level is an infant's curiosity coupled with confidence to explore the environment, which each one acquires as the result of favorable social processes. There is evidence that four-year-olds who have high self-concepts are not only more intelligent and socially responsible, but better able to plan ahead, which is a vital part of creative thinking (Mischel, Shoda, & Rodriguez, 1989). However, these studies involve difficulties in measurement, for example in accounting for the effects of influences such as gender, education, and socio-economic status.

Empowering children by giving them a feeling of competence and a goal to aim for (even examinations) generally increases both their motivation to study and the accompanying rise in level of work (Freeman, 1992). On the other hand, too much adult control can undermine this by requiring constant dependence on someone else's decisions, because it removes their "locus of control"—the place from which power comes (Rotter, 1966). If children see control of their learning as outside themselves, resting with the teacher or some other authority figure, then they will tend to be less involved and motivated to work. The urge to learn may also be improved when poorly motivated youngsters are empowered to help others, as when unsuccessful adolescents take on the role of tutors to younger children.

Self-Efficacy and Motivation

Bandura's theory of "self-efficacy" (1977) is concerned with explaining aspects of children's achievement motivation; it is seen as a psychological mediator, which intervenes between cognitive processes and action, while an efficacy expectation is the conviction that one's behavior will produce a desired outcome. Such expectations would influence people's choice of activities, how much effort they will expend, and how long they will persist at it. Individuals who perceive themselves as highly efficacious are expected to act, think, and feel differently from those low in self-efficacy, though the levels of it will vary over time and across tasks. They are more likely to set themselves challenges, persist longer at difficult tasks, expend more effort, and have fewer stress reactions than others when tackling difficult or threatening tasks.

Although both the self-concept and level of self-efficacy are formed through experience, there are probably more differences than similarities between the two. "Self-concept" is a relatively imprecise emotional construct, whereas self-efficacy is a cognitive construct, based on narrower and more consistent definitions, but both are situational rather than general, and so might lead to more precise, valid, and useful research findings

on the psycho-social development of the child. The evidence of accomplishment provides potent feedback about abilities. Bandura states that learning by imitation, although a weaker source of self-efficacy, has also been shown to promote it, as can verbal persuasion and emotional arousal, which can convince people that they will succeed at a task.

Improving Motivation Through Feedback

Knowing how well one is doing allows aims to be set at an appropriate level, avoiding both certain failure and too-easy success. Both success and failure tend to perpetuate themselves. A parent or teacher can modify feedback to give a child the feeling of success by raising the standard of the task, such as in learning to read, so that when the child succeeds, her outlook on learning is encouraged to be one of success and optimism. Motivational factors are as important to high-level human accomplishment as intellectual ones. The existing body of research on intrinsic (deep and meaningful) motivation, as distinct from superficially trying to please, is particularly relevant for high levels of performance. Ryan, Connell, and Deci (1985) analyzed over 200 studies on motivation, from which they formulated a theory of human motivation, which included personality factors. They found that when children feel competent, it motivates them to exercise and elaborate their abilities.

The best kind of motivation is intrinsic—that which is generated by interest or relevance in learning, and which is fired by children's belief in their own effectiveness. That energizing kind of assurance in one's ability to tackle a task comes best from positive personal experiences, especially from feedback that children have received from home and school on how well they did. Some of it they can see for themselves, but if other people's responses are to be effective, they must always be genuine, whether good or bad; simply giving praise for every effort, however little deserved, is not as effective in producing feelings of success.

Yet despite the importance of feedback, the situation is not entirely controllable by parents or other adults. Children can interpret feedback in different ways, depending both on the psychological context and on the child's personality. Telling one child he is doing badly may be interpreted as an excuse to stop work because it does not seem worth the effort, while for another, the response may be an increase in motivation to prove "them" wrong. Paradoxically, too much praise, particularly in a system of close supervision, may tell a child simply that he is doing the bidding of the teacher, rather than personally exploring the area of study and so developing his own competence. This can undermine intrinsic motivation, because it then becomes psychologically impossible for the child to feel in control of his own progress in learning.

All children, whatever their ability, want to feel effective and engaged by challenge, which must include

a risk of failure. The gifted need challenge at least as much as any others. Experimental work has shown that if children are given a superficial reward, such as money or sweets, they are far more likely to choose the easiest ways of succeeding, whereas if they are enjoying the activity for itself, they choose harder tasks, usually just above the level of previous success. When children are interested in what they are doing, they seem to have a natural tendency to take on challenges that exercise and expand their limits of competence.

Positive feedback, particularly a positive attitude on the part of adults, can be very effective. There is always something specific to praise, some form of recognizable success, and the possibility of offering a reward. Negative feedback, such as sarcasm, punishment, or detention, are much less effective: for emotional reasons, the child may have been seeking extra attention, and such punishment may simply fulfill what was wanted.

Social Cognition

Social cognition is the way an individual perceives other people and comes to understand their thoughts, emotions, intentions, and viewpoints. The processes by which children manage this is by the mental representation of mental states, such as beliefs, desires, and intentions. This development not only comes from a form of social role-taking, but is also tied up with personality formation. It is described in the theory of "personal constructs" (Kelly, 1955), in which people are seen as scientists, in the sense that we can all be seen as placing our own interpretations (theories) on the world of events confronting us, and from these personal theories, derive hypotheses and make predictions about future events. The way we behave is the "experiment" in which feedback from the environment determines how we behave in future. It is also described in Wellman's "theory of mind" (1990)—the ways in which children use their emerging intelligences to think of the objects, events and persons around them in a coherent way. Gardner (1991) calls this "intuitive understandings."

The theory of mind is used, for example, to make sense of the following scenario: a man comes out of a house, hesitates, then turns back into it. One might infer from his actions that he remembered leaving something inside, wanted to retrieve it, and believed he left it there. Indeed, all human communication requires individuals to share some understanding and suppositions, as well as wanting to communicate. Children who grow up in conditions of severe neglect, and so fail to develop an adequate, flexible theory of mind, can later be disadvantaged in human relationships, self-awareness, and feelings of competence as a result.

Children's experiences in the family are used to develop a system of inferences from the way they see others, which they then use to make predictions about these people, especially in relation to themselves. The development is part of every infant's learning, coming

from the earliest social relationships it is essential to people's understanding of each other's behavior, and consequently to how they think and behave themselves. Although social cognition is related to intelligence, actual social behavior comes from children's involvement in a variety of social situations, and benefits from adult guidance. Socially positive attitudes, such as being sensitive to the feelings of other people, are more often shown by confident young children, especially if they are highly intelligent; these are also better at making use of adults as resources, and tend to play more imaginatively.

To explore their awareness of other people's feelings, children of 3–6 years old were asked to predict what someone else would like as a birthday present, rather than what they themselves would have liked to receive (Flavell, Botkin, Fry, Wright, & Jarvis, 1968). Each child was presented with an array of objects, and asked to select a birthday present for each of his or her parents, siblings, and teachers. Choices were judged as role-appropriate on the basis of age and gender. The 3-year-olds disregarded both the age and gender of the intended recipient, while 4- and 5-year-olds' choices represented a type of transitional level, and all the 6-year-olds made appropriate role responses. Age seemed to improve social cognition, which was more advanced for the brightest children in each age-group. However, the available research does not reveal a recognizable relationship between social cognition and actual behavior towards others, whether intellectual or emotional. Neither does this seem to be the case for moral reasoning.

Leadership is usually considered as an outcome of gifted social cognition and moral reasoning, combined with prosocial behavior—that which is beneficial to others. It can be defined as a process which changes other people through influence and control on a consistent basis, as when a child has many friends, but it is not dependent on an exceptionally high level of intelligence, since personality characteristics and social situations play a major part in developing it. Although it may seem reasonable for leaders to have a high level of social cognition, because they must understand the perspective of others to effect change, it has to be recognized that leaders can be removed from normal life, being both brilliant and evil. For instance, Hitler and Stalin dramatically influenced, controlled, and led millions of people to disaster without any recognizably high level of social cognition.

It is strange that highly intelligent children are often thought of as having poor social cognition and therefore few friends, but in fact, as research has shown (Freeman, 1991a), they tend to have sympathy, adaptability and compassion in abundance, and do not usually choose to be without friends. If they do not seem to want to make friends with others of their own age, it can be because they have a high level of self-sufficiency, which means that they are happier on their own for longer periods of time than other children—or they may have been

discouraged from playing with other children by their parents' unspoken, but understood disapproval.

In his theory of multiple intelligences, Gardner (1985) recognized that the "personal intelligences", i.e., knowledge of self and others, are an important part of the sensitization of young people to moral and ethical issues. He suggested that this is an integral part of education, especially for the highly able who may become leaders; the emphasis would thus be shifted from psychological "adjustment" to positively recognizing and developing emotional and social sensitivity as abilities in their own right. It is clear that both families and school must be concerned and actively involved if children are to develop prosocial behavior, especially to a gifted level.

Evidence of Family Influence on Giftedness From Longitudinal Research

The author has conducted a follow-up study of gifted and nongifted young people since 1974, looking for the often subtle influences which have affected the development of their abilities, achievements, and happiness (described in detail in *Gifted children growing up*, Freeman, 1991a). The study was unique in its deep, counseling-style interviewing with the young people, and also in the wide approach taken, through investigating their families and schools, to provide an all-round perspective on their lives. It had two parts.

The first study was carried out between 1974 and 1978. In this study, each child in the Target group—those whose parents had identified them as gifted (with or without tests) was matched with two Control children for sex and age, all three being in the same school-class, so that education and socio-economic status was held as constant as possible. The first Control child was matched for measured intelligence, and the second Control child taken at random in that respect. Holding the wider context steady meant that differences in the families and in the children's feelings and behavior could be more readily seen. Their teachers were interviewed in the schools, while the parents and children were tested and interviewed in their own homes. The 210 children were aged five to 14, taken from a population of 4500.

The children who had been labeled "gifted," whether they were so or not, had far more behavior problems than those of equal ability who were not so labeled, at a 1% level of significance. It was clear that the description of "gifted" by the parents was associated with social behavior and not with ability alone. However gifted they actually were, those who underachieved were found either to have emotional problems or lacked appropriate educational facilities at home or school. High-level achievement was associated with the provision of practical materials and good tuition, as well as with parental involvement and example in their learning. The possession of an exceptionally high IQ score was not in itself related to emotional problems, but rather to other difficulties in the child's life.

The follow-up study was carried out between 1984 and 1988. The follow-up sample was statistically valid and representative of the different groupings at 81% ($N = 169$) of the original children and their families. They were now aged 15 to 24; 60 girls and 109 boys. The survey involved about 350 interviews of many hours each, again conducted in the young people's and their parents' homes, across the country. Although the interviews used a prepared, pre-rated questionnaire, they often became more like counseling sessions. The bright young people were mostly very articulate and keen to discuss—at times into the small hours, which is an excellent time for communication. The same story sometimes took on quite a different slant when seen through the eyes of children and parents respectively; even the effects of the grandparent's lives could be seen on their grandchildren's attitudes.

The audio-taped interviews were transcribed on to computer disk. Eventually, 338 filled-in questionnaires as well as about 500 interviews and report transcripts, were rated. Analysis was both statistical and by repeated readings of the text. When the original experimental groups were re-examined, many of the emotional differences between them had diminished to the point of no significant statistical significance. This may have been either because the labeled youngsters had grown out of their childhood problems, or because they had simply left the pressures and restrictions of home and school behind them. However, many strong differences did emerge between different groupings of the sample, notably with regard to family dynamics within the general social culture.

The Family Effects

The most pervasive social influences on an individual's education, which applies from birth, is family outlook; its effect on the gifted can be both different and more powerful because the stakes are much higher. In this study, parents were able to fill in details which would not have been seen in more conventional research methods about longer-term family effects. These were rarely due to wealth (the families ranged from very poor to very rich), but rather to people's ideas about themselves, their self-concepts, often recognizably related to social status, and gender. When a highly gifted boy refused to go to university (which is free in Britain) because "it's not for the likes of me," he was listening to past social values, and not the reality of today. When a father refused to allow his gifted daughter to study her choice of science because it was "not for girls," he decreased her chances in life; she was in fact less competent at modern languages, which she studied instead.

Home outlook is effective in enabling gifts to grow in many ways, but these are not always obvious. It may be seen, for example, in the amount and quality of homework that a child does (Timar & Kirp, 1988). In every country, children who are assigned homework

regularly, complete it, and have it marked, will perform better at school than those who do none. Even though there is a wide variation in how much homework different schools require, parents who approve of it often see a heavy load as a sign of a caring school, and some highly successful children even set themselves extra problems to do at home. Schools in poor areas sometimes make the premises available after hours to those whose homes are not conducive to study.

Family outlook and style of living was highlighted, for example, in the young people's television-watching habits. When those who watched more than three hours a day were compared with those who watched less, although there were no differences between the groups in sex or intelligence, a number of significant family aspects emerged. Those who watched less described themselves as distinctly higher up the social scale, more likely to be at academically selective schools than at comprehensives, had longer concentration spans, and enjoyed more outside activities. When they did watch television, they preferred more serious programs. Their television watching had also been much more closely monitored when they were young, and they were much less likely to be given absolutely free choice of time or content.

A modest family background could have a more profound effect on potential high achievers than on those of average ability: this was because they were more likely to change their educational environments, and thus have to operate in a somewhat different social setting. The move could come in childhood via a scholarship from the local elementary school to one which was selective, private, specialist, or boarding, or it could come later with entry to one of the more prestigious universities. Whenever it happened, the gifted individual would be well aware that it was made because of her brain power or talents, and that her social and educational background was not the same as that of most of the peer-group. This was sometimes difficult to cope with, for example, for children who did not feel they could invite their classmates to their modest homes.

Gender

Charles Kingsley, the English poet put the issue clearly—"Be good sweet maid, and let who will be clever." Very many studies have shown that from earliest childhood, families encourage boys more than girls to be independent, self-reliant, and able to assume responsibility, and that this alters their approach to both school and work (e.g., Mackey & Hess, 1982; Walden & Walkerdine, 1985; Fox & Zimmerman, 1985). In my study, over 30% of the boys, compared with 5% of the girls, said they found their greatest satisfaction in achievement—a basic difference in attitude, from which many other factors stemmed, including actual achievement. In addition, the boys were more ready to see their success as due to their own ability and

hard work, whereas the girls often looked upon it as something outside their control—luck—though they accepted their defects as their own faults.

Of this sample, more boys had gone on to university, the girls often settling for less selective colleges and polytechnics. So in spite of all the girls' hard work in well-run schools, and the parents' protestations about equal aims for all their children, both the girls and their parents appeared to be satisfied with a less intellectual form of higher education for their daughters than their sons. Some of the girls even spoke of being discouraged by their teachers, who sometimes directed those of the highest intellectual ability to nursing and art college rather than to university. Every one of the girls in this sample who had gone to university had been at an all-girls' school for most of her school life, and every one of the 17 boys who had gone to university from a comprehensive school had studied science. This extraordinary division may be coincidence, because the sample is not large, but it is in line with evidence from much larger studies.

When parents were asked whether boys and girls should have the same opportunities in life, virtually all replied that they should. But deeper questioning and observation sometimes exposed the old division—science for the boys and arts for the girls. In fact, three times as many boys as girls specialized in science, and more than twice as many girls as boys chose arts subjects: similarly, the parents of the girls were decidedly keener to have music appreciation taught at school. For all girls at school in Britain, as they get older, the likelihood of being taught science by a woman, and so seeing a woman in a scientific role, becomes less. In 1985, for example, 56% of ten-year-olds in Britain were taught science by a woman, but the proportion in 1992 fell to 31% for 14-year-olds, and was only 14% for 17-year-olds. However, not all the parents would even pay lip-service to the idea of equal opportunities. Even in the last decade of the twentieth century, the forces of prescribed gender roles were still seen to be molding the lives of these gifted girls and boys.

Family Progress

Opportunities in education have been improving over the generations throughout the Western world, but some families manage to make better use of them than others. One of the advantages of this long-term study was an overview of the accumulating influences of family outlook over three generations on the education of these children. It was clear that many of their parents and grandparents were very bright, though relatively uneducated; in so many cases they had been keen to study in their youth, but their chances had been blocked by poverty or social disapproval. Sometimes the goal of higher education needed several generations to reach. Very few of the parents in this sample who had left school at 15 themselves still assumed that their offspring

would do the same, and most made every effort to help their children to post-school education.

There were some remarkable stories of how quickly families had changed their lifestyles across just a couple of generations when the opportunities for betterment were presented, after perhaps hundreds of years at a basic level: as one graduate mother said: "My mother went into (domestic) service at about 15, so she had no education." For another family, all four great-grandparents were Scottish subsistence farmers, but one son had struggled via night school to become a school teacher, then his son, through apprenticeships and night schools, had become a qualified chemist. Now his son, as gifted as his forebears had doubtless been, had reached Edinburgh University.

The Effects of Pressure

There are parents from every walk of life who want their children to fulfill their dreams and who are prepared to spend great amounts of energy and money to make them come true. A handful of the gifted young people in this sample seemed to be squeezed to the last drop of effort to do better and better. For some, the fact that he or she could achieve the results without much obvious effort was not good enough; they had to be seen to work for them. For such parents, a "good" school always "stretched" their children and had a record of high examination success. But some youngsters, for whom the pressure had accumulated to an insupportable level, did suddenly opt out of school, just before the end; they were making their bid for freedom, with some unhappy results of disillusion and lost directions.

It was not always possible to tell where the pressure came from—how much from the young people themselves and how much from outside. For example, one boy's determinedly achieving parents were both scientists who said they simply could not imagine a family where people were concerned about the arts. The same was true of the boy himself, who spent all his time and energy on scientific study, to achieve the highest possible marks and early entry to university, but to the clear detriment of his emotional development. He knew that his self-esteem depended on the academic rewards he could present to his parents, and was worried that one day he might no longer keep up the pace.

Pressure from home was also imposed on young people who were seen as gifted, but who in fact were not. As these children could not live up to this ideal, it promoted a remarkable variety of excuses from the parents, as well as some depression in the children.

When a decision is made to accelerate gifted children to a higher class at school, both parents and teacher had acted sincerely, in a way that seemed right to them at the time. None, though, had asked any of the children what they themselves would have preferred, and for most in this sample, normal growing-up problems had been exacerbated by this acceleration in school, which

was illuminated by talking to the whole family about the process.

Disadvantage

Not all the gifted young people in the follow-up study had developed steadily over the years; some who had been well advanced and full of promise ten years earlier were found to be working at only an average level. Could this have been the “burn-out” syndrome? There was no evidence of that, but rather that for some children, progress had been impeded by the circumstances of their home lives. Even in modern industrial societies there are pockets of poverty, and where wealth usually provides opportunities for educational progress, poverty has the opposite effect. In a cold, damp home, where the quality of food is poor, illness and depression are common. All children in those situations suffer, but it is an added detriment to a child of high potential that intellectual stimulation is often also inadequate. Whilst the parents certainly love their children and want to help them, some were simply not able to provide what their gifted children needed. And even when the school tried to help, family culture was not always able to accept it.

Poorly cultured families are often intellectually deprived, most noticeably in the lack of breadth and flexibility in their use of language. A broad language base is vital for building knowledge (see Wertsch, 1990), yet for some families it is almost a time-wasting luxury. For them, communication is more practical, sufficient for everyday needs and feelings, but not enough for problem-solving and creativity. Where intellectual stimulation of the young child has a low priority, his or her curiosity is less likely to be appreciated, and spending time reading books and thinking can be unacceptable behavior in such a home.

One example of a young person pulled between the two cultures of home and school was a girl of 17. She had been born to parents who loved her, but were so different from her in ability and temperament that she was almost like a visitor from another family. As communication had become more difficult, she had developed some resentment towards them, simply because they could not give her the support and direction she so desperately needed. She did not approve of her negative feelings, but was slowly beginning to give way to her home culture. Her teachers had tried but failed to help this obviously gifted girl. She often truanted from school, and had become disruptive when she did attend, to the extent that she was banned from the school from time to time. But she still did extremely well in her examinations.

Another example of poor family influence was on a gifted boy, who was conscious that his great physical and mental gifts were under-used. His poor self-confidence and lack of sophistication had kept his ambitions very low. His considerable leisure time had few positive activities; his reading was minimal and even his television

watching was desultory. However, he had been selected at 11 for an academic school and said: “I knew I could do better than most of them. I was one of the best in the class, but it was boring and . . . I left school.”

Being Gifted and Different

Throughout the study, those in the top 1% of the IQ range had said they felt different; this was at a high level of statistical significance (1%). For most, the gifts which made them different were a source of pride and pleasure, just like any other blessings of nature. Parents saw the feelings of difference as starting very early in life and suggested that the bad aspects were due to other people—“Alison was always top at school, so some parents counted their child’s order in the class as though she wasn’t there. She used to keep her hand down in the class, things like that, so she wouldn’t stand out.” But those less happy aspects usually diminished with growing up and the increased freedom to choose companions more like themselves.

Since the first part of the study, several of the young people had lost contact with one of their parents through divorce, the boys appearing to be more adversely affected than the girls. Two gifted boys had been suddenly deserted by their fathers at educationally crucial times; in one case this was without warning, just three weeks before his school-leaving examinations. In both cases (according to the mothers), the boys’ outstanding abilities appeared to have played the catalyzing role in those events; the fathers had left just when the boys both had their greatest need of security and were also about to display evidence of their exceptional abilities, which were greater than those of their fathers. In spite of their emotional shock, both boys excelled.

Of the eight gifted young people (out of more than 100) who said their giftedness was an insuperable barrier to making relationships, all but one were male; their loneliness could be terrible, and by the time of the follow-up study, the outlook from this point of view seemed bleak for them. Like “academic ostriches,” they had buried their heads in their studies, thinking that the rest of the world could no longer see them.

Sigmund Freud was the first to describe the workings of psychological defences, which some of these intellectually gifted youths were hiding behind (Freud, 1937). In his view, protective emotional strategies are formed when people are confronted by an anxiety-provoking situation and unconsciously avoid seeing it. The favored psychological defence of some of the gifted, especially boys, was to hide behind a facade of scholarship, so withdrawing from the normal process of learning to make relationships. The psychological defence systems they had built against anxiety had started in early childhood, and at times seemed to be encouraged by their parents, who took this as one of the mythological “signs” of giftedness. Over the years, their withdrawal behind those barriers had become extreme in a few

cases, cutting them off from emotional contact with others. Six young men had gone so far as to almost sever any intimacy with other people—a process which they all blamed on being gifted. One explained: “The only school activity I was involved in was the Christian Union. I also worked in the school library for six months as an assistant. I had a really good time then.” Another had moved ever further into isolated study, cutting down on his feelings towards other people, and moving closer and closer towards the stereotype of the gifted scientist; peering down microscopes by day and returning alone to his room at night. His father approved of the solitary research work his son was doing, as he said it suited his character.

Yet measured ability, no matter how high it was, did not affect the majority of these gifted young people in their ability to have good relationships, and many were exceptionally empathetic. In fact, those who said they used empathy consciously and frequently in their daily lives were most often the intellectually gifted; quite a few of them used this ability to help others.

Conclusions

Research has shown how almost all babies are born with considerable potential, but it is clear that only some develop this to its full power, and fewer still to a level of excellence. What is it that makes the crucial difference in later behavior between people who start out in life with much the same potential ability? Because the first few years of life is the time when the bases for learning are formed, to reach the very highest levels of achievement, the necessary means with which to start this progress must be present even in infancy. That vital provision starts in the family.

What kind of families promote giftedness? There is no single type of parent-child interaction which is critical to the development of high-level abilities in children. The process is complex because parents and children each have their respective intellectual capacities, as well as their own personalities, but genuine and regular interaction between parents and children is decidedly effective. This may move on to a variety of mutually pleasurable activities and experiences, such as listening to music and exploring interests, but if the child's involvement in these should begin to fall off, and parents feel that it is justified, then there is a place in the family for discipline and some gentle pressure.

It is also clear that the way parents conduct their lives is a very powerful way of teaching their children—it was example and not expectations which made all the difference to the children in my research study. The parents who had the most positive effects on their children's high-level development were not those who told their children what to do, but those who did it with them. Although parents act as models, in modern societies the children do not simply imitate them, nor swallow their ideas whole. Instead, using cognitive

strategies, each child absorbs and then evolves its own values from what has been seen and experienced.

It is essential for potentially gifted children to have the materials with which they can learn—both in terms of physical equipment and adequate tuition about how to use them. Would-be artists need far more than a few scraps of paper and a pencil stub, a mathematician needs a teacher, a linguist has to hear the language, and a budding violinist needs a violin. They need to be taught specific skills and be given the opportunities to practice them.

However, the ways which are the most likely to enhance children's high-level learning, and which will last through life, do not require a great deal of money. In many parts of the world, for example, education authorities provide extras virtually free, such as a public library service, even if parents have to seek some of them out. Parents do have to be both willing and able to make the effort, if their children are to take advantage of the opportunities that exist around them (Freeman, 1991b).

Although gifted children are possibly more sensitive than others to emotional nuances in the family, there is no evidence that they are emotionally less stable than other children—even though it is sometimes argued that they are. In fact, the evidence is that the gifted are emotionally stronger than other children, with lower levels of anxiety, higher productivity, and higher motivation (Terman, 1924; Olszewski-Kubilius, Kulieke, & Krasney, 1988; Czeschlik & Rost, 1988). Perhaps those who are to be high achievers need to be stronger than most because their exceptionality makes them more likely to come up against some special problems. This implies that for them, the adaptation to social and emotional life may actually be somewhat more difficult than for others, calling for greater than usual family support in terms of love and security.

In their exceptionality and their sensitivity, the gifted sometimes construct complex, inhibiting psychological defences against expected hurt. A common variety is to hide behind academic, intellectual walls of their own making, implying that they are too clever to have normal relationships with ordinary people. Alternatively, they may present themselves as being bored at school, and so never acquire the routines of learning discipline, which can be difficult to pick up later, and so this defensive boredom becomes a downward spiral, getting worse and worse. Like other children, the potentially gifted with emotional problems generally achieve less well than those of the same ability who enjoy peace of mind. The best results in human terms are found when children are treated with respect, allowing them enough responsibility to make many of their own discoveries and decisions. There are some, though, especially in the arts, who seem to have an inbuilt impetus—a spark which can light up the world, bringing them great inspiration and success.

This wide variation of families and styles can be accentuated in the nurturance of giftedness, such as the upbringing of William Sidis, whose major reason for living, at least in his father's eyes, was to be

brilliant (Wallace, 1986). He grew up to be an emotionally impoverished man, who was unable to use his extraordinary gifts to any advantage.

The gifted need time to "stand and stare," to find out about life at their own pace and in their own ways. Yewchuk and Jobagy (1991) have pointed out the vulnerability of gifted adolescents, which they have found to lead occasionally to suicide. To be healthy, there has to be a balance in everyone's life, and for the gifted adolescent that includes good relationships, developing interests outside study subjects, and taking part not only in school, but in many other activities (Passow, 1991).

Summary

Good parenting for nurturing and enhancing children's giftedness involves the following (see Freeman, 1991b):

- (1) Interaction between parents and children from birth, which is positive and supportive, providing a structure in which a child can grow with security.
- (2) Meaningful stimulation, which provides opportunities for children's learning, including other people outside the family, especially as the child develops interests which may need specialist help.
- (3) A variety of experiences, which can be followed up by the child if wished.
- (4) Provision of both materials and tuition with which to reach advanced heights of learning and creative production. This includes good relations with the child's school.
- (5) Gifted children need the emotional freedom and materials to play and experiment, both for their mental health and for creative thinking.
- (6) Teaching skills are needed by parents to develop general and specific areas of their children's potentials. This starts with the basic teaching of language, and through it the family culture.
- (7) Sensitivity of parents to their children's potential talents from a very early age is different from attempting to mold them into the image that the adults may prefer. Knowing when to take action and when not to is a matter of sensitivity. Parents also have to be aware of their own feelings, notably to avoid labels and categories such as gender, in bringing up children who can demonstrate their gifts.
- (8) Real emotional support is not quite the same as love: parenting in the name of love can be directive and so inhibit the growth of children's gifts where they are not acceptable. Pride and pleasure in children's accomplishments (or efforts), along with suggestions and encouragement to practice, provide excellent feedback for improving performance.

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Issues, Problems and Programs in Nurturing the Disadvantaged and Culturally Different Talented

MARY M. FRASIER

University of Georgia, Athens, Georgia, U.S.A.

Introduction

A universal problem in the field of gifted education is the identification and nurturance of talented students from disadvantaged and culturally different backgrounds. Children from either group are disproportionately represented in talent development programs. Reasons for their low representation vary, often reflecting an intermingling of factors related to the general status accorded the subgroup of which they are a member, environmental issues, family status and educational background, performance on standardized tests and the level of school success predicted for or demonstrated by them.

In this discussion the term "culturally different" will be used in its broad sense to refer to children whose differences are related to their racial/ethnic status, language, values, religious beliefs and/or the way they are socialized by their family. "Disadvantaged" will refer to children reared in homes and environments characterized by limited financial resources and educational tradition. Some children may be labeled both culturally different and disadvantaged. Also, children who are members of these groups will differ according to the political, economic and social structure in a country. No matter how they are distinguished, it remains true that there are clear differences in the proportion of them identified for talent development programs (Gallagher, 1985).

What has research told us about the identification and education of talented disadvantaged and culturally different children? What has been the nature of practices designed to find and educate them? What are some research initiatives and implications for future research and development activities? This chapter addresses these questions through a review of relevant research and practice.

The discussion is organized in four sections. The first section focuses on characteristics of talented children in either or both groups and descriptions of conditions that affect their display of talents. The second section, identification, focuses on issues and problems related to the use of tests to determine

eligibility for talent development programs. Programs and curricula designed to address the educational needs of talented disadvantaged and culturally different children are discussed in the third section. The final section provides suggestions for future research and development.

Research and evaluation regarding the culturally different has been very limited. Problems, causes and recommended solutions have tended to be based on opinions or on approaches generalized from basic studies on disadvantaged and culturally different children. In addition, while there have been studies conducted in other countries on talented children in disadvantaged and culturally different populations, the greatest proportion of studies and discussions have occurred in America. Therefore, much of this discussion reflects an American perspective.

Characteristics

Processes to identify talented children generally begin with a list of attributes defining the type child sought and the kinds of abilities exemplifying exceptional performance. When efforts are made to identify talented disadvantaged and culturally different students, consideration is also given to conditions that may affect their display of exceptional abilities.

Three characteristics typically describing these conditions were offered by Passow (1982): experiential deprivations, especially in early childhood; limited language development; and socioeconomic or racial isolation. Three other variables have been offered to define unique conditions of disadvantaged and culturally different children: (a) cultural diversity, or conditions of racial, ethnic, language or physical differences from a dominant culture; (b) socioeconomic deprivation, or conditions of legal or *de facto* denial of social interaction combined with substandard housing and jobs; and (c) geographic or living conditions located away from the mainstream of society (Baldwin, 1985; Baldwin, Gear, & Lucito 1978). Baldwin suggests that these variables can occur singularly or in combination

and require different responses in identification and programming.

Three trends are noted in checklists developed to observe exceptional ability in disadvantaged and culturally different populations. One is to modify general characteristics lists to fit different groups, noting ways in which the traits are manifested differently. The second is to focus on culture-specific and culturally-determined indicators of exceptional performers. The third is to describe exceptional behaviors within the context of environmental conditions that affect their expression.

Modified Characteristics Lists

From a 1974 conference on the identification and education of talented culturally diverse children, five traits were identified as common to all gifted children, regardless of group membership. They were: (a) ability to meaningfully manipulate some symbol system held valuable in the subculture; (b) think logically, given appropriate data; (c) use stored knowledge to solve problems; (d) reason by analogy; and (e) extend or extrapolate knowledge to new situations of unique application (Gallagher & Kinney, 1974).

Characteristics of gifted children gleaned from the literature were used by Gay (1978) to develop a *Comparative Characteristics of Giftedness* checklist to facilitate observation of these traits in gifted African-American children. Basic traits of gifted children were reworded to exemplify how they would be manifested by African-American children.

Baldwin (1985) formulated a list of common descriptors for children affected by cultural diversity, socioeconomic deprivation and geographic isolation. General descriptors were related to indicators of external and internal deficits, possible environmental conditions affecting the appearance of the behavior in different groups, exceptional characteristics to be observed, indicators of intellectual processing abilities and guidelines to develop curricula guidelines to address the behaviors. She recommended that this list be used to develop identification techniques.

A frequent criticism of checklists and rating scales, even those discussed above, is that they still reflect the dominant group's definition of ability. McLeod and Cropley (1989) observed that the basic problem lies not in the fact that there are no talented culturally different and disadvantaged children, but in the choice of indicators used to signal the presence of gifts and talents. Several researchers (Baca & Chinn, 1982; Bernal, 1974; Wood & Achey, 1990) concluded that educator's limited information about culturally and/or environmentally based characteristics of giftedness exhibited in many disadvantaged and cultural subgroups prevents some children from being referred as candidates for talent development programs.

CULTURE-SPECIFIC CHECKLISTS

Key features of culture-specific checklists include a focus on (a) culture-derived definitions of exceptional abilities and (b) style differences in exhibiting exceptional ability. Examples of culture-specific checklists include the "Who" and "O" checklists (Hilliard, 1976), developed to observe for gifted behaviors in African-American student populations; a tribal-cultural checklist (Tonemah, 1987) developed through tribal agreement to capture characteristics of exceptional American-Indian children and youth; and a checklist developed by Bernal (1974) to identify gifted Mexican-American children.

CONDITION-SPECIFIC CHECKLISTS

These type checklists highlight the impact of factors described earlier by Passow (1982) on expressions of exceptional abilities. Their focus is on defining exceptional behavior within the environmental context of students. *The checklist of creative positives* developed by Torrance (1977) is a primary example. It was derived from his observations of talented low socioeconomic status children engaged in problem-solving activities and has been adapted or adopted by many school systems. Glaser and Ross (1974) developed a list to describe behavior of disadvantaged students who succeeded despite adverse environmental and family conditions. Behavior included having a strong sense of self, ability to break social ties with social norm pressures, questioning orientation, risk-taking capacity and ability to channel rage.

Identification

Identification has been one of the most problematic areas in the study of talented disadvantaged and culturally different children. A variety of measures and procedures have been recommended to improve identification decisions made about these children's eligibility for talent development programs. This discussion describes some of those measures and procedures.

Modifying or Altering Traditional Identification Procedures

A major problem has been that traditional identification procedures have not been appropriately applied to children in disadvantaged and culturally different populations. Witty and Jenkins (1934) successfully adapted the methods used by Terman to identify superior Negro students in grades 3-8. It provided early evidence of the presence of talented minority individuals at the upper end of an ability spectrum. A later study by Fitz-Gibbon (1975) used a conventional procedure, supplemented with culture fair measures, to successfully identify gifted inner-city eighth graders.

She used teacher nominations, *The California Test of Mental Maturity (CTMM)* (1963 edn, short form level 3), the *Raven Standard Progressive Matrices (SPM)* (1956), the *Advanced Progressive Matrices (AdvPM)* (1962), the *California Achievement Tests (CAT)* (level 4, form A in mathematics and reading 1970), and the *Wechsler Intelligence Scale for Children (WISC)* (1974). Fitz-Gibbon (1975) reported a 100% effectiveness rating and a 90% efficiency rating.

Modifying Scoring and Analysis to Tap Culture-Specific Strengths

Children raised in different circumstances and in different economic conditions develop different strengths. One recommendation has been to find ways to tap those strengths using standardized methods. The *Abbreviated Binet for Disadvantaged Students (ABDA)* was developed by Bruch (1971) to investigate the use of a special scoring scheme to identify the strengths of gifted disadvantaged students. By using Guilford's "structure of intellect" model to describe mental operations on the *Stanford-Binet*, Bruch assessed strengths of Black elementary students in problem-solving skills with visual and auditory content, memory operations and convergent production. Weak areas included cognition of semantic units and divergent productions. She concluded that cultural experiences do affect the development of cognitive strengths.

Meeker (1978) also used the strengths approach to assess abilities in culturally diverse children. She used the *Structure of Intellectual Learning Abilities (SOILA)* test (Meeker & Meeker, 1979) to investigate cognitive abilities in Navajo children. Auditory memory and high figural ability were identified as strengths. Semantic ability and classification skills in the figural dimension exemplified weaker areas. These strengths and weaknesses could be directly related to the culture of the Navajo child. She concluded that such knowledge about children from different cultural groups would better inform the development of appropriate identification instruments.

Matrix Models

Another problem has been over-reliance on a single measure to confirm eligibility for talent development programs (Fraser, 1987, 1991; Baldwin, 1985; Gregory, Starnes, & Blaylock, 1985, 1992; Shaklee, 1992). The use of multiple criteria (combining objective and subjective criteria to determine eligibility for talent development programs) has been highly recommended as a best practice to avoid reliance on a single score (Clark, 1991; Freeman, 1991; Maker & Schiever, 1989; McLeod & Cropley, 1989; van Bostel, 1992).

The *Baldwin Identification Matrix (BIM)* (Baldwin, 1984; Baldwin & Wooster, 1977) is an example of a

procedure developed to facilitate the use of multiple criteria to determine program eligibility. A wide variety of information is gathered in several areas to produce a profile of the child. The process is augmented by the use of a supplemental checklist completed by the teacher, the parent, or other persons who are familiar with the child. The major criticism of the matrix has been that it gives equal weight to data from dissimilar sources (Feldhusen, Baska, & Womble, 1981). However, some studies have documented the effectiveness of the BIM in improving the identification of talented minority students (Blackshear, 1979; McBeath, Blackshear, & Smart, 1981).

Quota System Models

Quota systems, created by designating places in a talent development program for students from disadvantaged and culturally different groups (LeRose, 1978; Mitchell, 1982), or by lowering thresholds for minorities to enter programs (Baska, 1989), have been recommended as ways to ensure delivery of special services to them. Baska (1989) strongly recommended using the same instruments to identify all students, but remedying disparities by lowering the entry scores for minorities.

Reserving places for students on the basis of cultural/ethnic group membership or economic conditions represents an artificial manipulation of a situation. While it is unfair that traditional identification procedures limit access to talent development programs for many disadvantaged and culturally different children, it is also unfair to deny places to students who qualify for services but are not members of a targeted group.

Use Assessment Measures Sensitive to Group Differences in Culture and Economic Conditions

A major problem in identifying talented culturally different and disadvantaged children has been the unresolved criticism that the tests used reflect the values and behaviors of the dominant culture (Baldwin, 1985, 1991; Barkan & Bernal, 1991; Bernal, 1974; Frasier, 1987, 1991; Hilliard, 1976, 1991; Maker, 1983; Maker & Schiever, 1989; Tonemah, 1987; Torrance, 1977). As McLeod and Cropley (1989) aptly observed:

Although different subgroups may define exceptional ability according to different criteria, only those of the dominant cultural group may receive recognition; in most countries this means emphasis on language, abstract thinking, listening, sitting quietly and attending, dealing with problems through discussions and respect for authority (p. 135).

In continuing attempts to remedy this situation, several assessment measures and procedures have been developed to better reflect sensitivity to cultural and economic group differences.

The System of Multicultural Pluralistic Assessment (SOMPA)

The SOMPA (Mercer, 1981; Mercer & Lewis, 1979) was developed to examine intelligence within the context of the culture of the child. A child is evaluated only in relation to others who come from similar sociocultural backgrounds and who have had approximately the same opportunity to acquire basic knowledge and skills. Results of a study by Matthew and associates (1992) provides strong evidence of the effectiveness of the SOMPA in increasing the proportion of disadvantaged students identified as gifted.

The Learning Potential Assessment Device (LPAD)

The LPAD developed by Feuerstein (1979) was designed to assess the cognitive potential of individuals, particularly the culturally deprived and to recommend remedies for any deficiencies. Built on principles of cognitive modifiability, the teacher and the student use a "test-teach-test" method to explore the child's acquisition and performance components of intelligence. It is highly praised for its potential to change the paradigm by which intelligence is assessed in minority children (Hilliard, 1991) and for its effectiveness in identifying gifted culturally different and disadvantaged children (Skuy, Gaydon, Hoffenberg, & Fridjohn, 1990; Skuy, Kaniel, & Turzel, 1988; Skuy & Shmukler, 1987).

OTHER INSTRUMENTS

Other measures believed to be appropriate for diverse cultural and economic groups are the (a) *Kaufman Assessment Battery for Children (K-ABC)* (Kaufman & Kaufman, 1983; Kaufman, 1984; Kaufman & Harrison, 1986; Lewis, 1989) (b) *The Torrance Tests of Creative Thinking (TTCT)*, *Verbal and Figural* (Torrance, 1966, 1971, 1977, 1987; Torrance & Goff, 1990), *The Raven's Progressive Matrices* (Raven, 1956, 1962; Raven, Court, & Raven, 1985).

Programs and Curricula

A summary of articles appearing in a book edited by Maker and Schiever (1989) provides a useful synthesis of features that should characterize appropriate programs and curricula for cultural and ethnic minority students. Essentially the authors agreed that program goals for talented cultural and ethnic minority students should reflect educational goals designed for all talented students. Basic principles included planning the curriculum based on students' strengths; providing for the development of basic skills and other abilities that the student may lack; considering differences as positives, not negatives; arranging for mentors from the home and the community; and creating and maintaining a classroom

with a multicultural emphasis. The following examples illustrate the application of these principles.

Akarsu (1992) described a special school being developed for economically disadvantaged urban and rural children in Turkey. The goal is to provide students with the skills they need to be admitted to a university of their choice. The organizational structure will include "learning villages" where all participants—students, educators, mentors, family and community members and researchers—will cooperate in a variety of activities as co-learners.

The *Skills Reinforcement Project (SRP)* (Lynch & Mills, 1990) is an example of a program that recognized the strengths of disadvantaged and minority students as well as provided them with opportunities to develop those basic skills they lacked. Over a nine-month period, specialized educational training was provided in mathematics and language arts. The goal was to use basic skill reinforcements to help capable minority and disadvantaged students increase their standardized test scores and eventually qualify for gifted and talented programs. SRP students did show significant pretest to post-test gains in verbal and quantitative reasoning. Results of student and parent evaluations indicated that students did appear to develop academic skills and affective traits needed to succeed in rigorous academic programs.

A Better Chance (ABC) is an example of a national search to provide access to excellent college preparatory programs for talented minority children. Over its 30-year existence, more than 8000 students who come from communities infamous for high drop-out rates, overcrowded classrooms, outdated equipment and inadequate materials, have been identified. Each year 700 applicants are accepted for enrollment in 160 outstanding public high schools, private day schools and boarding schools across the country. No special academic preparatory courses, private tutoring, seminars in test-taking, or study skills courses are provided these first year high school adolescents prior to their enrollment. A recent sample of ABC graduates found that 96% had completed or were in progress for a bachelor's degree, 38% for a master's and 7% for a doctorate (Griffin, 1992).

Israel has had a long history of attending to the needs of the gifted disadvantaged student. Results from a longitudinal study (Smilansky & Nevo, 1979) of disadvantaged adolescents enrolled in a specially designed boarding school indicated that "83% completed academic high school, against only 58% from a control group; 63% ultimately studied in university, against only 36% from the control groups; and 40% received a B.A. in the regular schedule of 4 years, against only 16% in the control group" (Smilansky, 1981, p. 280). In a follow-up study it was reported that 18% completed an M.A. and 4% had earned a Ph.D.

A final example of a program designed to find and nurture potential giftedness among young disadvantaged Black and Hispanic students is *The Program of*

Assessment, Diagnosis and Instruction (PADI) (Gregory et al., 1992). The PADI program is grounded in the belief that potential giftedness can be found among students with deficits in basic skills and limited English proficiency skills if the appropriate diagnostic tools are used and if appropriate adjustments are made in their instructional program. During the first six years of its operation, the rate of transition of PADI students into the regular gifted program has held between 25–30%.

New Research Initiatives and Implications for Future Research

New Initiatives

Several researchers have suggested that capacity definitions of giftedness are out of date (van Boxtel, 1992), that the problem of identifying talented disadvantaged and culturally different students will not be resolved by developing a new assessment instrument (Gregory, 1985); that there should be a change in emphasis from being gifted to a concern about developing gifted behavior in youngsters (Renzulli, 1987); and the need for a paradigm shift toward more flexible, inclusive and instructionally oriented conceptions, from using identification simply to include or exclude students from a particular category (Treffinger, 1991). The following research initiatives symbolize moves in these directions.

Federal funds were made available through the Jacob Javits Gifted and Talented Student Education Act of 1988 to investigate, among other issues, procedures that would improve the education of gifted children from economically disadvantaged families and areas and from limited English proficiency backgrounds. By 1992 more than 60 studies were being conducted across the United States of America with various populations of target students. Two of those studies are reviewed here to illustrate Javits programs.

Shaklee (1992) has developed an experimental model to identify exceptional potential in young minority and/or economically disadvantaged students. Computer-assisted analysis of videotaped samples of representative behaviors of children are used as the basis for identification. Currently four components have been designated as Primary Identifiers on the videographic data. They are: acquisition and retention of knowledge; comprehension and application of knowledge; individual creative attributes; and individual motivational attributes. Because the latter two categories are believed to be both environmentally and culturally bound, they are used only as additional information, not as primary means of identifying exceptional intellectual potential. Other components of the model include inservice experiences to prepare primary classroom teachers to modify curriculum and instruction based on systematic observations.

A 5-year National Research Center study being conducted at The University of Georgia (Frasier,

1992) is investigating the giftedness in economically disadvantaged and limited English proficient students. This comprehensive study which considers all factors that impact the identification of talented students in these groups at once is in process; complete data are not yet available. The study's objective is to provide a theory and process for identifying and educating talented disadvantaged and culturally different students based on their exhibition of basic attributes of the giftedness construct (Hagen, 1980; Hoge, 1988, 1989; Hoge & Cudmore, 1986; Leung, 1981). Data were analyzed from three sources: (a) case studies collected on a national sample of bright disadvantaged students from a variety of cultural/ethnic backgrounds; (b) a comprehensive review of literature describing gifted children; and (c) an intensive analysis of relevant checklists and descriptions of gifted students (Bernal, 1974; Gallagher & Kinney, 1974; Hagen, 1980; Torrance, 1977; Tonemah, 1987; Hilliard 1976). This process resulted in the formulation of ten basic attributes representing the giftedness construct. These basic traits, aptitudes and behaviors (TABs) provided the basis for creating a theoretical paradigm to guide identification of giftedness in diverse groups; a staff development model (SDM) to assist educators in observations and referrals of exceptional students for assessment and a research-based assessment plan (RAP) that incorporates the Frasier Talent Assessment Profile (F-TAP) (Frasier, 1990, 1992) to assess gifted potential using multiple criteria. The SDM and RAP models have been piloted in six rural and urban school districts of varying population configurations. The models are currently being field tested in 16 national sites, again reflecting various, size, location and population configurations. In the pilot test 117 elementary through high school students were identified, they are currently being served as *bona fide* gifted students in regular gifted program. Follow-up study is being conducted over the next three years to evaluate their performance, the program and curricula adjustment made, and further adjustments needed.

Implications for Future Research

Around the world, the rapidly changing characteristics of societies increases the complexity of issues and problems affecting the detection of talented disadvantaged and culturally different children. Research to identify and develop talent in these children must take a different direction from comparing performances among different groups of children and using family status variables to describe children's potential to learn (Clark, 1983). Kitano's (1991) summary of past research on ethnic diversity strongly points to the need for research based on cultural/ecological theories that focuses on within-group, rather than between-group differences. Theories of cultural differences, deficit and deprivation are no longer appropriate as a basis for focusing on talent development and nurturance in diverse populations. The

following recommendations are made for future research in this area.

(1) Hoge (1988, 1989) has argued forcefully that a clear statement specifying the traits, aptitudes, and/or behaviors that determine selection measures used to make decisions about labels and services must be presented to clarify the discrepancies between formal or official definitions of the giftedness construct and operational definitions provided by selection instruments. Further research should be developed that focus on identifying and educating for exceptional demonstrations of the basic traits, aptitudes and behaviors associated with the giftedness construct.

(2) Studies on the nature of environments of disadvantaged and minority students have tended to emphasize deficits, not strengths or supports. Almost all the contributors to the Maker and Schiever (1989) volume emphasized the need to understand better the support structures in the school and community environments of these students. This focus does not suggest ignoring adverse conditions but rather it recommends taking a more proficiency-oriented view to better inform intervention strategies.

(3) How individuals judge themselves and how they interpret the judgments made by others probably affect their performance more than anything else. Further research should be devoted to self-perceptions of ability among talented disadvantaged and culturally different students.

(4) While it has been frequently recognized that a combination of qualitative and quantitative measures would provide more efficient and effective detection of exceptional performance needs that require different instructional services (Treffinger, 1991), unfortunately few standardized and validated qualitative measures currently exist (van Boxtel, 1992). Further research should be focused on the development of qualitative assessment measures to validly assess talent potential.

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Reconceptualizing Gender Differences in Achievement among the Gifted

DAVID LUBINSKI AND CAMILLA PERSSON BENBOW*

Iowa State University, Ames, Iowa, U.S.A.

CHERYL E. SANDERS

University of Colorado, Boulder, Colorado, U.S.A.

Introduction

Over the past 30 years, many of the unenlightened barriers preventing gifted women from achieving educational credentials and occupational status commensurate with their abilities have been removed. In many educational programs, comparable gender representation quickly ensued, especially in areas like law where many kinds of 4-year degrees are acceptable for admissions. Exceptional performances by women on bar exams, law school grades and honors followed, just as the protagonists who worked so hard to remove the aforementioned barriers had predicted all along. Gender-comparabilities in medical schools, both in representation and in performance, followed shortly thereafter. This trend served to reinforce further the well-grounded arguments for removing gender-discriminating educational barriers to begin with. That is, arguments initially stemming primarily from political-ideological concerns now became buttressed by economic and psychological justification: not only were women performing admirably in these areas, the disciplines themselves were benefiting from a more able student population. As a consequence of the greater number of women with exceptional academic credentials entering law and medicine, both disciplines have insured that their future leaders and practitioners will have greater competencies and sophistication.

With such progress in mind, the attention naturally has shifted to the physical sciences (our area of concentration), where pronounced gender disparities still remain (Dick & Rallis, 1991; Eccles & Harold, 1992; Maple & Stage, 1991). Could similar benefits accrue for these disciplines if more women entered and maintained a commitment to physical science educational/voca-

tional tracks? Why has comparable representation in the math/science pipeline not been achieved? Have we completely removed from the physical sciences the barriers that previously prevented women from entering law and medicine? Are there factors unique to the math/science pipeline that discourage women from entering and excelling within it? These questions, among many others, are being investigated through our research. Here we focus specifically on factors relating to educational/vocational choice, exceptional educational/vocational achievements and gender differences within the gifted population. Our research, however, is also aimed at program experimentation and refinement of well-known educational interventions. That is, in working with intellectually talented students, individually and in groups, we attempt to find and provide environments wherein their talents can best blossom and come to their full fruition. Understanding what those environments consist of and learning how to provide them are two of the more central goals of our applied research. We shall draw upon that work as well.

Our work with mathematically and verbally precocious youth is particularly relevant to ascertaining the critical determinants of gender differences in math/science achievement. Noteworthy professional achievements in the sciences tend to be within the exclusive purview of the highly able—people located within the top few percentage points of the distribution of intelligence. Given this, our Study of Mathematically Precocious Youth (SMPY) provides a data bank especially well suited to speak to male/female differences in educational achievement and choice, inasmuch as it contains large proportions of individuals, of both genders, who possess

*Address correspondence to either Camilla P. Benbow or David Lubinski, Co-Directors of the Study of Mathematically Precocious Youth (SMPY) at ISU, Department of Psychology,

Iowa State University, Ames, Iowa 50011-3180. This work was supported by a grant from the National Science Foundation (MDR 8855625).

the intellectual potential for educational and career excellence in engineering, mathematics and the physical sciences, as well as for a variety of other distinct professional careers.

It is the thesis of this chapter that the theoretical model guiding our research with the gifted, which is to be explicated, has implications for analyzing and better understanding the under-representation of women all along the math/science pipeline. Indeed, our empirical studies have revealed unique factors operating to preserve gender-disparities in math/science careers and these factors relate to choice. We propose here that gender differences in achievement are a reflection of choices and that these choices naturally emerge from a number of gender-differentiating attributes critical for a commitment to, and excellence in, math/science careers. Further, we suggest that it might be profitable to reconceptualize the professional and the public view of gender differences in math/science achievement, namely, as consequences of the different perspectives and personal qualities that males and females bring to situations.

In what follows, we shall draw on the longitudinal findings from SMPY to illustrate key antecedents to gender differences in the physical sciences. We shall first describe the design of our study and its theoretical framework. This is followed by a discussion of gender differences in actual achievement among the mathematically talented and some empirical findings involving gender differences on familiar as well as underappreciated variables critical for choosing to excel in math/science domains. Finally, we close with a brief discussion of the implications of our current state of knowledge and how these implications might be used to both guide and organize the direction of future research on gifted females (as well as males).

Study of Mathematically Precocious Youth (SMPY)

SMPY was founded by Julian C. Stanley in September 1971 at Johns Hopkins University and predicated on the philosophy of conducting research through service to intellectually talented students. SMPY was interested in first identifying adolescents who possess exceptional intellectual abilities and then to ascertain the factors that contribute to their optimal educational and vocational development. Special attention always has been devoted to math/science disciplines. One intervention, implemented from the start, was to provide these students, through acceleration and special classes, with better opportunities to develop their already exceptional quantitative skills. To facilitate the uncovering of other beneficial interventions and to answer basic research questions about intellectual giftedness more generally, SMPY established in 1972 a planned 50-year longitudinal study, now being conducted at Iowa State University. Through this study, which currently includes about 5000 talented individuals identified over a 20-year period,

SMPY is beginning to bring into focus the factors that contribute to gifted students' educational, intellectual, personal, and vocational development.

Participants in SMPY were identified through a talent search, a concept developed by Stanley and initially limited to mathematical talent (cf. Cohn, 1991; Keating & Stanley, 1972; Stanley, 1973; Stanley, Keating, & Fox, 1974). The concept of a talent search has been refined over the past 20 years and extended from 450 students in 1972 to well over 140,000 on an annual basis and from a focus on mathematics only to include verbal and overall intellectual abilities. Yet the basic premise of the talent search has remained the same: students in 7th or 8th grade (12- to 13-year-olds) who are already known to have scored in the top 3% on national norms on standardized achievement tests (e.g., the Iowa Test of Basic Skills) administered routinely by American schools are invited to take the College Board Scholastic Aptitude Test (SAT) at regular administrations. The SAT measures mathematical reasoning (SAT-M) and verbal reasoning (SAT-V) ability and is designed for 11th and 12th graders who are planning to attend college. (This form of assessment is known as above-level testing (Stanley, 1990), inasmuch as the SAT was designed for students 4 to 5 years older than SMPY participants.) Nonetheless, the score distributions manifested by these gifted 7th or 8th graders are similar to those observed in random samples of high school students (Benbow, 1988; Keating & Stanley, 1972). It is through this mechanism, the talent search, that the SMPY subject pool for the longitudinal study was formed; all 5000 subjects, except for one group, were selected for high SAT scores that place them in at least the top 1% in intellectual ability. Although several "types" of gifted students are being studied, SMPY's emphasis has remained on the math/science disciplines.

SMPY's Longitudinal Design

Four SMPY cohorts of gifted students, initially identified at age 13, are being tracked longitudinally, as well as a fifth cohort comprised of graduate students in this nation's top math/science departments (see Table 1). Each cohort is separated by a few years. Collectively, the five cohorts span 20 years. Also, several comparison groups consisting of less able students are contained within the longitudinal study. Because the students in the first four cohorts were identified over a 20-year period, using the same criteria, our design allows us to assess historical influences to a degree (cf. Grindler, 1985). This is a great advantage. Lack of historical control is a problem associated with most longitudinal studies.

Another unique feature to the design of this present-day longitudinal study is the continued augmentation of Cohort 4, which is in the process of being formed. The influx of new students into the longitudinal study allows us to ask questions that were not possible in 1972 when the study began. The currency of the study is, therefore,

TABLE 1
The SMPY Longitudinal Study.
Its Cohorts of Subjects

Cohort	N	When identified	Age when identified	SAT criteria	Ability level
1	2188	1972-1974	12-13	Verb. \geq 370 or Math \geq 390	1%
2	778	1976-1979	12	Top 1/3 of Talent Search Participants	0.5%
3	423	1980-1983	<13	Math \geq 700 Verb. \geq 630	0.01%
		1983	12	SAT-M + SAT-V \leq 540	5%
		1982	12	500-590 Math 600-690 Verb.	0.5%
4	\approx 750	1987	12	Math \geq 500 or Verb. \geq 430	0.5%

Cohort 5 includes 750 students enrolled in top-ranked graduate departments in the U.S. in various scientific disciplines; they were surveyed at age 23-25 in 1992.

maintained. Finally, as a validity check on our selection procedures, as well as enhancing the longitudinal design features of SMPY, we are conducting a retrospective study of the characteristics and developmental paths of graduate students in the top math/science departments in the U.S. As noted earlier, this is our Cohort 5. Do such students differ in substantive ways from the students in the SMPY longitudinal study? If so, we soon will be in a position to detect how.

Thus, over 5000 students are currently participating in the SMPY longitudinal study and soon will increase to over 6000. All of the students in the five cohorts are being surveyed at critical junctures throughout their youth and adult lives. Moreover, each cohort will be surveyed at the same age to ensure developmental comparability of our cross-cohort findings. This serves as a rough sketch of the composition of the SMPY database and how it constructed.

The Theoretical Structure Guiding SMPY Research

The conceptual framework for our research draws on three already existing theoretical perspectives (e.g., Dawis & Lofquist, 1984; Tannenbaum, 1983, 1986; Zuckerman, 1977). We also incorporate some of what is already known about the development of talent and personal preferences for contrasting educational/vocational paths. Primarily, our work is based upon a well-known model of vocational adjustment, the Theory of Work Adjustment (TWA), a model that has been developed over the last 30 years by Rene V. Dawis and Lloyd H. Lofquist (Dawis & Lofquist, 1984; Lofquist & Dawis, 1969, 1991) at the University of Minnesota.

One especially attractive feature of this model is that it is readily extended to critical antecedents of vocational adjustment, such as choosing a college major.

According to TWA, to assess optimal learning and work environments it is useful to parse an individual's work personality and the environment into two broad, but complementary, subdomains. An individual's work personality is primarily comprised of his/her: (1) repertoire of specific skills or abilities and (2) personal preferences for the content found in contrasting educational/vocational environments. In contrast, different environmental contexts (educational curricula and occupations) are classified in terms of: (1) their ability requirements and (2) their capability to reinforce. Optimal learning and work environments are then viewed as requiring two levels of correspondence, labeled *satisfactoriness* and *satisfaction*.

Satisfactoriness denotes the degree of correspondence between abilities and the ability requirements of a particular environment (viz., occupation or educational curriculum), whereas satisfaction denotes the degree of correspondence between the preferences and the types of reinforcers provided by an occupation or educational track. Collectively, satisfactoriness (how the environment will respond to the individual) and satisfaction (how the individual is likely to respond to the environment) are useful for predicting the length of time individuals are likely to remain in various educational or career tracks. They are continuous as opposed to discrete concepts and one's psychological adjustment to any given environment at any point in time is, to a large degree, a joint function of these two broad correspondence dimensions (see Figure 1). One implication of the model is that assessing the environment

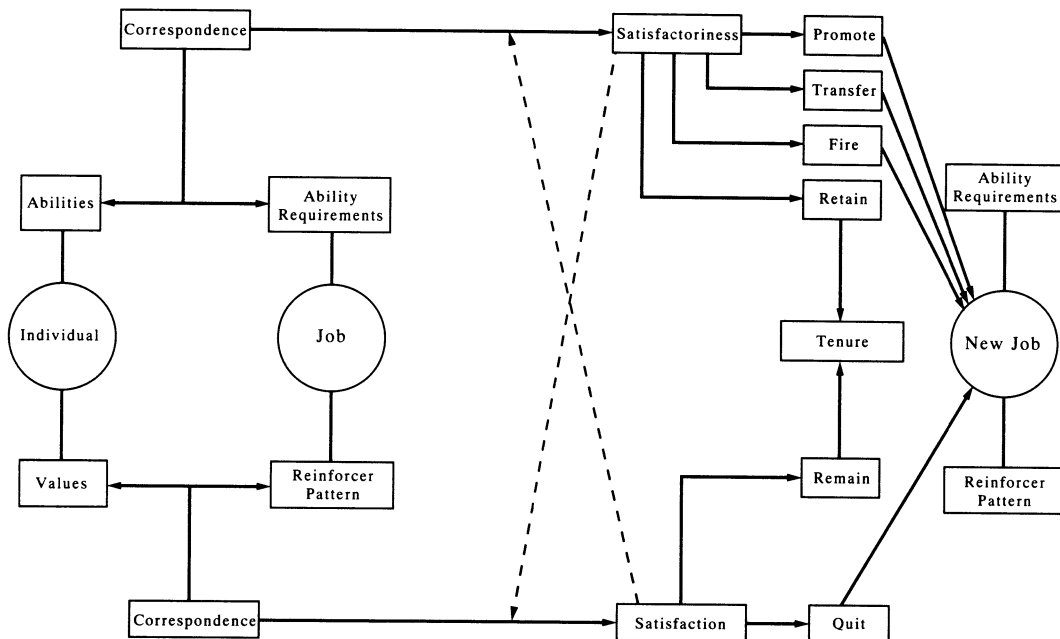


FIGURE 1. The theory of work adjustment — a depiction

for its requirements and reward capabilities is just as important as assessing the individual’s learning and work personality (i.e., abilities and preferences). This model also stresses the importance of assessing *both* abilities and preferences, *concurrently*, to ascertain the readiness of a given individual for a particular educational or career track (cf. Lubinski & Thompson, 1986).

Personality Structure: Assessing Critical Dispositions for Learning Readiness and Efficient Work

ABILITIES

Before assessing abilities, one needs to determine how intellectual abilities are best conceptualized. There is actually a remarkable degree of consensus that intellectual abilities are quite adequately depicted by Guttman’s (1954) early formulation of the Radex (cf. Ackerman, 1987; Carroll, 1985; Humphreys, 1979; Lubinski & Dawis, 1992; Snow et al., 1984); a Radex representation of intellectual abilities, taken from Snow’s work, is provided in Figure 2. In this organization, cognitive abilities are differentiated along two dimensions, *complexity* (viz., sophistication of the intellectual repertoire, general intelligence, or “g”) and *content* (viz., lower-order factors composed of three relatively distinct symbolic systems: verbal/linguistic, numerical/quantitative and spatial/pictorial). Both are important to assess. In our work with the gifted, for example, we have found it useful to assess the complexity dimension to determine

the extent to which educational acceleration is warranted (to provide a more correspondent learning environment), plus lower-order factors to ascertain the precise nature of the acceleration required (thus providing a more individualized and optimal learning environment, responsive to students’ unique strengths). Different “types” of gifted students, for example, verbally vs. mathematically precocious, assimilate certain course work at different rates and more optimal learning transpires if curricula are responsive to such individual differences.

PREFERENCES

In our research (and as part of our summer programs), the assessment of personal preferences is teamed with ability assessment to paint a more comprehensive picture of the unique aspects of each student and of how these features of their personality might factor into educational and career decision making. Students also have found this information useful in considering educational and career possibilities with high school counselors and parents. Two of the more useful schemes for analyzing educational/vocational interests and values are Holland’s (1985) hexagon (consisting of Investigative, Artistic, Social, Enterprising, Conventional, and Realistic vocational interests; see Figure 3) and the Allport, Vernon, and Lindzey’s (1971) Study of Values (SOV), which is comprised of six value dimensions (or evaluative attitudes), sharing appreciable

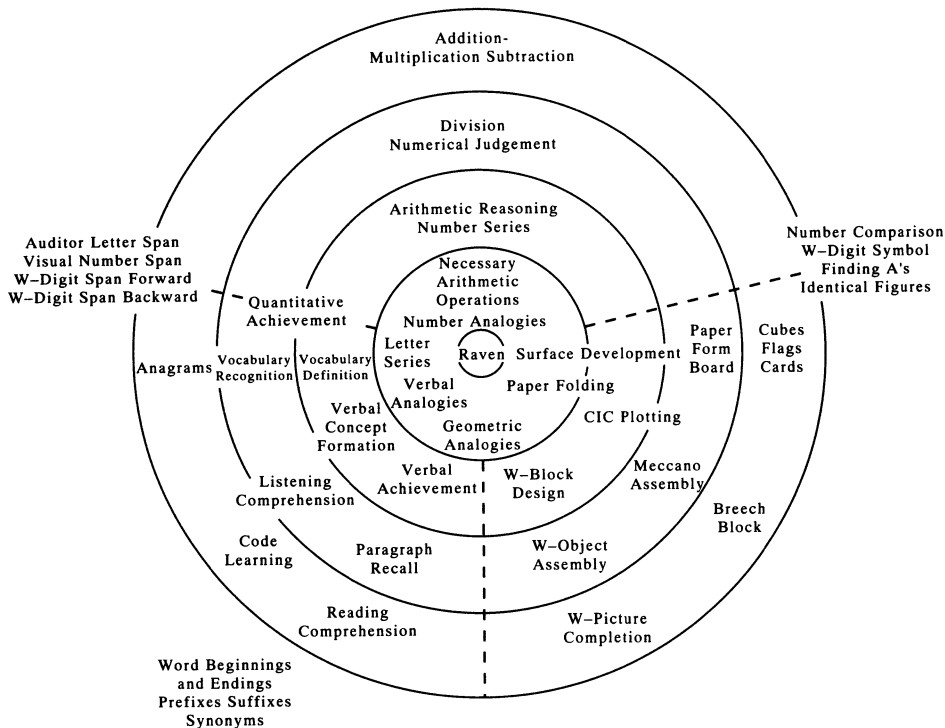


FIGURE 2. Hypothetical radex map showing suggested ability and learning simplexes and the content circumplex "w" identifies subtests of the Wechsler Adult Intelligence Scale. (After Snow, Kyllonen & Marshalek, 1984.)

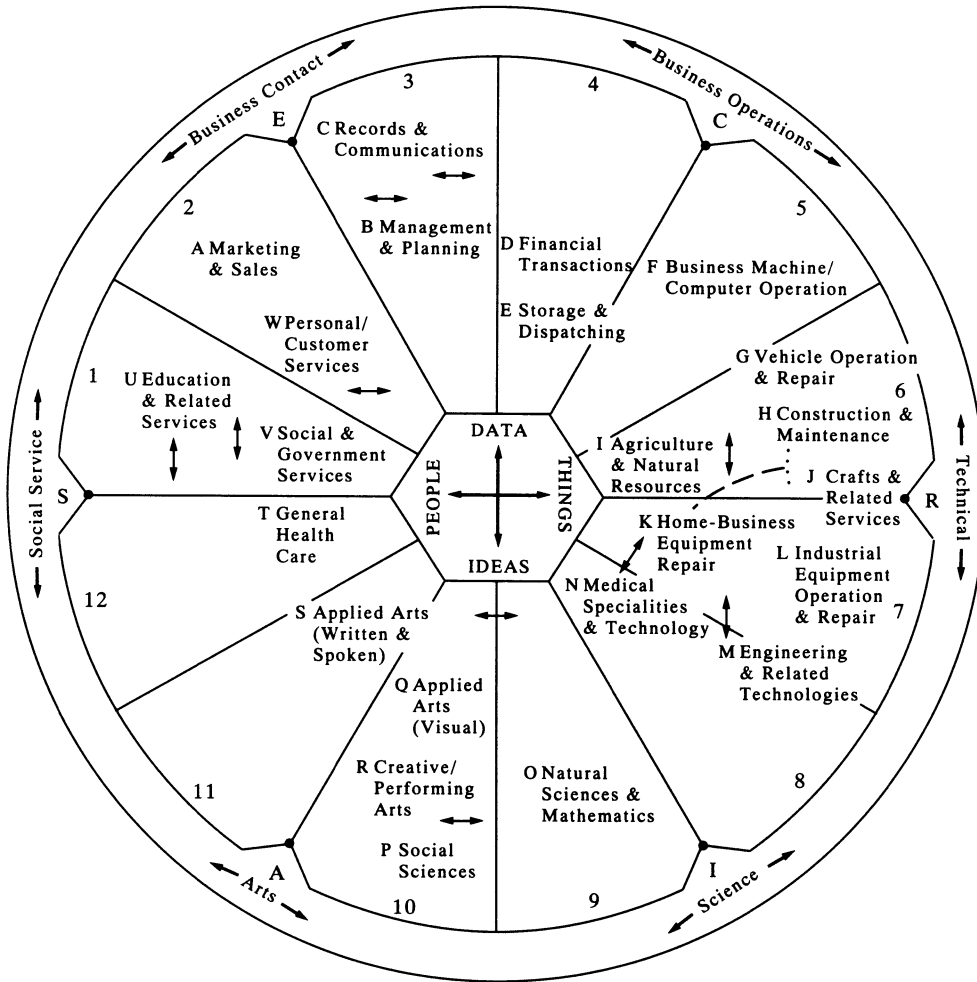
overlap with Holland's model (viz., theoretical, esthetic, social, economic, religious, and political). We assess these attributes as they are useful for identifying optimal learning environments (those likely to be most enjoyable and rewarding) for gifted students of comparable abilities but who differ in nonintellectual attributes ultimately related to career choice.

Environment Structure: Assessing Critical Features of Environmental Ecologies for Learning and Work

Up to this point we have talked about the personality structure of the individual (abilities and preferences). School and work environments also can be analyzed using analogous dimensions. Educational/vocational environments may be construed as molecular ecologies defined by: (1) their capability to reinforce certain preferences and (2) the response requirements (or the abilities) that they demand of individuals. In physical science environments the response requirements particularly involve high mathematical and spatial/mechanical reasoning abilities but also strong verbal ability, while investigative interests and theoretical values are among the most salient personal preferences for gravitating toward scientific environments, finding the content of these disciplines reinforcing (for developing one's intel-

lectual talent) and maintaining a commitment toward such disciplines (Dawis & Lofquist, 1984; Holland, 1985; Lubinski & Benbow, 1992; MacKinnon, 1962; Roe, 1953; Southern & Plant, 1968). These environments require intense abilities and preferences for manipulating and working with sophisticated things and gadgets for lengthy periods of time. Individuals with pronounced or relatively higher social values (or stronger need for people contact), in contrast, are not as readily reinforced in such environments.

The above is what we and others have found to be the person-environment correspondence structure for engineering and the physical sciences (Dawis, 1991; Dawis & Lofquist, 1984; Lubinski & Benbow, 1992; Holland, 1985; Roe, 1953). Although students are not formally selected for advanced scientific training based on their theoretical values, their investigative interests, or their spatial and mechanical reasoning abilities (but they are on mathematical reasoning ability), they appear to self-select scientific careers based on all of these attributes, whether they are explicitly aware of their abilities and preferences or not (Humphreys, Lubinski, & Yao, 1993). Moreover, an individual will remain in the sciences to the extent that congruence is established between (1) his/her abilities and preferences and (2) the skill requirements and reinforcers provided by the scientific environment, respectively. Satisfaction



- The World-of-Work Map arranges job families (groups of similar jobs) into 12 regions. Together, the job families cover all U.S. jobs. Although the jobs in a family differ in their locations, most are located near the point shown.
- A job family's location is based on its primary work tasks—working with DATA, IDEAS, PEOPLE and THINGS. Arrows show that work tasks often heavily involve both PEOPLE and THINGS (↔) or DATA and IDEAS (↕)
- Six general areas of the workworld and related Holland types are indicated around the edge of the map. Job Family Charts (available from ACT) lists over 500 occupations by general area job family, and preparation level. They cover more than 95% of the labour force.

FIGURE 3. World of work map

(need–reinforcer correspondence) and satisfactoriness (ability–ability requirement correspondence) are essential for optimal intellectual development; achieving both is the central goal of SMPY's programmatic work with gifted youth.

OPTIMAL EDUCATIONAL CORRESPONDENCE FOR THE EXTREMELY GIFTED

A proper response to this topic requires, first of all, a full appreciation of the range of interventions that need to be considered when creating optimal learning environments for the exceptionally gifted. That is, if giftedness is arbitrarily defined as being in the top 1%, individual differences in IQs among the gifted range from approximately 135 to over 200 (roughly one-third of the entire IQ range). Paralleling this vast ability range is an equally wide spectrum of ideal learning environments. Because learning environments can range from discordant to optimally correspondent, a key component of our research is designed to uncover unique ways to enhance the learning experiences and intellectual development of the *exceptionally* able—to make it as optimally correspondent as possible. We suggest that the work of Harriet Zuckerman (1977) provides clues for how to enhance educational correspondence among the exceptionally able. For this part of our thinking, we blend Zuckerman's theory on the accumulation of advantage with Tannenbaum's (1983, 1986) work on the critical elements for world-class achievement.

Zuckerman (1977) studied the career paths of Nobel Laureates and occupants of the "forty-first chair" (scientists generally acknowledged to have done research of Nobel prize quality, but not awarded the prize). These individuals almost universally show promise extremely early in their careers and this evidenced precocity appears not only to respond to but also to create greater opportunities for intellectual development. For example, most Laureates receive an advantage in graduate work by attending the most distinguished universities (10 universities produced 55% of the laureates) and by studying with the best minds of the day—other Nobel Laureates or occupants of the 41st chair—thereby begetting a pattern of eminence's creating eminence. Zuckerman claims that the development of scientific taste, standards and self-confidence are the most beneficial results of the Laureate's apprenticeships (cf. Julian C. Stanley, 1992).

Moreover, future Noble Laureates obtain degrees and start publishing earlier and more copiously than other scientists. Soon, by the quality of their scientific contributions, they become distinguished from their age-equivalent peers. This opens up further opportunities for their development. Zuckerman suggested that the descriptions of Nobel Laureates' careers fits well with the model of "the accumulation of advantage: the spiraling of augmented achievements and rewards for individuals and a system of stratification that is

sharply graded" (p. 249). Moreover, almost all future Nobel Laureates were "active" in creating this beneficial environment (cf. Scarr & McCartney, 1983).

Thus, among the gifted, it would seem that those who have the personal potentialities for manifesting exceptional achievement require special encounters with the appropriate environment to facilitate the emergence of world-class accomplishments. Consistent with this view, Bloom (1985) noted from interviews of talented performers in a variety of disciplines that special experiences, sometimes interventions, are important for the development of talent. Moreover, Tannenbaum (1983, 1986) postulated that great performance or productivity results from a rare blend of superior general intellect, distinctive special aptitudes, the right combination of nonintellectual traits, a challenging environment and the smile of good fortune at crucial periods of life. (The first three components seem to parallel the abilities and preferences discussed in the Theory of Work Adjustment and the latter two the work of Zuckerman.) According to Tannenbaum, success depends upon a combination of facilitators, whereas failure may result from even a single deficit. By virtue of its "veto" power, then, every one of the five qualifiers is a necessary requisite of high achievement and none of them has sufficient strength to overcome inadequacies in the others.

The above discussion presents the scaffolding for our work on the dispositional determinants of contrasting educational/career paths of the gifted and, thus, leads to the conclusion that individuals who are ideally suited for careers in the physical sciences are gifted individuals with highly developed mathematical and spatial/mechanical reasoning abilities and intense investigative/theoretical preferences. It is these individuals who will *choose* careers in the physical sciences and engineering and remain committed to them. Gifted individuals with other ability and preference profiles will choose careers in other areas. Given this line of reasoning, a natural consequence of educational and career counseling based on abilities *and* preferences will be disparate male/female ratios in academic and vocational choices, not only in the math/science disciplines but other disciplines as well. Moreover, these differences should intensify at the higher educational levels. Evidence supporting these conclusions is presented next.

Gender Differences in Abilities/Preferences: Their Implications According to TWA

Abilities

Recent reports seem to indicate that certain gender differences in cognitive abilities are steadily diminishing in normative samples (Feingold, 1988; Hyde, Fennema, & Lamon, 1990; Rosenthal & Rubin, 1982). That is, males and females appear to be converging toward a common mean on a variety of intellectual abilities. These trends, however, have not been noted among the most

able (Benbow & Lubinski, 1992, in press; Benbow & Stanley, 1980, 1983; Lubinski & Benbow, 1992; Stanley et al., 1992). Among the gifted, there are sizable gender differences at age 13, favoring males, in mathematical reasoning and in spatial and mechanical reasoning abilities—the very abilities required of the physical sciences. Moreover, at the end of high school and college, these differences remain and accompany gender differences favoring males in math/science achievement test scores (as well as other test scores), whereas females tend to do slightly better than males on a number of verbally oriented achievement tests (Stanley et al., 1992). Before profiling these differences in some detail, we will address first the question: how can normative male/female means be converging while gender differences among the gifted remain pronounced? There are at least two possible explanations and probably both operate to a degree: test construction practices and gender differences in ability dispersion.

First, Stanley et al. (1992) have remarked that it is difficult to assess changes in group performance on cognitive tests over the last few decades, inasmuch as a number of test publishers may have routinely culled from their instruments items that characteristically generate the most conspicuous gender differences—a procedure that some refer to as correcting for “gender bias” or “equity in testing.” Thus, it is possible that the apparent convergence of male/female group means is due to test construction practices as much as, or perhaps even more than, a genuine change in the cognitive attributes purporting to be assessed by these measures.

Second, if *meta-analytic* reviews are indeed detecting a degree of genuine gender-convergence, consumers of

meta-analytic reviews must keep in mind that this methodology provides information only on group differences in *overall level* of the attribute under analysis. *Meta-analytic* reviews do not provide information on group differences in other statistics such as those indexing ability dispersion. There are other parameters on which the genders can differ and a critically important one is *variability* (cf. Benbow, 1988).

Many lines of evidence have converged to suggest that males are more variable than females on a variety of intellectual variables and, interestingly, this appears to hold even for variables on which females have superior means. This phenomenon has been observed over several decades in normative samples (cf. Feingold, 1992; Lubinski & Benbow, 1992; Lubinski & Dawis, 1992; Lubinski & Humphreys, 1990a, 1990b). Table 2, for example, consists of data from Project TALENT (Flanagan et al., 1962). Project TALENT contains data from a stratified random sample of U. S. high schools, collected back in 1960; this data bank contains four grades of students, 9 through 12, with approximately 100,000 students in each grade. A number of ability and preference measures were administered to these students over the course of several days of testing. Four composite measures (*viz.*, English language, spatial visualization, mathematical reasoning, & general intelligence) are assembled in Table 2; each mean and standard deviation represents approximately 50,000 subjects. It is clear that even for the English language composite, on which females are clearly superior as a group, the males across all four grades were more variable on this measure as well as all the others.

A more contemporary example is provided by Stanley

TABLE 2
Means and Standard Deviations for Four Ability Composites.
From Project TALENT for Grades 9–12 by Gender

	<i>English language</i>		<i>Mathematics</i>		<i>Spatial</i>		<i>Intelligence</i>	
	M_x	S_x	M_x	S_x	M_x	S_x	M_x	S_x
<i>Grade 9</i>								
Females	87.65	17.29	15.35	6.43	60.15	20.07	145.36	52.58
Males	79.51	18.11	16.01	6.98	69.18	22.54	142.48	54.22
<i>Grade 10</i>								
Females	92.29	17.43	16.65	7.08	63.42	20.80	157.35	52.69
Males	84.37	18.12	18.05	7.65	74.45	22.77	156.40	54.27
<i>Grade 11</i>								
Females	96.63	16.91	17.77	8.02	66.22	20.94	169.97	52.13
Males	89.28	17.89	20.69	8.90	79.01	22.96	173.56	53.95
<i>Grade 12</i>								
Females	100.27	16.55	18.60	8.15	68.49	21.31	180.08	51.56
Males	92.73	17.56	22.46	9.32	82.35	23.31	184.98	53.82

Sample sizes for each cohort by gender follow: grade 9, females = 49,393, males = 49,968; grade 10, females = 47,119, males = 48,543; grade 11, females = 45,428, males = 43,851; grade 12, females = 40,116, males = 38,392. Detailed descriptions of these ability composites may be found in Lubinski and Humphreys (1990a).

et al. (1992). These investigators again report that males tend to be more variable on measures of cognitive functioning, including tests for which females have higher means. For example, Stanley et al. (1992) noted that the largest gender difference favoring females on the Differential Aptitude Test (DAT) is observed in DAT-Spelling. Grade 12 females score approximately .5 standard deviations above the males on this measure. Alternatively, one may state that only 30% of males score above the female mean; yet, because of greater male variability, there is a comparable male/female proportion among students within the top 1% in "spelling talent." This finding and the general phenomenon of gender differences in ability dispersion has important implications for understanding male/female differences at exceptional levels of achievement (cf. Lubinski & Dawis, 1992). When assessing gender differences in achievement among the gifted, it is the upper tail of the ability distribution that we are evaluating; and this upper tail contains an inordinate number of males. Moreover, gender differences in dispersion and level often operate in concert to produce especially disparate male/female ratios at the extremes, as we will illustrate next by returning to SMPY's work with the mathematically talented.

In nationwide talent searches in the U.S., discussed previously, gifted students taking the College Board Scholastic Aptitude Test (SAT) have consistently generated the following pattern of scores. Gender differences in SAT-V are typically small. Yet on SAT-M the difference between means approximates .4 standard deviations, favoring males, and males are more variable than females. Together, these gender differences in level and dispersion produce the following male/female ratios for these 12- to 13-year-olds: SAT-M – 500 (average score of college-bound 12th-grade males), 2:1, SAT-M – 600 (83rd percentile of college-bound 12th-grade males), 4:1, and SAT-M – 700 (95th percentile of college-bound 12th-grade males), 13:1 (Benbow & Stanley, 1983). Comparable ratios have been replicated across the U.S. in a number of talent searches across several years, as well as in other cultures.* Score ranges at SAT-M – 500 are important for a 12-year-old to consider. They reflect important individual differences in quantitative sophistication (Benbow, 1992) and mark the level at which successful graduate work in the physical sciences at the very best universities begins to become probable.

The above gender difference in mathematical reasoning ability does not operate in isolation, however, to solely produce the profound gender disparities in educational attainment and pursuits along the math/science pipeline. Gender differences in other abilities required by the physical sciences, especially spatial and mechanical reasoning, amplify the disparities. These abilities are

frequently overlooked by investigators trying to come to grips with the under-representation of women in engineering and the physical sciences. Table 3 contains data that bear on this issue. They were collected on Cohort 4 by SMPY at Iowa State University over the last 4 years. In addition to the SAT, students in Cohort 4 are administered a variety of nonverbal tests including Raven's Advanced Progressive Matrices, three-dimensional spatial visualization and mechanical reasoning. (A number of personal preference questionnaires are administered as well, see below.) Gifted students at or above the cutting score for the top 1% in overall mathematical reasoning ability display trivial gender differences in not only SAT-V but also in Advanced Raven scores. Yet significant gender differences are revealed for spatial ability and mechanical reasoning. This also parallels the findings of Stanley et al. (1992). These investigators analyzed gender differences on the Differential Aptitude Test (DAT) in effect-size units, taken from a national sample of over 61,000 students. The most pronounced gender difference in this battery was observed in Grade 12 on the Mechanical Reasoning measure, the male-female effect-size difference was almost a full standard deviation (.89) favoring males.

These gender differences in spatial and mechanical reasoning abilities, combined with the well-known gender differences in mathematical reasoning ability (Benbow, 1988), help explain why disparate male/female proportions are observed all along the math/science pipeline. The satisfactoriness criterion for engineering and many of the physical sciences is not as frequently met by gifted females as males. This is only part of the picture, however. There are gender differences in *nonability* personal attributes (vocational interests and values), in addition to life style preferences, that exacerbate disparities stemming from gender differences in satisfactoriness for the physical sciences. We turn to them next.

PREFERENCES

As noted earlier, physical scientists are characterized primarily by their high theoretical/investigative preferences (MacKinnon, 1962), coupled with a *relatively* low need for people contact. Both mathematically gifted males and females have, relative to their own sex norms, strong theoretical values and investigative interests. Yet, there are prominent gender differences in critical preferences for maintaining a commitment to careers in the math/science pipeline that mirror the aforementioned spatial/mechanical abilities among the gifted at age 13. Mathematically talented males are more theoretically oriented on the SOV (see Table 3). Further, their primary interests lie in the investigative and

*Within Asian samples, male/female proportions at the extremes of mathematical talent are narrower than those reported for Caucasians (Stanley et al., 1989). For example,

at SAT-M > 700, the male/female Asian ratio is closer to 4:1, whether students assessed live in the United States or not.

TABLE 3
Ability Profiles of Mathematically Gifted Students Attending a Summer Academic Program Across Five Separate Years by Gender

Year	Gender	N	Age-Adjusted				Advanced			Mental		Bennett			
			SAT-M		SAT-V		Raven's			Rotation Test		Mechanical Reasoning			
			\bar{X}	SD	\bar{X}	SD	N	\bar{X}	SD	N	\bar{X}	SD	N	\bar{X}	SD
1992	* M	72	494	93	398	91	72	24.6	4.1	72	31.3	7.7	72	49.8	7.1
	F	45	458	66	396	82	45	24.3	4.4	45	23.7	8.8	45	45.3	5.2
	† M	84	486	91	395	88	85	24.4	4.2	83	31.6	7.5	83	49.9	7.0
	F	49	465	76	404	90	47	24.6	4.5	48	24.1	8.9	49	45.6	5.2
1991	* M	68	532	101	426	78	68	25.1	3.9	68	29.9	8.1			
	F	51	480	87	418	87	51	25.8	4.3	51	25.1	10.2			
	† M	107	579	101	413	81	92	25.2	4.2	95	30.0	8.1			
	F	67	472	85	418	80	58	25.9	4.2	63	24.1	10.0			
1990	* M	69	537	100	415	79	69	24.5	6.5	69	29.2	9.1			
	F	48	487	74	422	76	48	25.3	4.4	48	22.5	9.7			
	† M	87	545	96	415	79	82	24.6	6.8	80	29.8	8.8			
	F	61	487	71	419	80	57	25.1	4.1	56	21.6	9.4			
1989	* M	20	585	86	441	98	20	27.3	4.4	20	24.9	9.9	20	40.2	9.4
	F	11	505	80	449	96	11	24.7	5.1	11	17.8	4.1	11	35.6	8.0
	† M	43	593	95	446	78	21	27.0	4.4	40	23.8	9.7	42	42.2	10.0
	F	34	514	82	455	79	11	24.7	5.1	34	21.8	7.9	32	35.2	9.4
1988	* M	57	562	81	435	59	57	26.6	3.8						
	F	32	491	65	424	80	32	25.1	5.3						
	† M	72	571	85	440	62	66	26.8	3.7				8	39.3	6.5
	F	39	500	64	425	76	36	25.3	5.3				9	29.0	7.2

* Students who took all of the tests.

† All students who took any one test.

(secondarily) the realistic sectors of Holland's Hexagon (Benbow & Lubinski, 1992; Fox, Pasternak, & Peiser, 1976). In contrast, mathematically talented females are more socially and esthetically oriented and have interests that are more *evenly divided* among investigative, social and artistic pursuits (Table 3; Benbow & Lubinski, 1992; Fox, Pasternak, & Peiser, 1976). Females are more balanced and less narrowly focused in terms their interests and values. (One could also say this about their abilities, cf. Lubinski & Benbow, 1992.) Consequently, the TWA satisfaction criterion is less often achieved for females than males when considering the physical sciences.

Thus, at age 13 more males than females possess ability and preference profiles that are congruent with choices to pursue highly focused careers necessary for distinction in the physical sciences. Due to their more evenly distributed preferences and abilities, the career choices of mathematically gifted females and the amount of time they devote to scientific careers will be less distinguished than their male counterparts. Males will be more exclusively committed to the sciences, while females will have competing interests and will tend to develop their talents in relatively equal proportions across artistic, social, and investigative educational/vo-

educational domains. That is exactly what is found in our educational programs designed for adolescents in the top 1% in ability. Females enroll in courses in math/science and English/foreign language in essentially equal proportions, whereas males were approximately six times more likely to enroll in math/science areas than in English/foreign languages. TWA would predict that the same pattern will reveal itself when career choices, made at a later age, are examined. Indeed, this is the case. Table 4 provides data on the secured educational credentials that mathematically gifted students in Cohort 1 achieved (or are intending to achieve) 10 years following their identification at age 13. Less than 1% of the females in the top 1% of mathematical ability are pursuing doctorates in mathematics, engineering, or physical sciences (Lubinski & Benbow, 1992). Eight times as many males are doing so. Benbow and Lubinski (1992) presented similar data just collected for SMPY's Cohorts 2 and 3.

An alternative way to capture the essence of these gender differences in preferences takes us back to Thorndike (1911) and one of the most celebrated dimensions of individual differences, "people versus things." In normative samples, females tend to gravitate toward the former, while males gravitate towards the

TABLE 4
Preference Profiles of Mathematically Gifted Students Attending a Summer Academic Program Across Five Separate Years by Gender

Year	Gender	N	Study of Values											
			Theoretical		Social		Economic		Aesthetic		Political		Religious	
			\bar{X}	SD	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD
1992	* M	72	46.7	7.1	35.7	6.8	43.7	7.1	36.7	7.1	44.0	6.7	33.2	10.9
	F	45	41.5	8.2	44.0	7.4	39.3	6.7	43.6	6.7	37.4	5.9	34.2	10.0
	† M	73	46.7	7.1	35.7	6.8	43.6	7.1	36.6	7.1	44.0	6.7	33.5	11.0
	F	45	41.5	8.2	44.0	7.4	39.3	6.7	43.6	6.7	37.4	5.9	34.2	10.0
1991	* M	68	47.7	7.0	37.1	7.3	41.6	7.2	36.4	8.2	42.9	6.6	34.2	10.4
	F	51	42.0	6.8	43.2	8.1	37.8	6.9	42.6	7.1	39.0	7.2	35.4	10.2
	† M	77	47.6	6.9	37.1	7.0	41.8	6.9	36.5	8.3	43.1	6.8	33.8	10.1
	F	57	41.7	7.0	43.8	8.3	37.5	7.0	42.8	7.5	38.7	7.0	35.6	10.3
1990	* M	69	46.6	8.8	38.4	7.8	40.4	8.2	38.4	8.4	42.5	6.9	33.4	11.14
	F	48	40.3	8.0	44.0	8.0	35.8	7.1	42.1	6.4	40.1	6.7	37.5	8.1
	† M	73	46.6	8.7	38.3	7.6	40.4	8.1	37.8	8.7	42.7	6.8	33.9	11.3
	F	51	40.7	8.0	43.6	8.1	35.3	7.2	42.8	7.1	40.1	6.6	37.1	8.4
1989	* M	20	49.3	7.4	35.4	5.9	40.3	9.4	37.3	8.0	45.0	7.8	30.8	11.1
	F	11	39.0	9.1	42.3	9.1	41.1	9.6	40.6	5.2	40.4	9.3	36.6	12.5
	† M	43	50.0	6.8	34.8	7.5	42.2	8.2	37.0	7.7	44.1	8.2	30.9	10.7
	F	34	41.8	7.4	41.2	8.3	39.6	7.7	43.9	8.2	39.2	7.2	34.3	10.9
1988	* M	57	48.0	8.5	34.4	7.8	44.9	7.6	35.3	8.1	45.2	8.2	32.4	12.8
	F	32	42.3	7.5	40.7	8.0	38.2	7.5	43.6	8.4	40.1	6.2	34.9	10.3
	† M	61	48.3	8.5	34.5	7.6	44.7	7.4	35.0	8.0	44.8	8.3	32.9	12.7
	F	33	42.5	7.4	40.9	8.0	38.0	7.5	43.4	8.4	40.0	6.2	35.2	10.2

* Students who took all of the tests.

† All students who took any one test.

latter (cf., Lubinski & Humphreys, 1990a) and this parameter of individual differences operates among the gifted as well (Lubinski & Benbow, 1992). Given the female preference within the sciences for biology and medicine, however, compared to the physical sciences, as is evident in Table 4, perhaps it would be more precise to state that gender differences in vocational preferences are structured around "organic" versus "inorganic" content domains (Benbow & Lubinski, in press). It is not science, per se, that turns off many females, rather, it seems to be the inorganic nature of many of its content domains. We are currently investigating key value configurations (high theoretical values, relatively low social values), which we believe more precisely map the individual differences that contribute to these career decisions. Our preliminary findings indicate that the higher-order trend, theoretical minus social as assessed at age 13, has predictive validity for structuring choice of college major and areas of graduate concentration.

Life-style choices: Before leaving the domain of preferences, there is one critical gender difference in life-style preference that is essential to document (and one that is typically not assessed on standardized interest or values questionnaires). This gender difference is likely to exert a huge effect on gender differences even in

disciplines in which male/female ratios in achieved educational credentials are comparable: commitment to full-time work as young adults. In our first three cohorts, for example, about 95% of mathematically talented males versus less than 60% of such females plan to work full-time until retirement, a percentage that has been stable over the past 20 years (Benbow & Lubinski, 1992, in press). This latter statistic would indicate that females, as a group, will tend to devote less time to their vocational development relative to males. Further, in most research in this area as in our previous research, questions to respondents are typically framed in terms of full-time versus various part-time options, not in terms of how much they are willing to work. Thus, we are currently assessing how the gifted feel about 50- to 70-hour work weeks, schedules more in line with people at the cutting edge of their discipline. This might reveal further gender disparities.

In sum, therefore, mathematically gifted females, in addition to having a more multifaceted interest profile and a more complex mixture of value orientations for evaluating their experiences and structuring their life-style, prefer to devote less time to vocational pursuits. They have more to balance, more competing needs at comparable intensities. Mathematically gifted males,

however, are more focused on a theoretical/investigative style of life with fewer competing pulls and prefer to devote a greater amount of time to vocational pursuits.

Contemporary Research Trends: Viewed From the Context of TWA

We have illustrated above how the personal attributes of females compared to males will lead them to *choose* scientific careers less frequently, as a group, and to distribute their educational development across artistic, social and investigative areas more evenly. Of course, conventionally purported barriers (Eccles, 1985; Eccles & Harold, 1992; Kerr, 1985; Noble, 1989; Reis & Callahan, 1989; Silverman, 1986) might still remain. We suggest, however, that these and other purported barriers be evaluated from a broader context using TWA and its key components, satisfaction and satisfactoriness, to establish expectations on the degree to which comparable gender representation might be anticipated. According to TWA, because of their differing ability and preference profiles, highly able males and females achieve, as a group, satisfaction and satisfactoriness through different means. Consequently, they respond to the environment differently, as does the environment to them. Gender differences as a reflection of choice need to be factored into existing models and perceptions. Moreover, satisfactoriness and satisfaction baselines might be useful for appraising theoretical explanations of gender differences in achievement more generally.

For example, Eccles et al. (1983) introduced the expectancy-value model of motivation, which they proposed as a framework for understanding the relationship between values/personality attributes and academic achievement, as well as gender differences therein. This popular model describes two primary factors affecting achievement behavior: (1) expectations for success and failure and (2) subjective task value. Moreover, it conceptualizes gender differences in achievement, just as we do, from a *choice* perspective rather than a *deficit* perspective. It also views choices as being made from a variety of options presented within a complex social reality, wherein gender roles and stereotypes operate (see Eccles & Harold, 1992, for a discussion of this model as it pertains to the gifted). Yet to what extent do expectations and subjective task value reflect realistic personal estimates of the degree to which TWA's correspondence dimensions, satisfactoriness and satisfaction, respectively, are achievable in contrasting educational and work environments? Is self-confidence and self-efficacy, for example, merely a reflection of the extent to which one is in a correspondent environmental ecology in the TWA sense?*

Inadequate math/science preparation is another factor often mentioned as curtailing women's career options.

Sells (1980), for example, perceived mathematics in high school as a "critical filter," screening out females from engineering and science majors. Indeed, the number of mathematics and science courses taken in high school is found to relate to choice of college major as well as career (Berryman, 1985; Ethington & Wolfe, 1986); gifted females, even mathematically gifted ones, do take somewhat less mathematics (and science) in high school compared to such males (Benbow & Minor, 1986; Benbow & Stanley, 1982). Consequently, it has been suggested that more females would enter and remain in the math/science pipeline if they were required to take more mathematics and science courses in high school. But to what extent is course-taking among mathematically gifted females a reflection of their preferences and/or abilities? Preference and ability profiles are in place long before high school. Can they be changed as a function of course-taking? Would *requiring* mathematically gifted females with intense preferences for social and artistic content to take more mathematics, chemistry, physics, and computer science in high school increase their representation in the math/science pipeline? Would *requiring* mathematically and spatially gifted boys with intense preferences for building and manipulating physical materials and inorganic things to take more high school courses in English increase their representation in the humanities?

Some of the other factors thought to attenuate the professional development of women include those that women "do to themselves." These are, among others, the Queen Bee Syndrome (Staines, Tavis, & Jayaratne, 1974), the Great Impostor Syndrome (Clance, 1985; Machlowitz, 1982; Warschaw, 1985), the Cinderella Complex (Kerr, 1985) and the Perfection Complex (Reis, 1987). The Queen Bee and Perfection Complex are similar in that females feel that they have to be perfect in every way and in how they handle the multiple roles of professional, mother, and wife. The Great Impostor Phenomenon captures how many successful women feel they achieved their success—not through their hard work and ability but rather through luck; and they are waiting to be found out. To avoid being "found out" they get caught in a circle of working even harder, achieving greater success and developing greater fear of being detected as the impostor they truly believe they are (Kerr, 1985, 1991). To what extent is this depiction characteristic of a gifted female with several competing interests at comparable intensities coupled with the greater conscientiousness of females in general (Schmidt & Hunter, 1992)? These questions and others like them will be pursued in our future research. In all of our research, however, detailed assessments of well-known personal attributes critical for satisfaction and satisfactoriness in specialized careers and advanced educational tracks are conducted, not only

*Moreover, among the gifted, their self-concepts, especially academic ones, are so high in both males and females that

measures derived on normative samples are psychometrically inadequate due to ceiling effects (Swiatek, 1992).

to establish expectations for gender representation in the math/science pipeline, but also the degree to which the self-perceptions of our students are reality based. Investigators in other areas of educational/vocational development, as well as theorists interested in indexing the magnitude of social psychological influences, might find this strategy profitable too.*

Conclusions

In this chapter, using TWA, we have organized data collected at SMPY with data of other investigators on key gender-differentiating attributes that channel the nature and degree of educational/vocational achievement among the gifted. We feel that this model is useful for conceptualizing and better understanding many different kinds of gender differences surrounding the manifestations of intellectual talent. We conclude with three points: one intended for researchers, another for theoreticians and finally one for educators and applied psychologists. While, to be sure, the expressed thoughts shared by these three categories possess appreciable overlap, they also reflect a unique emphasis.

First, for the researcher, if one thing is apparent from the last 20 years of research on the gifted and the ensuing gender differences uncovered therefrom, it is the need to conduct multi-attribute assessments of key characteristics relevant to criterion behaviors of interest. Our particular area of interest involves the determinants of educational and career excellence in engineering and the physical sciences. It behoves us, therefore, to incorporate measures of spatial and mechanical reasoning into our correlational and experimental designs, in addition to assessing critical vocational interests and values and life-style preferences. We simply cannot restrict investigations solely to abilities, preferences, or attitudes (or any "favorite" class of personal attributes) and expect findings to generalize with fidelity. There are simply too many gender differences observed in key variables relevant to multiple educational/vocational paths to make one-shot, one-variable designs unquestionably defensible.

Second, theoretical formulations must at least attempt to genuinely embrace all available evidence before casting highly integrative frameworks for interpreting

research findings. Theorists certainly should not ignore relevant auxiliary data which speak to the tenability of certain conclusions. In another context, we have suggested that researchers employ the Total Evidence Rule for evaluating the verisimilitude of competing theoretical formulations. This rule of induction was formulated by Rudolph Carnap (1950). It maintains that consideration of all relevant information is essential when evaluating a proposed scientific assertion. There are multiple examples in the gifted literature for the relevance of this important rule, but the following two involving gender differences will suffice to illustrate its significance. First, if social influences are operating in isolation to attenuate the development of exceptional levels of mathematical reasoning abilities in females (as some have suggested), theorists must address why it is that females are superior to males in arithmetic computation and also tend to get better grades than males in high school math courses (cf. Benbow, 1988; Kimball, 1989). A second example involves sex-role identification. The masculine identification hypothesis has been used to explain the relative superiority of males compared to females in mathematical reasoning ability. This formulation must come to grips with the fact that regardless of how giftedness is defined (e.g., by selecting subjects based on exceptional levels of verbal, spatial, or mathematical ability), gifted adolescents of all "types" are less gender stereotyped than their average-ability peers in a variety of interests (Lubinski & Humphreys, 1990a), even though it is the gifted that display the largest gender differences in achievement. Moreover, in a recent *meta*-analytic review, covering the literature on parents' differential socialization practices as a function of their child's gender, Lytton and Romney (1991) observed many *insignificant* effect sizes for a number of abilities and social behaviors.

Finally, we, like most vocational psychologists working with young adults, feel it is important that gifted adolescents are provided with the opportunity to develop in ways commensurate with their unique abilities and personal preferences. If this means that more gifted females *choose* to become biologists, lawyers, and physicians, relative to physical scientists, electrical engineers, or computer scientists, *as long as they are aware of their full potential* we are not concerned. We view gifted students as individuals first and try to be as

*In applying TWA to programmatic interventions for the gifted, we have observed an interesting corollary phenomenon. Although we are only in the beginning stages of attempting to document this observation empirically, it might be profitable to alert practitioners and theorists to the following nascent (but we believe promising) line of empirical research: It appears that when interventions are implemented that are more optimal for the intellectual development of the gifted, the environments provided (relative to normative classrooms) are ideal for their social and emotional development as well. In correspondent educational environments, the gifted are simultaneously placed in environments composed of their age-mate intellectual peers

and of individuals with shared academic *and* nonacademic interests. This is rarely the case for the gifted student placed in traditional educational settings. Thus, closer friendships are easier to cultivate in correspondent educational environments for the gifted. Moreover, their self-reports indicate that the experience of knowing that there are others "like them" and developing friendships with one another constitutes an invaluable support system that enhances their psychological well-being and personal development. We are now beginning to study the social and emotional effects of this kind of peer-support system more systematically, with students in our summer programs for the highly able.

responsive to their individual differences and uniqueness as possible. If one is to be all that one can be, to borrow Maslow's phrase, one must be responsive to one's true nature—a theme that cuts across many fulfillment theories and formulations aimed at construing optimal forms of human functioning, including those of Gordon Allport, Carl Rogers, and Carl Jung. It might be advisable for counselors and educators to keep the wisdom offered by these theorists in mind when working with clients and students searching for optimal direction for their educational and vocational development, and, perhaps also, to remind clients of Jane Loevinger's (1976) observation (contained in her treatment of ego development) that "personality develops by acquiring successive freedoms." Yet all of this actually can be encompassed by TWA, an empirically based model of personal fulfillment within the world of work (Dawis & Lofquist, 1984; Lofquist & Dawis, 1969, 1991).

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Gifted Handicapped: A Desultory Duality

CAROLYN YEWCHUK

University of Alberta, Edmonton, Alberta, Canada

JUDY L. LUPART

University of Calgary, Calgary, Alberta, Canada

Gifted Handicapped: A Desultory Duality

As the mainstreaming and inclusive education movement in education has gained momentum in the last two decades, there has been increasing concern with providing appropriate education to all children with handicaps (Turnbull, 1986). During this same time period, there have also been tremendous gains in the relatively late-developing area of gifted education (Colangelo & Davis, 1991). Unfortunately, the educational needs of certain subgroups of this population of children, i.e., the gifted handicapped, have been slow to receive recognition (Lupart, 1992; Karnes & Johnson, 1991).

Interest in handicapped individuals with high potential is not just a contemporary phenomenon. There are many historical examples of gifted men and women with handicapping conditions who have made significant contributions to society, for example, Thomas Edison, Helen Keller, and Franklin Roosevelt (Goertzel & Goertzel, 1962). Other notable people, such as Albert Einstein, Woodrow Wilson, and Auguste Rodin, had learning difficulties in reading, writing, and spelling (Thompson, 1971). Despite the widespread recognition of a few such individuals, we have no way of knowing how many more handicapped individuals failed to develop areas of potential giftedness because of lack of recognition and support or inappropriate schooling. In the past, gifted children with handicaps were generally underserved. Where they received special educational services, it was in the area of handicap without provision for extension of gifts and talents. Only those few individuals who had the support of informed, concerned families and/or visionary, innovative educators were able to develop their potential giftedness (Johnsen & Corn, 1989).

Since the 1970s there has been increased professional awareness of the gifted handicapped as an underserved subpopulation of students (Gallagher, 1988; Whitmore, 1986a). In the United States, the Association for the Gifted, a division of the Council for Exceptional

Children, established a subcommittee of educators of gifted handicapped children. The first national conference on handicapped gifted and talented students was held in 1976 and the term "gifted handicapped" was added to the ERIC indices in 1977 (Porter, 1982). By the mid 1970s, in the United States, at least eight special programs for gifted handicapped children had been developed (Maker, 1977), and special interest groups advocating on behalf of the gifted handicapped had been created (Johnsen & Corn, 1989).

One notable example is *Very Special Arts*, an organization dedicated to enriching the lives of handicapped children, youth and adults, founded in 1974 as an affiliation of the John F. Kennedy Center for the Performing Arts (Karnes & Johnson, 1991). This organization sponsors noncompetitive programs and festivals in drama, dance, music, literature, and the performing arts. It has since expanded to include international affiliations at over 50 sites around the world (Very Special Arts Education Office, 1985).

By the early eighties, education of gifted handicapped children was being hailed as a "new frontier" (Whitmore, 1981), and educators were being challenged to develop procedures for identifying creative potential in handicapped children (Ford & Ford, 1981), to make appropriate use of new technology in the classroom (Higgins, 1981), and to provide appropriate individual educational programs which encouraged development of potential while attending to areas of deficit (Karnes, Schwedel, & Linnemeyer, 1982). Despite this early flurry of professional interest, however, leading American advocates for gifted handicapped students noted a general neglect of the special educational needs of these students during the 1980s.

Karnes attributes this neglect to a lack of coordinated leadership arising from the separation of educational services for gifted and handicapped students. After several years of working with young handicapped gifted children, she has noted that teachers of the gifted are usually unaware of services for handicapped children, while teachers of the handicapped are not trained to

recognize potential gifts or talents. In some instances, state consultants for the gifted may not even know the consultants for the handicapped (Whitmore, 1989).

From Gallagher's perspective, the neglect may be attributed to both administrative and logistical, psychological barriers. There is a problem in allocating limited resources for special program development to the very small number of students who are both gifted and handicapped, while psychologically, people who work with a particular group of students may not be able to respond appropriately to another group. "Children who are gifted almost seem to be disliked . . . for their potential, or disregarded at the very least" by professionals trained to work with the handicapped, while educators of the gifted "can be made uncomfortable even by the presence of handicapped children in the same program" (Whitmore, 1989, pp. 8-9).

To Hanninen, the emphasis within special education programs on the handicapping condition rather than on serving the whole child has contributed to neglect of potential giftedness. Where the handicapping condition is very severe, teachers consider the development of basic skills so important that other considerations, including encouragement of gifts and talents, are relegated to a position of secondary importance (Whitmore, 1989).

In spite of the perceived neglect in educational provisions for the handicapped gifted during the 1980s, professional concern for this subpopulation of students has remained strong, and impressive gains have been made, particularly in identification and programming. Nevertheless, many gifted handicapped children continue to be underserved, and the need remains for considerable effort and initiative to ensure that all handicapped children have the opportunity to develop their potential gifts and talents (Karnes & Johnson, 1991).

Definition

The gifted handicapped are those individuals of exceptional ability or potential who can achieve high performance, despite handicaps such as hearing, visual or orthopedic impairments, emotional disturbance, or learning disabilities. In order to reach their potential, they require special educational programs which take into account both their giftedness and their handicap. The range of possible combinations of giftedness and handicap is very broad, with varying degrees of specific strengths and weaknesses. In practical terms, a handicapped gifted child must meet the criteria for single or multiple dimensions of giftedness as well as the criteria for handicap.

Current definitions of giftedness which acknowledge multifaceted manifestations of high potential are more amenable to the conceptualization of gifted handicap than the more stringent traditional definitions based only on extremely high intelligence. In particular, the

following definition proposed by Marland (1972, p. 10) has been influential in broadening the concept of giftedness to include children with handicaps:

Gifted and talented children are those identified by professionally qualified persons who, by virtue of outstanding abilities, are capable of high performance. These are children who require differentiated educational programs and services beyond those normally provided by the regular school program in order to realize their potential contribution to self and society.

Children capable of high performance include those with demonstrated achievement and/or potential ability in any of the following areas:

- General intellectual ability
- Specific academic aptitude
- Creative or productive thinking
- Leadership ability
- Visual or performing arts
- Psychomotor ability.

Following this definition, a child does not have to be superior in all dimensions in order to be considered gifted. High potential or demonstrated achievement in only one area is sufficient to meet the criteria of giftedness. No lower limits of performance or ability are specified in the other areas. By implication then, deficient or low-level performance might very well be evident in these other areas. A child with a severe handicap, like any other child, could then meet the criteria for giftedness, by showing high potential or performance in at least one of the six areas.

Handicapped children include those who require special education services for mental retardation, hearing impairment, speech impairment, visual impairment, serious emotional disturbance, specific learning disability, or orthopedic or other health impairment, either singly or in combination (U.S. Congress, 1975). Special education services are indicated if the handicap prevents children from performing appropriately in regular school programs. With the possible exception of mental retardation (except in some special cases, as we outline below) it is possible for all of these categories of handicap to occur simultaneously with any of the areas of potential giftedness.

To put it simply, a gifted handicapped child requires special education services for one or more areas of potential giftedness, and one or more types of handicap. Handicapped gifted children form an extremely heterogeneous group, with great variability in individual profiles of strengths and weaknesses.

Incidence

The incidence of handicapped gifted children is low compared to other segments of the school population. Estimates based on the assumption that the incidence of giftedness among the handicapped is similar to that

within the general school population, with the exception of mental retardation, range from a conservative 2% of all handicapped children in the United States or between 120,000 and 180,000 (Schnur & Stefanich, 1979) to a more liberal 5% or between 300,000 and 540,000 (Whitmore & Maker, 1985). Data from studies of specific subpopulations of gifted handicapped children have varied even more. Mauser (1980) found 2.3% of learning disabled children to be gifted. Karnes and Johnson (1986) reported that 9.2% of preschool handicapped children met their criteria of giftedness. Among hearing-impaired children, the figures were found to be 4.2% (Gamble, 1985) and 6.1% (Yewchuk & Bibby, 1989a). Neither the estimates nor the empirically derived percentages can be considered definitive because of the range in criteria for giftedness and the nature, severity, and effect of handicap.

Characteristics

Handicapped gifted children may manifest a variety of characteristics; some positive, some negative. Moreover, in some cases, positive qualities may be interpreted in a negative way by adults working with the children (Friedrichs, 1990).

Among the positive characteristics are those usually associated with giftedness. These include the following (Udall, 1985; Whitmore, 1981; Whitmore & Maker, 1985):

- Superior memory and general knowledge
- Superior analytical and creative problem-solving skills
- Notable drive to know, or master
- Superior use of language, oral or written
- Exceptional comprehension
- Keen sense of humor
- Persistence in pursuit of academic or intellectual tasks
- Awareness and/or ability to capitalize on personal strengths.

Gifted handicapped individuals who achieve at high levels receive support, encouragement and guidance from their parents. Effective, nurturing parents have high expectations of their children and recognize their successes (Whitmore & Maker, 1985). They devote a great deal of energy to obtaining the best possible education for their children and de-emphasize the handicap. They allow their children to develop their own interests, nurture a sense of independence, and arrange maximal contact with nonhandicapped peers (Epstein, 1980).

Successful gifted handicapped individuals have been observed to have an intense drive to succeed in reaching their goals. They are capable of devising creative coping strategies for goal attainment. These have been shown to include strategies for overcoming personal limitations (Whitmore & Maker, 1985), and alternative solutions for attainment of a goal (Robertson, 1985). Gifted

handicapped people, in general, have a positive vision of their potential, accurate self-knowledge of their strengths, and a high degree of energy in trying to reach their goals (Whitmore & Maker, 1985; Wingenbach, 1985).

The characteristics of giftedness which teachers perceive in handicapped children have been found to be very similar to those perceived in nonhandicapped children (Yewchuk & Bibby, 1989a). Teachers of severely and profoundly hearing-impaired children in integrated (public school classrooms) and segregated (school for the deaf) settings associated a wide variety of characteristics with giftedness, including superior recall, superior comprehension, reasoning ability, academic ability, expressive ability, eagerness to learn and keen observation. These characteristics were similar to those reported for hearing populations of children (Davis & Rimm, 1989). Hearing-impaired children, like their hearing counterparts, excel in intellectual, academic, and motivational endeavors relative to their peers (Yewchuk & Bibby, 1989a).

On the negative side, the characteristics most often associated with gifted handicapped individuals include the following (Meisgeier, Meisgeier, & Werblo, 1978; Nielsen & Mortorff-Albert, 1989; Vespi & Yewchuk, 1992; Whitmore & Maker, 1985).

- Struggles with self-acceptance
- Fragile self-concept
- Feelings of social discomfort, embarrassment, shame
- Intense frustration and anger
- A need to release or vent pent-up energies
- Interpersonal difficulties with peers, teachers, and family
- Academic difficulties in selected skill areas.

For some individuals, these negative characteristics may develop into emotional/behavioral difficulties (Schiff, Kaufman, & Kaufman, 1981). Others may become socially isolated, either through withdrawn or aggressive behavior (Meisgeier, Meisgeier, & Werblo, 1978). An end result might involve avoidance of academic and social involvement because of the fear of failure or rejection.

Part of the emotional difficulties faced by gifted handicapped individuals may lie in the conflicting patterns typically observed in handicapped and in gifted individuals in the areas of locus of control, field dependence/independence, achievement motivation and learned helplessness (Bireley, 1991). In studies of gifted and disabled populations, the gifted tended to respond according to the more independent adult pattern than their peers; they showed internal control, field independence and expectation of success. On the other hand, disabled populations such as deaf or congenitally blind children tended to show more dependent, externally controlled behavior. In situations where gifted handicapped individuals are treated as a handicapped person to the neglect of their intellectual ability, Bireley (1991) assumes that a "handicapped" or

immature pattern is likely to emerge, but in a proper environment, the "gifted pattern" could emerge.

The positive qualities of gifted handicapped children may not appear praiseworthy to adults around them (Friedrichs, 1990). For instance, these students might aspire to negative goals, such as identifying and criticizing inconsistent school policies (Rosner & Seymour, 1983). For the gifted handicapped students themselves, the interaction of positive and negative characteristics may have painful results. Some noteworthy effects arising from the interaction of the characteristics of giftedness and handicap are shown in Table 1 (Friedrichs, 1990; Tannenbaum & Baldwin, 1983; Whitmore, 1981).

TABLE 1
Effects of Interactions between characteristics

<i>Gifted characteristic</i>	<i>Handicapped characteristic</i>	<i>Effect</i>
Areas of strength	Handicaps	Uneven profile
Perfectionism	Low achievement	Frustration
High aspirations	Low expectations	Inner conflict
Few gifted peers	Few handicapped peers	Social problems
Drive and determination	Limited outlets	Pent-up energy
Desire for independence	Handicap	Creative problem solving
Keen sensitivity	Self-criticism	Fragile self-concept
High career ambitions	Limited access	Feelings of exclusion

The conflicting interpersonal and intrapsychic effects evident in the above listing were found also in a phenomenological study of gifted learning disabled children (Vespi & Yewchuk, 1992). In general, the subjects resembled gifted students in terms of positive emotional characteristics, and learning disabled students with respect to negative academic characteristics, but they also exhibited some unique characteristics which differed from both subgroups.

Like gifted students, the gifted learning disabled subjects were internally motivated, believed that success and failure were under their personal control, and showed traits of independence. Furthermore, they were able to interpret and communicate with nonverbal cues (Vespi & Yewchuk, 1992).

On the other hand, the characteristics which were shared with learning disabled students included a discrepancy between performance and potential ability, frustration and anxiety about academic tasks, difficulty with concentration, problematic relationships with peers, and poor work habits (Vespi & Yewchuk, 1992).

These unique characteristics, underscored a powerful fear of failure associated with the discrepancy between high expectations based on self-perception of abilities, and low achievement resulting from the disability. The subjects also exhibited inconsistent social skills; they knew what was expected of them, but they

weren't always able to follow through. A final unique characteristic involved a fluctuating self-image, enhanced by success in limited areas and diminished by repeated academic failures. It is of particular interest to note that special educational interventions were crucial in helping gifted disabled children deal with the social-emotional difficulties (Vespi & Yewchuk, 1992).

The most salient learning and motivational characteristics of gifted handicapped children have been summarized in a checklist called Teacher Observational Items (TOI) consisting of the following items (Pledge, 1982, p. 223):

- Has advanced, expressive and elaborate vocabulary, and may read prior to school entry
- Memorizes and recalls information easily
- Is aware of cause and effect relationships, and can question and apply information
- Engages in divergent thinking; can generalize and provide more than one correct answer
- Has a prolonged attention span and is persistent
- Is curious, has many interests, and may be a high risk taker
- Displays a sense of humor.

The TOI may be used as a general indicator of potential giftedness by teachers, parents, and others who have frequent interaction with handicapped children. However, as Pledge (1982) cautions, a simple checklist is not adequate for identifying the multiple aspects of gifted handicaps, and should be coupled with the use of appropriate standardized measures, specific to areas of handicap, modified as required by qualified personnel. Pendarvis and Grossi (1980) provide a listing of appropriate identification instruments cross-matched by type of disability and area of giftedness.

Identification

The basic problem in identifying giftedness in handicapped individuals is to remove the mask that a disability can place over intellectual ability, talent and creativity (Maker & Grossi, 1985). It is easy to identify individuals with an obvious handicap such as blindness or deafness, or those who are obviously gifted. But for many handicapped individuals, talent and ability may be present but blocked. Identifying the true ability of a handicapped child who cannot speak or hold a pencil presents a unique problem and a challenge.

Identification of students for special programming usually proceeds through the three phases of referral or nomination by teachers, parents or others, assessment or diagnosis of strengths and weaknesses by appropriate professionals, and selection or placement by a duly constituted selection team. In each of these three phases of the identification process giftedness can be overlooked by individuals who lack familiarity with the characteristics of gifted handicapped children (Minner, 1990; Minner, Prater, Bloodworth, & Walker, 1987).

Many barriers exist which hinder identification of

gifts and talents in children with handicaps. These include stereotypic expectations, developmental delays, handicapping effects, inappropriate identification procedures and lack of trained professionals (Karnes & Johnson, 1991; Maker, 1977; Whitmore & Maker, 1985; Lupart, 1992).

Stereotypic Expectations

Some of the stereotypes that we hold of typical gifted children and typical handicapped children may be impediments to identification of the gifted handicapped. Gifted children may be expected to look "bright" (Karnes & Johnson, 1991) and children who look "different" in some way may be considered to be less gifted than they actually are. It is a common experience of gifted handicapped individuals to be noticed for their handicaps rather than for their talents or gifts. In the words of a gifted handicapped individual interviewed by Maker (1977, p. 33), "They try to stifle you if you're handicapped . . . it's awfully hard to convince people that you're gifted." When parents and teachers focus on the handicap alone, areas of functioning that are inconsistent with perceptions of that handicap are ignored, and expectations are lowered. When we don't expect much from a child, we don't get much in return.

Of perhaps the most serious concern is a widespread destructive tendency to associate handicap with mental retardation, particularly if language is absent or delayed (Whitmore & Maker, 1985), since advanced language skills are commonly associated with giftedness. These and other stereotypes of intellectual inadequacy may have been fostered through the historical practice of segregating handicapped children for educational instruction (e.g., schools for the deaf, blind, trainable retarded) which hindered contact with nonhandicapped peers (Yewchuk & Bibby, 1989b). Hopefully, with the recent movement toward inclusive education, a more accurate perception of the interaction between giftedness and handicap will emerge.

Developmental Delay

Cognitive development, intellectual functioning and language development can be delayed when a handicapping condition hinders or prevents the child's access to information, opportunity and resources (Maker, 1977). This is obvious, for example, in the case of hearing impairment where inability to hear the sounds of language may severely limit the acquisition of language comprehension and speech. In cases of developmental delay, comparison with nonhandicapped peers is prejudicial to handicapped children. A more accurate indication of intellectual ability can be obtained by comparison with similarly handicapped peers who have experienced a similar degree of developmental delay.

Handicapping Effects

Handicapping conditions can disguise a child's true potential and abilities, and impede the expression of characteristics revealing giftedness (Gerken, 1979; Maker, 1976). If the nature of the handicap limits or distorts assessment of intellectual abilities, it is important for teachers and psychologists to note ways in which children compensate for the condition, and to attach greater weight to characteristics instrumental in successful adaptation. For example, nonverbal communication and visual and abstract abilities might provide the best clues to giftedness in deaf children, while problem solving and abstract thinking might be weighted more than reading or writing for learning disabled children (Maker, 1977). If the normal channels of expression are blocked altogether, then alternate methods of assessing superior abilities must be sought. Instead of depending on oral and written language as indicators of giftedness, teachers might employ tasks requiring problem solving, memory, critical thinking, and creativity (Whitmore, 1981).

Inappropriate Identification Procedures

The three most frequently used procedures for identifying children for gifted programs are teacher nomination, tests of achievement, and IQ tests (Cox, Daniel, & Boston, 1985), often supplemented with additional sources of information such as tests of creativity or critical thinking, or parent nomination. It is frequently recommended that multiple sources be drawn together into a matrix or profile chart (Lupart, 1990) to minimize the possibility of bias in any one criterion, and to ensure a balanced, holistic view of the child.

For the most part, the same types of referral, assessment, and selection procedures used with nonhandicapped children can be used with handicapped children (Whitmore & Maker, 1985). However, it would be unreasonable to expect handicapped children to demonstrate potential gifts and talents in the same way and at the same level as nonhandicapped children (Karnes & Johnson, 1991). Instruments such as IQ tests and achievement tests which have been standardized on nonhandicapped children may not be appropriate for use with handicapped children. An inappropriate test may underestimate potential ability in handicapped students. For example, in view of the fact that most group IQ tests require independent reading ability, the use of such tests will quite certainly yield low scores for students with reading disability.

In general, unless examiners take care to eliminate test items biased against specific types of handicap, or to alter the mode of testing (for example, using Total Communication with deaf students), the standardized tests of intelligence and achievement commonly used to identify nonhandicapped gifted learners will underestimate the gifts and talents of handicapped indi-

viduals. It is paramount that testing modifications reflect a thorough familiarity with the limitations imposed by specific types of handicap and that special concessions be appropriate for that type of handicap (Pendarvis & Grossi, 1980). Moreover, experienced examiners suggest that, where possible, an examiner who is similarly handicapped should be involved in the identification process (Stefanich & Schnur, 1979). Of course, if it is anticipated that performance would be selectively depressed during IQ testing, it is preferable to use instruments which have been developed specifically for subpopulations of handicapped children. Better known examples would include the Hiskey Nebraska Test of Learning Aptitude (Hiskey, 1966) for deaf children and the Perkins-Binet for blind children (Warren, 1984). Recognizing that specific instruments and procedures have not been developed for every subgroup, it is recommended that checklists and tests used with nonhandicapped students be examined and assessed for appropriateness of use, bearing in mind the unique characteristics of the particular subgroup (Corn, 1986). For example, characteristics such as "understanding of abstract concepts" and "perception of the environment" are not appropriate indicators of giftedness in visually impaired children and should be deleted when assessing these children (Johnson, 1987). In general, verbal tests of intelligence are appropriate for blind children. On the other hand, nonverbal measures of intellectual potential such as the WISC-R performance scale, the Leiter International Performance Scale, or the Raven's Progressive Matrices are more appropriate for deaf children (Levine, 1974).

A somewhat controversial practice (arising from concern about the masking effect of handicaps) has been to accept a lower IQ criterion for admission of handicapped children to gifted programs when handicap specific tests are not available.

This practice is most commonly reported by professionals working with learning disabled gifted children. For this unique subgroup the typical IQ criterion ranges between 120 and 125 on any one of the Verbal, Performance, or Full Scales of the WISC-R, rather than the more conventional 130 and over (Fox, 1983; Schiff, Kaufman, & Kaufman, 1981; Udall & Maker, 1983; Yewchuk, 1986). The crucial concern here is that if the conventional criterion were used, learning disabled children would be at a disadvantage in comparisons with nonhandicapped peers. The possibility of test bias against this subgroup of children is borne out by Rawson's (1968) study showing that very few language disabled children with superior achievement score above 135 IQ on the Stanford-Binet.

Lack of Trained Professionals

Teachers, psychologists, and others working in the field are inadequately trained to identify gifted handicapped children (Karnes & Johnson, 1991). Teachers of the

handicapped typically have only limited familiarity with characteristics of gifted learners. Furthermore, the orientation of most special education programs is to identify deficits and to provide remediation of basic academic and self-help skills to a level equal with nonhandicapped peers. Typical methods stress memorization and repetition of basic facts and skills at the lowest levels of Bloom's (1956) taxonomy, with little provision of opportunity for students to exhibit abilities in analysis, synthesis or evaluation at the higher levels of the taxonomy. This orientation is inconsistent with the identification of the artistic, creative, intellectual, scientific, and literary endeavors characteristic of gifted learners.

Personnel working with handicapped children often fail to notice their strengths unless they have received specific training in characteristics of giftedness. For instance, when Eisenberg and Epstein (1981) initially surveyed teachers of 60,000 handicapped children in New York City, they did not receive a single nomination for their program for gifted and talented learners. Nominations were received, however, after the teachers were inserviced on the characteristics and educational needs of gifted handicapped children. This example points to the importance of providing inservice and preservice training in gifted education for special educators.

In a similar vein, educators of the gifted have little experience with handicaps, or their effects on learning. Programs for gifted children seek to foster superior talents and gifts in creative problem solving, deductive and inductive reasoning, research into real problems, and enrichment or acceleration of specific academic areas (Yewchuk & Bibby, 1989b). Because of the stress on overall excellence, handicapped children are usually not considered suitable candidates for gifted programming. Previous reports have noted that teachers without special training exclude gifted learning disabled children from gifted programs (Minner, 1990). Professionals working with gifted children require training on handicapping conditions in order to recognize and work effectively with handicapped children who have special gifts and talents.

In the regular classroom, few teachers have any formal training in either special education or gifted education. They too require inservice and/or preservice training in both fields in order to develop the expertise required to provide differentiated instruction for students with handicaps and special gifts (Karnes & Johnson, 1991). Identification of gifted handicapped children is facilitated when teachers, psychologists, counselors, parents and others are familiar with their positive and negative characteristics.

Summary of Identification

Based on the above review of the literature on identification of the gifted handicapped, the following suggestions for school personnel stand out:

- Be familiar with the characteristics of giftedness and talent, and how they can be manifested by children with handicapping conditions.

- Use a variety of referral sources and assessment procedures, both formal and informal.

- Compare gifted handicapped children with like-handicapped peers, not with the general population of gifted learners or nonhandicapped peers.

- Create situations where handicapped children have the opportunity to display gifted and talented behavior.

- Modify assessment procedures as required to make it possible for handicapped children to respond without bias to their true ability.

- Include examiners with similar handicaps in the assessment process where possible.

- If handicaps hinder performance on conventional assessment instruments, place greater emphasis on characteristics which circumvent or compensate for the handicapping condition.

- Use a dynamic, interactive assessment procedure to develop a comprehensive profile of the total functioning of the child.

Primary Subgroups of Gifted Handicapped

Gifted Learning Disabled

This subgroup of gifted handicapped children has received the most attention from educators and researchers. Unlike other groups of special needs children, which can be identified by some type of discrete loss such as visual impairment, children with learning disabilities do not constitute an easily identifiable group. Many of these students appear intelligent but they have major difficulties with academic tasks. Their work may be inconsistent, and there may be great variability in performance for different subject areas such as reading and arithmetic.

Learning disability may be manifested in many different ways. Over forty definitions have been reported in the literature (Ysseldyke, Thurlow, Wesson, Algozzine, & Deno, 1983), but the most frequently cited is that of the American National Joint Committee on Learning Disabilities (Berk, 1983, p. 55):

Learning disabilities is a generic term that refers to a heterogeneous group of disorders manifested by significant difficulties in the acquisition and use of listening, speaking, reading, writing, reasoning or mathematical abilities. These disorders are intrinsic to the individual and presumed to be due to central nervous system dysfunction.

Even though a learning disability may occur concomitantly with other handicapping conditions (e.g., sensory impairment, mental retardation, social and emotional disturbance) or environmental influences (e.g., cultural differences, insufficient/inappropriate instruction, psychogenic factors), it is not the direct result of those conditions or influences.

Problems associated with identification of learning disabled children who are gifted stem from a lack of familiarity with the characteristics of these students and an inefficient screening process. Fox (1983) points out that gifted learning disabled children are often identified incidentally as a result of assessment for other purposes. Some children are initially referred for assessment of learning difficulties, and through the course of testing are found to have IQs in the gifted range. Others are referred for placement in gifted programs but fail to meet the criteria of high achievement. The third group comprises children performing at grade level who are referred for psychological assessment because of personal and social problems and subsequently found to be gifted (Schiff, Kaufman, & Kaufman, 1981).

While the children in these three situations may be recognized as gifted learning disabled, others may not come to the attention of the classroom teacher. Utilizing advanced abilities to compensate for the learning difficulties (Weill, 1987), these students may be functioning at or near grade level, and the teacher may not be aware of their gifted potential (Gunderson, Maesch, & Rees, 1987). Furthermore, students receiving special education services for a learning disability may not have the opportunity to exhibit superior abilities, because of the remedial emphasis of such programs.

The primary defining characteristic of learning disability in the classroom is a discrepancy between measures of aptitude and achievement. Since children with exceptional gifts and talents may develop compensatory strategies, their disabilities may be noticed only if they are very severe. For both gifted and learning disability programs, the typical identification procedure involves referral, assessment, and selection (Fedoruk & Yewchuk, 1986; Gunderson, Maesch, & Rees, 1987; Suter & Wolf, 1987). Because classroom teachers are the primary source of referrals, it is crucial that they be informed of the characteristics of gifted learning disabled children (Baum, 1984; Baum & Owen, 1988). An extensive survey of special education and gifted programs in Texas has shown that gifted learning disabled children often fall into the gap between the two types of programs (Boodoo, Bradley, Frontera, Pitts, & Wright, 1989). Interestingly, teachers who have training in special education are more likely to identify gifted students with learning problems than regular classroom teachers without such training (Waldron, Saphire, & Rosenbaum, 1987). Moreover, classroom teachers who are aware of the characteristics of gifted learning disabled students are more likely to de-emphasize achievement scores in selecting students for gifted programs (Baum, 1988; Baum, Emerick, Herman, & Nixon, 1989; Baum & Kirschenbaum, 1984).

Studies of the characteristics of gifted learning disabled children have generally confirmed the informal reports by teachers and parents of a discrepancy between high potential in abstract reasoning, problem solving, insight and comprehension, and low performance in academic areas such as reading. WISC-R patterns

indicate high scores on those subtests usually associated with giftedness and low scores on those associated with learning disability (Barton & Starnes, 1989; Fox, 1983; Schiff, Kaufman, & Kaufman, 1981; Waldron & Saphire, 1990). The highest scores occur on measures of verbal conceptualization/comprehension (Similarities, Vocabulary, Comprehension) and the lowest on measures of sequencing/distractibility (Arithmetic, Digit Span, Coding). Even though this general patterning appears to be fairly robust, some divergence has been noted. Silverman (1989) found Block Design to be among the high scales in a clinical sample. Fox (1983) found Coding among the highest and Vocabulary among the lowest subtests for girls with reading disability.

Interpretation of WISC-R scores for evidence of gifted learning disability by a qualified professional should include subtest scatter, Verbal-Performance discrepancy and quality of responses (Yewchuk, 1986). On the Verbal, Performance and Full Scale IQs, differences of 7, 9, and 10 points, respectively, between the highest and lowest subtest scaled scores are indicative of unusual scatter. Differences between Verbal and Performance IQs, in either direction, of at least 15 points may also be indicative of learning disability. The responses of gifted learning disabled children tend to be a combination of lengthy, highly detailed answers (like other gifted children) and hesitant, stumbling responses in areas of deficit. While skilled interpretation of WISC-R performance may be useful in identifying some gifted learning disabled children, it is important to emphasize that some students exhibit patterns which are quite different from the ones outlined here.

Identification of gifted learning disabled children should involve a wide variety of referral and assessment devices. Ideally, the emphasis is minimized for identification and labeling purposes, and is instead directed at determining the learning strengths and weaknesses of the individual within the educational context. To this end, Lupart (1990) recommends that formal and informal assessment procedures, including input from parents and teachers, should be combined in a two-stage assessment model for gifted learning disabled children. In the first stage, based on information from interviews, the student's cumulative record, and additional testing as required, a summary profile is developed. The profile documents intelligence, achievement, creativity, self-concept, teacher evaluation, and family support.

Stage two comprises an in-depth examination of the student in a structured individual interview session ranging from 2 to 2½ hours. The student brings all relevant classroom material to the interview. For example, students with learning difficulties in language arts are asked to bring current textbooks, notebooks, previous written assignments and leisure reading materials. During the interview the student participates in a writing/response activity and a silent reading activity. The interviewer notes how the student approaches academic tasks, organizes work, and follows through, and asks questions dealing with the student's

self-perception as a learner. Based on the information gathered in both stages, an individual program focusing on specific strengths and weaknesses is then developed in consultation with teachers and parents.

Ganschow (1985) similarly advocates that a comprehensive profile of the student's cognitive, academic and language functioning be developed through interviews, observations, inspections of work samples, and a comprehensive study of cumulative records. Using case studies of a third grader, sixth grader, and a college student, she demonstrates how the reading problems of gifted students may be diagnosed and then remediated. Each student required an individualized instructional plan. One student required work on illegible handwriting, two had substantial spelling problems, and two had simplistic sentence structure with little sentence variety.

What seems to be emerging out of these recent studies is a trend toward assessment to inform programming, a critical dimension for individualized instruction for gifted learning disabled youngsters. It would appear that in contemporary work, for this subgroup of gifted handicapped at least, there is the start of a critical merging of the two fields of expertise (Lupart, 1992). Future efforts will no doubt be dependent on classroom teachers becoming much more involved in both assessment and instructional aspects of educational responsibility.

Gifted Hearing Impaired

The historical pattern for educating hearing-impaired children has involved placement in special programs based on handicap rather than giftedness. In segregated settings such as schools for the deaf or special classes for hearing impairment, emphasis has been placed on "normalizing" development of language and speech. Hearing-impaired children have been less likely to be identified as gifted than their hearing counterparts (Yewchuk & Bibby, 1989a). Within the last decade a limited number of programs for gifted hearing-impaired children have been established (Gamble, 1985; Pollard & Howze, 1981; Whiting, Anderson, & Ward, 1980). An estimated 15% of gifted hearing-impaired students in the United States are enrolled in such programs (Gamble, 1985).

Gifted hearing-impaired children may be identified through the same basic referral, assessment, and selection procedures used with other gifted children (Whitmore & Maker, 1985) using appropriate concessions to the handicapping effects of hearing impairment (Pendarvis & Grossi, 1980). The three most frequently used procedures in gifted education, namely teacher nomination, achievement tests, and IQ tests (Cox, Daniel, & Boston, 1985) are also the most frequent identification sources for gifted hearing-impaired students (Gamble, 1985).

The most appropriate intelligence tests for hearing-

impaired children are individually administered and nonverbal in nature (Sattler, 1982). In descending order of frequency, the most commonly used measures are the Wechsler Intelligence Scale for Children—Revised (WISC-R)—Nonverbal Scale, the Hisey—Nebraska Test of Learning Aptitude, the Leiter International Performance Scale, and the Snijders—Oomen Non-Verbal Intelligence Scale for the Deaf (Levine, 1974).

Use of standardized achievement tests alone to identify giftedness among hearing-impaired children is discouraged because their academic achievement, relative to hearing age-mates, is typically delayed by four to five years (Bess & McConnell, 1981). For hearing-impaired children, functioning at or somewhat above grade level, may be indicative of giftedness (Yewchuk, Bibby, & Fraser, 1989). The Stanford Achievement Test—Hearing Impaired Version is the most commonly used achievement measure in identification of gifted hearing-impaired students (Gamble, 1985).

The importance of including various sources of information in identifying gifted hearing-impaired children was illustrated in a study of severely and profoundly hearing-impaired students (Yewchuk & Bibby, 1989a). Teachers and parents were asked to nominate children in two educational settings: a school for the deaf and classes within the public school system. Altogether, 47 students were nominated, 22 by teachers only, 11 by parents only, and 14 by both teachers and parents. Thus most students were seen as gifted in either the school or home, as parent and teacher perceptions differed substantially. The most glaring discrepancy between parent and teacher nominations involved the two students with the highest IQ scores. The student who stood at the 99th percentile was nominated only by a parent, while a similarly intellectually gifted student at the 98th percentile was nominated only by a teacher.

Statistical analyses of the three sources of information indicated that IQ scores, teacher nominations and parent nominations functioned independently of each other. No significant correlations were found between parent nominations and teacher nominations; parent nominations and IQ; and for the most part, between teacher nominations and IQ. All three sources provide significant information about the potential abilities of hearing-impaired children (Yewchuk & Bibby, 1989a). Clearly there is a need to promote awareness and to provide instruction and training for all parties involved in the development of the full potential of gifted hearing-impaired children.

Gifted Retarded

This must be the most paradoxical of all dually labeled children. How can an individual be unable to manage independent living, while simultaneously being capable of remarkable mental feats in other areas of endeavor? Such is the puzzle of the individuals referred to as “idiots

savants”, who can be described as “mentally retarded persons demonstrating one or more skills above the level expected for nonretarded individuals” (Hill, 1978, p. 291). Idiots savants constitute only 0.06% of all institutionalized retarded individuals (Hill, 1977) and their specific areas of expertise cover a wide range of human abilities.

Areas of brilliance of the idiot savant are judged not against retarded peers, but against those of the normal population exhibiting those particular skills. For example, playing the harmonica by a retarded person of itself is not considered exceptional, even though most nonretarded individuals cannot do this. The term applies only when the retarded individual performs better than a proficient harmonica player (Hill, 1978). Thus retarded individuals can also be gifted (Bergman & DePue, 1986). Some idiots savants, such as Yoshihiko Yamamoto, the “Van Gogh of Japan”, have become famous for their outstanding work (Morishima, 1974).

The extraordinary abilities of idiots savants are manifested in a number of discrete ways, categorized by Hill (1974). Some savants excel in one type of skill, while others may excel in several. Best known categories include calendar calculating, artistic ability, musical ability, memorization of obscure facts, mathematical abilities, mechanical ability and sensory discrimination. More recently, children who in the past would have been identified as idiots savants are being included within the categories of autism or childhood psychosis (Yewchuk, 1990). Shared characteristics of idiots savants and autistic individuals include impaired ability to think abstractly, eccentric mannerisms, social aloofness, and islands of brilliance (Steel, Gorman, & Flexman, 1984). Discrete characteristics include the discrepancy between low general mental ability and high specific ability of idiots savants and the symptomatic behavioral manifestations of autism.

In most cases of idiots savants, the specialized skills have developed in unsupportive environments without specific training. Few attempts are made to systematically nurture gifts and talents of retarded individuals. Where there are systematic attempts to identify special talents and to provide instruction in related skills, the results can be dramatic. Specially trained teachers can search for islands of interest and talent, and then foster these talents through specialized instructional approaches and techniques. Morishima and Brown (1977) document how under the tutelage of special education teachers a severely retarded youngster developed his observational, graphic, and artistic skills to become a renowned Japanese illustrator of insects. Educational programs for idiots savants should provide the opportunity for developing specific areas of talent in addition to training of skills for normal functioning within society (Nishimura, 1989). Given the current educational trends in support of inclusive education, it is highly probable that such individuals will be more readily identified and given greater opportunity to develop talent areas.

Emotionally Disturbed Gifted

It has often been assumed that bright children are capable of solving not only academic, but also societal and emotional problems without need of guidance. Although some research supports the emotional stability of gifted children (Khoury & Appel, 1977; Terman, 1925), there is also an increasing body of knowledge revealing that gifted children suffer from various stresses that may place them at risk for developing emotional and behavioral disturbance.

The very traits which enable gifted children to excel may also make them more susceptible to difficulties in coping. Traditionally, perceptions of giftedness carry the expectation that the child possesses high ability in all areas. A common complaint of gifted children is that adults and peers expect them to be perfect all of the time (Schmitz & Galbraith, 1985). Adults fail to recognize that gifted kids are subject to "peaks and valleys" in their development and that advanced abilities do not generalize to all areas of development (Blackburn & Erickson, 1986; McGreevy, 1987; Roedell, 1986; Whitmore, 1980). Concomitant with the tendency for adults to assume that gifted kids are capable of anything, is the erroneous belief that all that is required is more effort. Gifted children are often asked: "What do you mean you don't understand? You're gifted, aren't you?"

Studies investigating the incidence of suicide, underachievement, and anorexia nervosa among the gifted point to the high expectations of parents as a primary contributing factor (Detzner & Schmidt, 1986; Farrell, 1989; Hayes & Sloat, 1989; McCants, 1985; McMann & Oliver, 1988; Thoresen & Eagleston, 1983; Whitmore, 1980). Parents and teachers may fail to provide gifted children with the coping skills to deal with the demands resulting from their exceptional abilities. The common assumption that gifted kids can handle anything results in a tragic lack of services to help those gifted children who have difficulty in coping.

School experiences are also a significant factor within the emotional lives of gifted children. It has often been heard that gifted kids are bored in school, a result of a mismatch between the curriculum and the child's abilities. Teachers are often guilty of squashing creativity by providing structured tasks, leaving little room for individual expression. As well, the difficulties inherent in relating to classmates who are on a different intellectual level may leave the gifted child feeling frustrated and alone. As the following discussion details, gifted children are at risk for underachievement, school dropout, delinquency, depression, suicide, and anorexia nervosa.

The gifted underachiever typically begins school successfully, with high grades and high achievement test scores (Rimm, 1984). However, as the child moves forward in school, grades become progressively lower, and more deviant behaviors are displayed by the child.

Most researchers into gifted underachievement agree that it is a learned behavior (Delisle, 1984; Rimm, 1984, 1990; Whitmore, 1980, 1986b). The behaviors leading to underachievement may be mastered long before a child enters school, although they are not seen as problems during those early years (Zuccone & Amerikaner, 1986). For example, underachieving may often be the result of an environment which is overly protective and indulgent, leaving the child with no reason to take personal initiative (Rimm, 1986). Delisle (1984) and Whitmore (1980) also point to the school environment as a major factor in the underachievement of gifted students. Inadequate curriculum, teacher behaviors, and peer relationships can all be culpable for the lack of motivation found in underachievers.

Experts claim that the percentage of high school dropouts who are gifted ranges from a low of 3.4% (Marquardt, 1987) to a high of 18% (Irvine, 1987). Lajoie and Shore (1981) state that the proportion of gifted dropouts may be average, and stipulate that future research utilizing a broad definition of giftedness may achieve different results. Gifted students at risk for dropping out of school most often come from dysfunctional families, making the need to belong at school even more significant. However, Marquardt (1987) found that gifted students at risk for dropping out tend to be less group oriented, less able to conform to group standards, more easily frustrated by criticism, and less in control of impulses than average students. In fact, these characteristics are similar to those found by Seeley (1984), in his study of gifted delinquents. French and Cardon (1968) point to the need for school activities which help develop social skills in potential high ability dropouts, resulting in feelings of self-respect, belonging, and acceptance.

The term juvenile delinquency is a general concept encompassing a wide range of behaviors. Although it may refer to morally deviant behavior to some, it may be considered a normal rite of passage through adolescence to others. Within the legal context, delinquency is "the infraction of codified norms by a child or a young person which results in subsequent labeling or adjudication by the court" (Csapo, 1989, p. 144). A child or adolescent is labeled delinquent when the behavior is seen to be so persistent that it becomes intolerable by others, thus requiring intervention.

There is increasing evidence supporting the notion of gifted delinquents (Tennent & Gath, 1975). Estimates of high ability juvenile delinquents range from 3.5% to 9% of the total delinquent population in the United States (Anolik, 1979). Brooks (1985) cites a number of studies revealing that some 12% of boys admitted to approved schools for convicted delinquents over a period of five years had IQs over 110. Mahoney (1980), Parker (1983), and Seeley (1984) all discuss the prevalence of gifted youth in institutions for juvenile delinquency—albeit a lower percentage of gifted in comparison to the rest of the population. Nevertheless, the relatively small

number of gifted delinquents does not make the problem any less serious.

It has been revealed that underachievement may be the link between giftedness and delinquency (Anolik, 1979; Sealey, 1984). In light of research which shows that most delinquents experience difficulties in school, it seems readily apparent that gifted underachievers, with low motivation toward school achievement, would be most likely to become delinquent.

It is difficult to determine the number of gifted youth attempting or committing suicide, partly because of the wide variance in definitions of the gifted population (Farrell, 1989), as well as the large numbers of unreported suicides. A study conducted at the University of California, Berkeley revealed that 67% of the campus students committing suicide had above average grades and 91% of the undergraduate students committing suicide had above average grades (Seiden, 1966). Lajoie and Shore (1981) cite a number of studies detailing the higher rate of suicides at highly competitive and selective schools, implying that intellectual ability may have a role in predicting suicidal tendencies.

Suicidal gifted students share some common traits (Delisle, 1986, 1988, 1990; Farrell, 1989; Hayes & Sloat, 1989, 1990). The most prominent trait discussed in the literature is a distorted perception of failure—once again, the perfectionism of gifted individuals gone awry (Adderholt-Elliott, 1987). Additional vulnerabilities include the pressure to meet expectations of parents and teachers, conflicting with the desire to fit in with one's peers (Yewchuk & Jobagy, 1992). Another area of concern is the frustration that can result from understanding adult situations and world events but being powerless to affect their outcomes. These internal and external stresses, combined with impotence to affect changes in one's own life, may lead the gifted adolescent to contemplate death as a viable alternative (Leroux, 1986; Morgan, 1981; Shneidman, 1981).

One of the biggest tragedies in modern society is the vast number of starving people throughout the world. However, what is perhaps equally tragic is the increasing prevalence of self-starvation among intelligent, mainly upper class, adolescent girls (Csapo, 1989). Anorexia nervosa is an emotional and physical disorder in which an individual undergoes self-imposed starvation due to an intense fear of gaining weight, and the affected population is almost exclusively female. It has been estimated that approximately one out of 200 adolescent girls in Canada suffer from anorexia nervosa (Csapo, 1989), with the long-term prognosis remaining guarded, at best. It has been noted that anorexia nervosa is more prevalent in girls of a higher socioeconomic status. In college prep high schools, one in 100 girls was found to have anorexia, a much higher percentage than that of the general population (Detzner & Schmidt, 1986). These affluent families tend to stress appearances and achievement, and place great pressure upon their children to succeed. Coupled with the persistent belief that thin is beautiful, anorexic girls continually starve

themselves in an attempt to meet the extreme internal standards they have set.

The gifted adolescent girl appears to be at high risk for developing a disorder such as anorexia nervosa. It has been observed that gifted adolescent girls attempt to hide their talents in order to remain popular with peers. Dieting is a common activity among this age group, and the gifted girl, driven by her need for perfection, may become overly obsessed with losing weight. As well, underachievement tends to be a problem with this age group. The pressure from parents to succeed could result in the gifted girl attempting to control some aspect of her life, perhaps through weight loss.

Gifted children and youth are as likely to be at risk for developing maladjustment conditions as the rest of the population (Johnson, 1981). In some ways, gifted children are no different from other children in that they have no special mechanisms for dealing with life's everyday stresses. As well, they are also subjected to additional pressures that the average child is not, due to their talents (Freeman, 1985). All teachers, parents and counselors need to be aware of the social and emotional needs of gifted children, and be prepared to provide assistance as needed. Gifted programming needs to address not only academic needs, but also the social and emotional skills for interacting with others and understanding themselves as individuals with exceptional talent.

Preschool Handicapped Gifted

Professionals working with gifted handicapped children acknowledge that the earlier educational intervention begins, the better the chances are for full realization of potential. In the preschool years handicapped children may be stimulated to exhibit skilled performance by special educators familiar with characteristics of gifted and talented children.

Even though there has been only limited work in this area, an exemplary program for preschool handicapped gifted children, referred to as Retrieval and Acceleration of Promising Young Handicapped and Talented (RAPYHT), was developed at the University of Illinois (Karnes, 1979, 1984) and replicated in over 20 states at 89 local sites (Karnes & Johnson, 1991). In the RAPYHT model, teachers and parents were trained to identify and program for gifted and talented preschoolers with mild to moderate handicapping conditions. The model, which will be described in the following section on programming, has proven highly successful, and as such suggests the need for continued and more widespread development of such programs. The concept of early identification and nurturing of individual talent and ability holds considerable promise, particularly in view of the common practice for many school systems, where programs for gifted students are first made available to students at the upper elementary level. Without early challenge and opportunity to

develop special abilities and talents, gifted handicapped youngsters are further at risk of being unidentified and consequently underserved.

Programming

Suitable programs for handicapped gifted children incorporate elements from gifted education as well as handicapped education. The general features of such combined programming include special education services for areas of deficit, encouragement of gifts and talents through gifted education options, adaptive instruction in areas of handicap, and development of self-concept (Friedrichs, 1990; Yewchuk & Bibby, 1989b). Although these features are relevant to all types of gifted handicap, programs are typically developed to accommodate the educational needs of specific subgroups of students. A variety of delivery systems and models have been used to provide special programs for gifted handicapped students. Whereas a comprehensive overview is beyond the scope of this chapter, some of the better known models and practices will be described.

The Retrieval and Acceleration of Promising Young Handicapped and Talented (RAPYHT) project, referred to earlier in the chapter, is widely recognized as an exemplary programming model (Karnes, 1979, 1984; Karnes & Johnson, 1991). The model comprises seven components: general programming, talent identification, talent programming, parent involvement, interagency collaboration, transitional procedures and evaluation (Karnes & Johnson, 1986, 1991).

General programming includes a set of materials designed to stimulate creativity, problem solving, critical thinking, and evaluative thinking in the classroom and at home. These activities are intended to encourage recognition and emergence of gifts and talents in handicapped children.

Talent identification involves the use of specially designed parent and teacher checklists to identify potentially gifted children. Both instruments focus on the six areas of Marland's (1972) definition of giftedness. Based on checklist profiles, standardized test results and *in situ* observation, a multidisciplinary team of teachers, parents, and ancillary staff identifies between 10% and 20% of children as potentially gifted.

Talent programming is developed in conjunction with project-developed, in-depth, curriculum-based assessment in each talent area for those children identified as potentially gifted. Results from this assessment are used to develop individual education programs and to measure progress.

Parents and other family members are encouraged to participate in all components of the model, in accordance with their interests, needs, level of comfort, and volunteer time available.

An interagency committee comprising RAPYHT staff, school staff and parents of handicapped and nonhandicapped children promotes communication and

cooperation among stakeholder groups. The committee acts as an advisory group on programming, and engages in active identification of resources within the community such as mentors for the children and consultants for the teachers.

Transitional procedures are intended to smooth entry into kindergarten for the gifted handicapped preschoolers. These include compilation of pertinent information about the child for the receiving school, meetings with the new principal and teacher, and the offer of consultative help as needed.

Finally, in the evaluation component, pre/post feedback from parents and teachers is collected annually regarding creativity, basic skills in the talent area, interests in the talent area, task persistence and self-concept (Karnes, 1984). An analysis of program effects on 28 handicapped gifted preschoolers indicated significant short-term gains on measures of self-esteem, creativity, task persistence and talent area functioning (Karnes, Schwedel, & Lewis, 1983b). In a follow-up study of 30 students, 1-5 years after leaving the RAPYHT program, Karnes, Schwedel, and Lewis (1983a) found performance on standardized reading and math tests to be at or above the 50th percentile. Furthermore, teachers rated these children higher than their nonhandicapped peers in regular classrooms on listening skills, self-assurance, memory, writing skills, attention span, and self-concept.

Karnes and Johnson (1986, 1991) have been very encouraged by the positive effects of their model on parents, teachers, and children. As parents and teachers learned how to identify characteristics of giftedness and participated in programs of talent development, their perceptions of handicapped individuals changed. Their interactions became more positive. The children were given the opportunity to become more creative and think at higher levels, and they rose to the challenge.

The special gifts and talents of gifted learning disabled children have been accommodated within the Enrichment Triad Model (Baum, 1984, 1988; Baum, Emerick, Herman, & Nixon, 1989; Baum & Kirschenbaum, 1984; Baum & Owen, 1988). Based on the tripartite criteria of above average ability, creativity, and task commitment, the model is considered suitable for gifted learning disabled students because of the emphasis upon higher level thinking and independent project work. Enrichment is provided through a pull-out model for gifted learning disabled children for the same reasons as for other gifted children, namely to extend, challenge, and stimulate creative productivity in an area of strength and interest. The essential components of successful enrichment programming for gifted learning disabled students include development of alternate modes for thinking and communicating, use of strategies to identify passion areas, including psychometric and dynamic sources of information, use of motivating activities, and use of student-friendly instructional methods (Baum, Emerick, Herman, & Nixon, 1989).

The Differentiated Curriculum Model (Kaplan, 1986)

has also been used with gifted learning disabled children. At Assets School located in Pearl Harbor, Hawaii, skills are taught in the context of themes integrated into a generic unit emphasizing critical thinking and research skills (Hishinuma, 1991). As students work on research projects and term papers, they use reading, spelling, oral expression, mathematics, science, and social studies skills. Each student follows an individual education plan consistent with the objectives of the thematic unit and his or her specific interests and academic needs.

Special problems arise when a handicapped student is integrated into an ongoing program for gifted and talented children. In developing a unit on astronomy for a group of 8–10-year-old gifted students, for example, Paskewicz (1986) found the major stumbling block to integrating a visually impaired child to be the lack of adequate brailled materials, which limited in-depth exploration of subject matter. It was also necessary to prepare the teacher and the sighted students for integration through discussion about the effects of blindness, stereotypical beliefs, and how to assist blind people. In another setting, critics argued that gifted visually impaired students would be better served by additional instruction in braille usage, orientation and mobility, and socialization skills rather than enrichment in areas of talent (Hackney, 1986).

A school-based model for differentiating instruction for gifted students was developed at the Texas School for the Deaf (Pollard & Howze, 1981). This model took into account the grade level of the students and the administrative arrangements within the school. At the elementary level, two gifted resource teachers worked with the regular classroom teacher to enrich the curriculum for identified gifted students. In the middle school, the gifted students were placed together for instruction in core subjects but integrated with other students for elective classes. Teachers of the core subjects were inserviced regarding gifted education, and had access to the services of a gifted resource teacher. In high school, gifted students attended regular classes, as well as a special class for gifted students where they worked individually with a gifted resource teacher.

Parents can play an important role in educational intervention with handicapped gifted children. In an intervention strategy focused almost exclusively on the home setting, Sah and Borland (1989) report on a program devised for nine upper elementary gifted learning disabled children. The children were referred to a learning disabilities specialist because of difficulty following instructions, inability to organize time, and academic underachievement. The intervention program consisted of a structured timetable for after-school activities, including homework, and a set of parental strategies for monitoring and reinforcing these activities. Over a 6-month period the specialist met periodically with student and parents at school and at home to monitor progress and make changes if necessary. Pre/post assessment results indicated a significant decrease in all problem behaviors at home and in school.

Teachers reported improvement in attitude toward authority, group participation, classroom behavior, performance on tests and quizzes, and completion of homework assignments. With the exception of homework submissions, these gains were maintained over a subsequent 6-week nonintervention period.

A major thrust of any program for gifted handicapped children should be the development of a positive self-concept (Vespi & Yewchuk, 1992). Children need to experience the classroom as a positive and supportive environment. Through meaningful, challenging activities, children should be encouraged to experience a sense of achievement. There should be no immediate pressure for students to achieve at the beginning of the program, and tests should not be given until children can have some expectation of success (Whitmore, 1980). Suggested initial activities could include interest areas in art, music, science, social studies, movement, and literature.

At the beginning of a program, administration of a learning styles inventory could provide useful information for individualizing instruction (Wees, 1990). Students who know their own preferences, strengths, and weaknesses can develop more realistic plans of action and assume greater responsibility for their own learning. To develop a positive self-concept, the acceptance of the teacher and a compatible peer group is vital. The teacher's interest and support facilitates the development of trust and comfort in the classroom. Development of positive rapport may be enhanced by scheduling private times when students and teacher can share common interests, concerns and feelings. A teacher who shares his/her own frustrations and dreams may be perceived as more caring by the students. Class meetings and role playing can be used to develop self-awareness, empathy and communication skills in social problem-solving situations. The child develops self-worth through practice of social skills in an emotionally supportive group (Wees, 1990).

Conclusion

The title for this chapter introduces the field of gifted handicapped as a "desultory duality". The ensuing review of the literature reveals the reality of a somewhat disconnected and unmethodical knowledge base. For the most part efforts have been directed within specific categorically defined areas, such as gifted learning disabled and gifted hearing impaired, with consideration given to the blending of programs and services to best meet the unique needs of those identified. Certainly there have been impressive gains in both research and educational practice; unfortunately, there are only small pockets of this exemplary work being carried out.

Future prospects, however, do appear to be promising. Lupart (1992) has noted that general and special education are undergoing significant changes due to current broad-based educational movements such as the regular

education initiative, school reform, effective schooling, inclusive education, and collaborative consultation. Accordingly, educators, parents, and researchers are being forced to "re-examine all dimensions of educational practice from legislation to school organization, to curriculum, to teacher roles, to resource deployment, and most important, to serving individual student learning needs" (p. 3). The ultimate merging of general and special education into a unified educational system will hopefully generate schools that can provide an appropriate education for all students, including those who are gifted handicapped.

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Mentoring and Role Modeling Programs for the Gifted

RACHEL ZORMAN

The Henrietta Szold Institute for Research in the Behavioral Sciences, Jerusalem, Israel

Introduction

In this chapter, mentoring will be presented as one of the most effective ways of helping gifted students actualize their potentials. The nature of mentorship will be discussed in historical perspective, various existing means of providing gifted students with mentors will be explored, and finally, a model of life-stage mentoring will be proposed. This model integrates the accumulating evidence concerning developmentally appropriate role models for the gifted into a systematic approach utilizing different mentors to meet the needs of the gifted at various phases of their lives.

The Nature of Mentorship

The term *mentor* stems from the famous work of Greek mythology, *The Odyssey*. Mentor was the wise and trusted friend appointed by Ulysses to educate his son Telemachus while he was away. Mentor served as a teacher, guide and surrogate father to young Telemachus.

Mentoring was propounded as a highly appealing and effective mode of training and teaching starting from the Greek philosophers, such as Socrates, who conducted philosophical dialogues with his students, through Erasmus in the Renaissance era and Rousseau in the Age of Enlightenment in the eighteenth century (Aries, 1962). Mentoring became institutionalized into the educational system via the medieval English colleges, such as Cambridge and Oxford. From the sixteenth century onward, it became one of the main features of moral and intellectual education in these prestigious colleges (Kearney, 1970).

In his historical review of the role of mentor relationships in creative achievements, Torrance (1984) concludes that in almost all of the cases where individuals reached the heights of creative achievements, they received intellectual and spiritual support and encouragement from another individual who served as a mentor, a patron or a sponsor. More specifically, Pizzini (1985) notes that most scientists who reached extraordinary achievements had a significant long-term one-to-one relationship with a teacher. Mosely and Todd

(1983) and Chauvin (1988) report in their inquiries into the development of leadership that most successful leaders had a mentor who was their source of inspiration.

A different research methodology using longitudinal data to probe into the effects of mentorship experiences on individuals yielded similar results. Torrance (1983) reports the results of a 22-year follow-up of 220 young adults. These subjects were tested for various abilities in 1958–1964 when they were in Grades 1–6 in two Minnesota elementary schools. In 1979–1980, data were obtained concerning their educational experiences, achievements, frustrations and obstacles to achieve, future plans and desires, and life satisfaction from career, personal and social perspectives. The study indicates that mentored subjects obtained significantly higher levels of education than their nonmentored peers. Moreover, having a mentor correlates significantly with several criteria of adult achievement, such as: the quality of adult creative achievement, the number of recognized creative achievements, and the number of creative style-of-life achievements.

A further probe into the nature of mentorship relationships that developed in Torrance's study shows that the mentors of these subjects included their teachers, employers, or experienced professionals in their occupations. Over half the subjects noted that they continued to maintain their relationship with the mentors. The benefits of that relationship were varied. Women tended to report that they valued most the encouragement and praise given to them by the mentor; that is, the emotional aspects of their relationship. Men reported that they valued most the career, business, and professional expertise of the mentor.

From the above studies, it seems that throughout history, the flavor of that unique relationship has been savored. This is reflected in the present definitions of the roles played by the persons who form this relationship. Thus, according to the Merriam-Webster dictionary (1974), the mentor is defined as "a trusted counselor or guide", and the protégé is defined as "one who is under the care and protection of an influential person."

What are the critical elements that distinguish such a relationship between a mentor and a protégé from other relationships? Why is this relationship so important, especially for gifted individuals?

The special relationship that developed between the father of evolution theory, Charles Darwin, and his professor at Cambridge, John Henslow, provides some clues as to the distinctive features of mentorship. Further, it illustrates vividly the beneficial lifelong effects of this form of education.

Feldman (1986) notes that Darwin “seems to have been a case of a relatively lackadaisical child intellectually, with little to suggest that he would do anything well, let alone revolutionize biological science” (p. 181). Darwin’s father intended his son to follow his footsteps and become a doctor, but young Darwin dropped out of medical school, much to his father’s disappointment. In 1828, he came to Cambridge as a divinity student and was introduced to the sciences by Professor John Henslow, a naturalist and a clergyman. Darwin was attracted to Henslow’s methods of teaching, which emphasized self-discovery, exploration and field excursions. They started to take nature walks together, to collect specimens of insects and analyze rock formations. Darwin was so thrilled by these experiences with his mentor that he exclaimed in his journal: “the hour with him is the pleasantest in the whole day. I think he is quite the most perfect man I ever met with” (McGreevy, 1990, p. 6).

After he graduated from Cambridge in 1831, Henslow strongly recommended Darwin for the position of naturalist in the government survey tour of South America, even though Darwin was not considered a fully trained naturalist. During the hard and arduous 5-year journey to South America, Henslow offered him continuous spiritual encouragement and support in their letter correspondence. Moreover, he received the specimens that Darwin collected and kept the collection in good shape for further analysis on Darwin’s return. Darwin expressed his deep gratitude to his mentor by writing to him: “It is useless attempting to thank you for taking charge of my collections; for I know no other person who would; this voyage would then be useless and I would return home” (McGreevy, 1990, p. 7).

After returning from South America, Henslow helped Darwin get a grant for writing a five-volume work on the zoological aspects of his work. Their friendship continued, even though Henslow did not see eye-to-eye with Darwin in regard to his theory of evolution of the species. However, in 1860, when Darwin published the controversial *Origin of the species*, Henslow chaired a meeting of scientists who debated this revolutionary theory and helped to propagate it.

Some characteristic features of the mentorship relationship emerge from this case study. These are formed as a result of a complex interplay between general cognitive abilities, such as high level abstract thinking, an extraordinary talent in a specific field and nonintellective personality components, such as unending curiosity, persistence, sensitivity to others and a preference for a particular learning style. They include: (1) shared passion and interests, (2) a true match between the mentor’s teaching style and the protégé’s learning style,

(3) a special lifelong bond of trust, (4) a mutual perception of symmetry, (5) a sharing of lifestyle.

Shared Passion and Interests

The unique relationship between the mentor and the protégé is kindled on the basis of sharing mutual interests and passions together. In the case of Darwin, it was the keen interest in nature, from collecting insects to observing rock formations, that formed the basis for his relationship with Henslow. This mutual passion also sustains the relationship for a long time. In the sciences, this may be expressed in the sharing of knowledge, in gathering facts, analyzing phenomena and discussing conclusions. In the arts, it may be reflected in encouraging the protégé to find a unique mode of expression in coping with challenges of technique and content inherent in the art form.

In his study of talent fulfillment, Wallach (1976) finds a significant relationship between a person’s interests and activities during adolescence and adult accomplishment. Hence, it is important to identify and nurture these interests and activities, especially among students exhibiting high potential. However, many researchers in the area of gifted education lament that these students have special needs that are not always met in programs for the gifted (Winters, 1989).

Levey and Dolan (1988) point out that there may be a mismatch between gifted students’ specific strengths and the program options that they are offered, leading to frustration and disinterest. In an article on science instruction for gifted high school students, Pizzini (1985) identifies one of the main problems plaguing gifted education: while most educators support the notion of encouraging gifted students to engage in self-directed projects in their areas of interest, all too often teachers of the gifted do not know enough about these specific areas and have difficulty in approaching these areas meaningfully. Hence, there is a danger that without proper guidance, the students’ interest will fizzle and die. Moreover, Pizzini (1985) claims that the major portion of teaching is textbook based. The textbooks are often outdated and not designed for the upper end of the student population. Furthermore, experiments performed in school laboratories are generally used to verify the textbook or the teacher, not focusing on new concepts. Hence, there is a great need for matching up students with specific interests and passions with people who share their avocation and domains of strengths and can offer them guidance and support, whether in a formal or an informal setting.

A True Match Between the Mentor’s Teaching Style and the Protégé’s Learning Style

An important ingredient in the “chemistry” between the mentor and the protégé is the match between

the mentor's teaching style and the protégé's learning preferences. In Darwin's case, Henslow's teaching focused on helping students to become active learners. He encouraged them not to take anything for granted, but rather to ask questions, to form hypotheses, and to test them in actual experiments. He also taught them to observe natural phenomena accurately, to collect evidence and to analyze it carefully, before reaching conclusions. This style of teaching was just right for Darwin, who loved to investigate nature on his own, collecting rocks, plants and animals and finding similarities and differences among them (McGreevy, 1990). Henslow's approach to education emphasized the transfer of responsibility for learning to the students, while the teacher monitors their activities.

Many educators of the gifted agree that the ultimate aim of education for gifted students is to help them become producers of knowledge (Tannenbaum, 1983). In order to do so, they have to acquire the skills of independent learners. Hence, many programs for the gifted emphasize individualized and self-directed learning (Colson, 1980). Since many gifted students are independent and highly motivated learners, the type of experiential learning that takes place in mentorship is regarded by educators as enhancing real life skills and competencies (Boston, 1976; Runions, 1980; Mosely & Todd, 1983; Ellingson, Haeger, & Feldhusen, 1986).

A Special Lifelong Bond of Trust

The special bond between the mentor and the protégé forms slowly over time in what Edlund and Haensly (1985) term "unhurried interaction." Such interaction developed in the daily walks that Darwin and Henslow took around Cambridge. This bond results from mutual respect for one another, even though the mentor may possess more knowledge and may have a higher status than the protégé. The bond of trust is essential in forming a true friendship, where each side knows that the other is "always there," to offer understanding, compassion, and support. Thus, in the long and lonely voyage on the *Beagle*, Darwin regarded Henslow's letters as a constant source of spiritual support.

In their retrospective studies of highly creative adults, Torrance (1984) and Pizzini (1985) also cite many cases where individuals who reached outstanding achievements faced many frustrations and obstacles on the road to achievement. These circumstances led them toward thoughts of giving up. However, their mentors were there for them in these crucial times, offering emotional support and urging them on.

Results of longitudinal studies also provide evidence concerning this facet of mentoring. In a longitudinal study of a sample of the 1964–1968 Presidential Scholars in the U.S., Kaufmann et al. (1986) investigated the role and influence of mentors on these individuals' lives. Fifty-eight percent of the Presidential Scholars

reported that the mentors provided them with support and encouragement, including both professional and personal support. From a different perspective, a 30-year longitudinal study following 698 children born in 1955 in Hawaii shows that the ones that reached considerable achievements despite being in high risk circumstances had a mentor who offered them support and encouragement (Werner, 1989).

A Mutual Perception of Symmetry

One of the elements that also plays a most important role in forming a nurturing mentoring relationship is symmetry. Rapoport, Yair, and Kahane (1989) suggest that "symmetric relations are based on accommodation to the other's expectations and on common values of exchange" (p. 18). Symmetric relations develop when the differences between the persons engaged in the relationship are perceived to be relatively small. Thus, even though the protégé has less knowledge and skills than the mentor, both gain from the relationship.

A symmetric relationship is a dynamic one. It changes in line with changes in knowledge and skill levels that the protégé acquires. Changes in expectations may also affect the nature of the relationship. Berger (1990) asserts that a true mentorship does not end in a formal sense. Rather, it transforms itself from a student–teacher role modeling relationship to a supportive, nonsmothering colleague relationship. Both parties continue to learn from one another and grow personally, as well as professionally, as a result of their exchange of ideas.

A Sharing of Lifestyle

Mentorship is not simply a teaching situation, wherein a knowledgeable person teaches a student. It is not an apprenticeship or an internship, where one comes to learn a profession by spending time and working with a master. It encompasses all of these, but is much more than these relationships. As Boston (1979) claims, it is a relationship where values, attitudes, traditions, and passions are shared between the mentor and the protégé. Thus, the mentor does not simply transmit skills and knowledge, but opens up his life and lets the protégé enter into it, tasting and feeling it.

Darwin enrolled in divinity studies, intending to become a priest. His relationship with Henslow changed the course of his life dramatically. Henslow transformed Darwin's world by encouraging him to take risks and try to develop his abilities in completely new fields, in the natural sciences. Moreover, as Darwin himself remarked in his journal, Henslow helped him to believe in himself, by encouraging him to discover various phenomena after making careful observations on his own and letting him experience with him what it is really like to be a naturalist.

Many educators of the gifted agree about the importance of mentoring in opening up new unexplored horizons. Boston (1976) argues that mentorship enables gifted students to gain competencies that they may not gain in the classroom. Studies of mentoring in high school programs for the gifted (Beck, 1989; Ellingson, Haeger, & Feldhusen, 1986; Runions, 1980) emphasize the importance of mentoring in presenting gifted students with “hands on” experiences of a variety of educational and career options.

For example, extremely talented youngsters in the sciences who may acquire much knowledge and skills in this domain in the classroom. However, they may never experience how it feels to be a scientist day in and day out. Only when working with a mentor intensively can the students really “live” the frustrations and difficulties, the long and often lonely hours of hard work, of dealing with failures, until getting some results, at last. From another perspective, students whose dream is to become doctors may not realize what kind of personal problems a doctor often faces, in terms of family and social life, as a result of working in continuous shifts for a few days at a time. A mentorship may lead the students to comprehend these problems in an experiential manner. By supplying a role model who actually confronts these difficulties, mentoring may also help students to examine alternative ways of coping with them.

Studies of mentoring in the business world (Collins & Scott, 1978; Roche, 1979) stress its role in career development and advancement of successful professionals. Professionals who had mentors exhibit a greater job satisfaction, higher professional performance, higher levels of education, faster promotion, clearer view of their future career plans, and more of a likelihood of becoming mentors themselves (Hunt & Michael, 1983; Watkins, Giles, & Endsleg, 1987).

From the organization’s perspective, Krupp (1987) notes that mentors seem to benefit from this relationship by experiencing emotional growth and finding enhanced satisfaction from their own jobs. Moreover, Gray (1988) and Krupp (1987) claim that besides nurturing young committed and creative personnel, mentoring improves the general morale in the organization, and enhances the sense of shared values and humaneness.

Five stages of the mentorship relationship in the academic and business setting have been delineated as follows: (1) Introduction—recognizing a protégé, usually via some type of performance. (2) Initiation—mutual trust building. (3) Cultivation—sharing professional skills and standards of behavior, and encouraging risk taking. (4) Separation—urging the protégé to take a new direction. (5) Redefinition—becoming a friendship between colleagues (Galvez-Hjornevik, 1986; Hunt & Michael, 1983; Kram, 1985).

In summary, this type of relationship may help clarify the costs and the rewards of choosing a certain path in life. Further, it may help students weigh these costs and rewards toward making a decision whether this style

of life is right for them. Once individuals make their decisions and begin to engage in a profession, mentoring helps them learn the “rules of the game” (i.e., what it takes to survive and succeed) from the intellectual, as well as the social standpoints.

The Role of Mentoring in Gifted Education

The literature on the role of mentoring in gifted education suggests that mentoring may contribute to the resolution of general issues with which educators of the gifted grapple such as: How to deal with heterogeneity in the classroom; How to encourage the development of gifted girls; How to nurture gifted students from disadvantaged backgrounds.

In order to implement mentoring effectively to deal with such issues, two perspectives must be considered: What kind of connection between the program and the mentor may most benefit the student? Who may be the best mentors for students in different ages?

How to Deal With Heterogeneity in the Classroom

Students participating in programs for the gifted are still chosen mainly on the basis of high scores on tests of general intellectual ability. This results in a shift of scores measured by tests of general intellectual ability to the upper extreme. However, this does not diminish the heterogeneity of the students in such programs for several reasons: their interests and specific abilities in various domains differ from one another considerably and their nonintellectual attributes such as motivation, self concept and preferred style for learning remain as diverse as ever. Consequently, teachers in special programs for the gifted face a very different group of students each year.

The challenge posed by this situation is often great. For instance, the facilities and sophisticated equipment needed to engage in advanced areas of research in the sciences may be extremely expensive. Moreover, as Pizzini (1985) notes, in many cases teachers do not have enough knowledge or instructional tools to connect with the students’ fields of interests. The textbooks that are available may discuss basic concepts but are often outdated in an era of information explosion. As a result, Levey and Dolan (1988) lament that the students’ interests and strengths are often not met.

Mentors holding similar interests and passions as gifted students may help educators create much more meaningful interactions for these students. Further, mentors working with students in their preferred learning style in a facility that is equipped with the most appropriate equipment may help educators become more effective in nurturing these interests.

How To Encourage the Development of Gifted Girls

Many of the studies on gifted individuals, starting with the Terman longitudinal follow-up (Terman, 1925; Terman & Oden, 1947) and continuing to the present (Benbow & Stanley, 1982; Fox & Cohn, 1980), indicate that there are significant differences between males and females on test performance: males score consistently higher in the upper percentiles of tests of general academic ability and tests of school achievement. These differences are especially evident on tests of mathematical ability. As intellectually gifted boys and girls mature, the gap between them increases. A series of studies (Benbow & Stanley, 1982, 1984; Fox & Cohn, 1980; George & Denham, 1976; Stanley, 1976) show that intellectually gifted girls tend to participate less than boys in special programs nurturing their talents or to accelerate their studies and commence studying at universities at an earlier age. Once they start their higher studies, women who had high achievements in the sciences in high school tend to choose to continue in this path significantly less than men. Moreover, significantly fewer women continue to study for higher academic degrees beyond the B.A. and advance to high status in various professions (Eccles, 1985; Fox & Zimmerman, 1985).

A few theories attempt to account for these significant gaps between gifted males and females. One such theory emphasizes the stereotyped perception of the female role in our society (Cassery, 1979; Navarre, 1980; Wolleat, 1979). The strong societal pressure to conform to an expected feminine role may put gifted girls in a bind that contributes to a deterioration in self-concept and performance in domains that are considered "masculine," such as the exact sciences. This may lead to a considerable narrowing down of choices for academic and career development as well as to attribution of success to external factors, such as chance and ease of task, while attributing failure to internal factors, such as lack of ability.

Eccles (1985) and other investigators (Fox & Zimmerman, 1982; Grau, 1985) point out that the attitudes, expectations and behaviors of various socializing agents, such as parents, peers, teachers, and counselors, may influence this perception greatly. Grau (1985) proposes that one strategy to help gifted girls adopt a more realistic perception of themselves is to provide them with female mentors. Females who attained success in professional careers may provide gifted girls with knowledge and professional skills just like male mentors, while also serving as role models, demonstrating how to succeed in a career, and also fulfill other personal and social functions.

Research on role models indicates that females are more likely than males to choose female mentors as role models, even though there is no difference between male and female protégés in their choice of male mentors as role models (Basoe & Glasser-Howe, 1980). More specifically, high school students who participated in a men-

tor program in Minnesota felt strongly that their female mentors helped them take risks and work independently, as well as get to know the characteristics of professionals and examine their lifestyles (Beck, 1989). However, a study pertaining to women in organizations (Shapiro, Haseltine, & Rowe, 1978) indicates that women may not want to use "older women" as role models, possibly because they feel that life circumstances for successful women who started their careers a generation ago were completely different than at present; different choices and coping tactics were demanded of older successful women than today. Shapiro, Haseltine, and Rowe (1978) and Kram & Isabella (1985) suggest that women may benefit from partial, multiple role models of men and women who "made it," as well as from a number of peer relationships that may help them acquire instrumental skills, as well as social behaviors.

In conclusion, studies indicate that mentorships may help gifted girls and women cope with society's stereotyped views of the female role and realize their potential in a more realistic manner. More specifically, mentoring may be especially valuable to gifted adolescent girls (Beck, 1989) and to women in the early stages of their careers (Collins, 1983). Further, as a study of Presidential Scholars (Kaufmann, Harrel, Milam, Woolverton, & Miller, 1986) shows, female Presidential Scholars who received mentoring did not differ significantly in their salaries from their male counterparts, a different finding from the total sample of Presidential Scholars, where males earned significantly more than females. This important finding suggests that mentorships may also help gifted women acquire the more tangible benefit of overcoming a traditional inequality and equalizing their earnings.

How to Nurture Gifted Students from Disadvantaged Backgrounds

One of the problems that plagues the identification of the gifted is finding gifted students from disadvantaged backgrounds. Studies in the U.S. (Alvino, McDonnell, & Richert, 1981; Bernal, 1980; McKenzie, 1986; Mercer & Lewis, 1979) and elsewhere (Minkovitch, Davis, & Bashi, 1977) persistently indicate that children from lower socio-economic backgrounds score lower on tests of general academic ability. Baldwin (1978) suggests that this is due to various environmental conditions including: (1) cultural diversity from the mainstream culture, in such respects as language, racial, or ethnic background, (2) socio-economic deprivation, related to low levels of parental education and jobs and to poor housing conditions, (3) geographic isolation from larger centers of population.

Even when children from such backgrounds are identified as gifted, they face different social, personal, educational, and vocational problems than their counterparts from advantaged backgrounds (Colangelo & Lafrenz, 1981; Colangelo & Zaffrann, 1979; Frasier,

1979; Zorman, 1991). For example, students may experience great difficulty in integrating in a cohesive manner the values, standards and norms of their families and friends with values and standards of the majority culture. The difficulty may lead to emotional turmoil and anxiety, and may hinder educational and career plans.

How is it possible to help these young people resolve these conflicts and actualize their potential? In their review of literature, Flaxman, Ascher, and Harrington (1988) note that young people from disadvantaged environments often do not enjoy the support from various social, psychological and academic resources that is needed. They propose that "because such youth often have a patchy reservoir of social resources, the psychosocial and instrumental aspects of planned mentoring may be even more critical to their individual success than for others" (p. 36).

There is evidence of the effectiveness of mentors for college students from disadvantaged backgrounds in a few studies. Rodriguez (1986) compared the effects of mentor counseling to traditional counseling. Mentor counseling involved faculty members who assessed students' academic, vocational and personal needs, provided needed aid and followed their progress regularly. Traditional counseling provided students with the usual counseling facilities available in the college. Results show that the mentoring program had stronger positive effects on social and academic integration of the students. Further, having a mentor had a stronger positive effect on student goals and increased their commitment to their studies in the college. Another study by Oestereicher (1987) indicates that students who received peer mentoring improved their course grades in college more than their counterparts who were not mentored.

In the case of gifted students from disadvantaged backgrounds, extra care must be taken to match the mentors with the protégés. It is not enough to match them only on the basis of their interests, hobbies and aspirations. It is important to think also in terms of their ability to communicate with one another across cultural differences and to understand each other's needs (Branch, Riccio, & Quint, 1984; Cameron, 1988; Snyder & Rosenblum, 1987).

For example, Branch, Riccio, and Quint (1984) note that in *Project Redirection*, successful matching of women mentors from the community with minority teenagers was affected by the ability of the women to be empathic and help the youth to negotiate welfare bureaucracy, not simply by similarity of culture or economic conditions.

What Kind of Connection Between the Program and the Mentor May Most Benefit the Student?

A national U.S.A. survey of programs for gifted students conducted by Cox and her associates (1985) indicates that, in many cases, mentoring is initiated

as an instrumental relationship designed to meet a specific learning task. As Fox (1979) and Gallagher (1985) note, most mentors may be accomplished professionals but may not be equally accomplished educators. Thus, they are not always able and willing to ascertain what kind of knowledge the student has mastered and what types of thinking and research skills the student possesses. For instance, gifted students may show a keen interest in the field of the mentor and even use fancy and complicated terms, hiding an actual superficial level of understanding.

From a different perspective, mentors may not necessarily be attuned to the psychological and emotional needs of their protégés (Cox, Daniels, & Boston, 1985). For example, they may impose unrealistic expectations on their protégés or not be able to provide the specific kind of emotional support that the student may need at certain times.

The studies indicate that in order for mentoring to succeed, it is not enough to identify mentors who are expert in their fields and express interest in working with students. In addition, mentors need an ability to collaborate with gifted programs manifested as a willingness to receive training on how to work with students. Cooperation is needed between the formal programs, the teachers of the gifted and the mentors.

As a means of coping with this issue, Clasen and Hanson (1987) propose a process of double mentoring involving a teacher-mentor and an expert-mentor. The expert-mentor concentrates on the specific professional skills that the student may acquire while the teacher-mentor focuses on the developmental needs of the student in initiating and coordinating the relationship. Their process consists of seven steps: (1) the teacher-mentor assesses student commitment, (2) the teacher-mentor helps the student with self-assessment, (3) the teacher-mentor matches the student with an expert-mentor with similar interests and learning style, (4) all three parties discuss their expectations and form a "conceptual contract", (5) all three parties formulate a specific work plan, (6) the mentoring process actually begins, with all three parties maintaining regular contact, (7) a final product is presented.

Clasen and Hanson (1987) note that many mentoring relationships falter between the actual mentoring process and the realization of the final product. However, they observe "that the psychological and emotional support provided by the teacher-mentor throughout the mentorship is often the key to this final success for the student" (p. 109).

Who May be the Best Mentors for Students of Different Ages?

Holeman (1984) interviewed individuals who attained creative achievements and reports that 61% of them mentioned family members as mentors compared with

33% who mentioned teachers as mentors. In a retrospective study of young adults who reached extraordinary achievement in music, visual art, athletics, mathematics, and science, Bloom (1985) stresses the roles of parents in the development of talent in early childhood. He describes their attempts to encourage curiosity, their reading to the children and their provision of opportunities for the children to be exposed to various fields of interest. Moreover, he regards them as role models of the work ethic and of the individual achievement orientation in these specific talent fields.

In the study on gifted adults who were selected as Presidential Scholars, Kaufmann, Harrel, Milam, Woolverton, & Miller (1986) report that 66% of the subjects noted that their most significant mentor was a teacher. While about half (47%) of the teacher mentors were encountered in graduate level studies, about a third (29%) were encountered in high school.

Gray and Gray (1985) and Galvez-Hjornevik (1986) discuss the nature of mentoring relationship with teachers, noting characteristics of good teacher-mentors. These include being people-oriented, self-confident, sensitive to the protégé's needs, and providing moral support and practical counseling and strategies for success. However, the interpersonal relationship of the teacher-mentor with the student does not have to be very intensive. Gray and Gray (1985) divide these relationships into two categories, primary or secondary. A primary relationship involves both parties heavily, cognitively and emotionally. A secondary relationship is more instrumental and less involving emotionally.

In Bloom's (1985) retrospective study on talent development, teachers are noted as important influences during childhood and adolescence. He points out that at different stages of talent development, different kinds of teachers helped the subjects. In early childhood, when the children initially received instruction, their teachers had the quality of making their studies interesting, playful, fun, and extremely rewarding. They often treated them as "special" learners and encouraged their efforts. During middle childhood, the teachers were chosen for their expertise and reputation for developing talent in the child's specific area of interest. These teachers were much more demanding, in terms of precision and accuracy, as well as in terms of commitment to the field. They were often perfectionists, setting high expectations of the children, but providing encouragement as well. During adolescence and young adulthood, these talented individuals were taught by master teachers, who were experts in their fields. Their main goal was to help the subjects reach the highest levels of performance possible and develop a unique personal style.

Mentorships involving peers are based on the assumption that this type of relationship provides important benefits to both parties. Thelen (1969) and Cloward (1967) note that the students needing help gain a friend close to their age who does not patronize them. Further, this friend provides them with an opportunity for individual learning at a time when they most need it. Peer

mentors get an opportunity to exercise responsibility and leadership. Further, in order to teach well, they have to assess their cognitive abilities, as well as their interpersonal skills and improve them.

A review of research on children tutoring children (Devin-Sheenan, Feldman, & Allen, 1976) and a meta-analysis of 65 evaluations of tutoring projects (Cohen, Kulik, & Kulik, 1982) found that tutees had a marked improvement in academic subjects. More specifically, similarity of racial or ethnic background and cross-age tutoring were found to improve tutee academic gains. However, no marked effect was found on self-concept of either parties in this relationship.

Descriptions of Mentoring Programs for the Gifted

There is a variety of mentoring programs available which deal with the issues raised above in different ways. Examples of such programs will be presented below, according to the age groups that they serve: children, adolescents, and young adults. Evaluation data will be provided when reported.

Mentoring Programs for Gifted Children

There is only scant information about mentoring programs for preschool children. The *Mentor Companions in Curiosity Program*, operated by Northern Michigan University (Hendricks & Scott, 1987), represents one such program, initiated in response to parents' requests to help them find alternatives other than the home or the preschool to encourage their children's curiosity and interest in various fields.

The *Mentor Companions in Curiosity Program* operates in the following manner. Initially, the youngsters' general intellectual level and interests are assessed by faculty members of the Education Department—the assessments are based on formal and informal testing, and on interviews with the children and their parents. Each gifted youngster is matched with an undergraduate student volunteer or a member of the Education Department on an individual basis according to needs and interests. The mentor explores with the child those areas that the child would like to know most about or do. They continue to meet once or twice a week in the university for as long as the child shows interest. The child reports periodically to department personnel on what has been done, orally or in writing.

Some important features of the program should be noted. The program is child-centered in nature, with content and length determined by the child. Since young children are influenced greatly by their home environment (Bloom, 1985), the role of the parents in realizing the need for such a program, in referring the child to the program and in maintaining contact with the university on a continuous basis, is crucial. Mentors

are chosen on the basis of their ability to form a close personal relationship with a child and their expertise in the child's field of interest.

In some fields, such as the sciences, the performing arts (music and dance) and sports, where signs of talent are clearly observable from an early age (Robinson, Roedell, & Jackson, 1979; Zorman, 1991), specific mentoring may be quite important. Bloom's study (1985) presents evidence about the role of parents in exposing children to these fields. Parents were also instrumental in searching and finding highly capable teachers (though not master teachers) for their children. These teachers served as mentors by providing the children with basic skills and knowledge in their specific fields in a pleasurable manner while stimulating their interest and motivation.

In an attempt to cater to the needs of elementary school students gifted in a specific field, Stanley (1978, 1979) and his associates at Johns Hopkins University (Stanley, Lupkowski, & Assouline, 1990) developed a structured mentoring model as part of their Study of Mathematically Precocious Youth (SMPY).

In the *Diagnostic Testing-Prescriptive Instruction (DT-PI) Model*, testing yields a systematic profile of students' knowledge and comprehension in mathematics. Based on that profile, students are matched with peer mentors and receive a carefully structured program of challenges in mathematics. The activities are individually paced, resulting in flexibility of scheduling. Students may be in the program once a week for a few hours or in more concentrated periods of time according to their needs. The mentors of these students are themselves extremely talented students, usually several years older than their protégés, many have experienced this type of mentoring previously. Stanley, Lupkowski, and Assouline (1990) note that this type of mentoring helps the mathematically bright elementary school child develop a firm grounding in basic mathematical skills, which are essential prerequisites for engaging in higher level mathematics.

For those subpopulations where talent is hard to discern in childhood, such as the socio-economically disadvantaged, mentoring may help bring those talents out (Alvino, McDonnell, & Richert, 1981). In an attempt to cater to the needs of young, economically disadvantaged, potentially gifted students, Wright and Borland (1992) developed a mentoring component as part of a program called *Project Synergy* implemented at Teachers College, Columbia University. Students participating in the program are identified by using a dynamic assessment process, observations in many situations, and performance on individual problem-solving tests. Once identified, they participate in an intervention program designed to help them bridge the gaps between them and other children in gifted programs. This program involves direct instruction, parent workshops, teacher in-service, and mentoring.

Project Synergy mentors were chosen from a school for gifted minority adolescents on the basis of having

relationships with younger individuals, enjoying these relationships and expressing a willingness to act as role models. They received two training sessions orienting them toward the aims and activities of the project. General classroom practices and management, as well as their specific duties, were also discussed. The mentors came to a university-based summer session of the program. They played with the children informally, and assisted them to develop academic skills in various situations. They also discussed their work daily with the project's supervisor and wrote a journal. These activities are planned to continue throughout the year during weekend sessions and after-school drop-ins.

On the basis of student interviews and mentor reports, the ongoing evaluation of the program reveals that all parties are enthusiastic about their newly acquired friends. The children regard their mentors as role models to be emulated. Further, they gained a sense of being someone special, receiving a boost to their self-esteem. The mentors appear to have made a commitment to this relationship, and in many cases provided new insights into the children's abilities. As Wright and Borland (1992) conclude, "being culturally and temporally closer to the children than any of the project staff, the mentors provided an invaluable and otherwise unattainable window into the lives of these young children" (p. 128).

Mentoring Programs for Gifted Adolescents

Much of the literature of mentoring programs for the gifted is focused on adolescents. As Berger (1989) and Frederickson and Rothney (1972) note, many gifted students possess multiple potentials, and are talented and interested in a few areas. Therefore, they often confront a difficult time in making choices from a wide variety of higher education and career options available to them. Thus, it is important to guide them individually in exploring various interest areas in depth.

The *Mentor Assisted Enrichment Projects*, developed at the University of British Columbia (Gray, 1982), attempt to use college students in order to help gifted adolescents delve into various domains of interest. In this program, university students design a structured enrichment project with various learning activities in an area that interests them. The mentors are then matched with gifted youngsters who share similar interests. They proceed to work on the project, culminating in a student presentation.

Gray (1982) assessed the program and found that adolescents participating in it preferred it more than other self-directed enrichment projects. Their motivation to engage in the program was high, as shown by completing their assigned activities for the meetings with the mentors. They also used more community resources than before and rated the quality of their projects highly.

The *William and Mary Mentorship Model* (Prillaman & Richardson, 1989), developed at the College of

William and Mary in Virginia, is partly based on the concept of the previous program described. But, instead of starting off with the mentors' interests, this program starts off with the gifted adolescents' interests. In this program, gifted eighth to eleventh graders together with their resource teachers identify a specific area of interest. They are then matched with college students with knowledge and skills in that specific area. Mentors and their protégés work out a structured plan for a semester-long project culminating in some type of product. They meet on a weekly basis and may use campus facilities and staff. The program relies on the cooperative efforts of the college, the local school personnel, parents, and students, exemplified by the systematic monitoring conducted by both college staff and school personnel. Monitoring is performed by collecting and analyzing standardized weekly reports of progress prepared by the mentors and their protégés and by weekly discussions conducted by the resource teachers with their protégés.

Summative evaluation data of the William and Mary program consists of a set of questionnaires completed by mentors, protégés and their parents. In these questionnaires, each group rates its perception of goal attainment. They report about such aspects as the clarity of the project's plan, the interest of the student in the project, the consistency of pursuing the project by both parties, and the match between the mentor and the students. Results of these questionnaires, administered during 1984-1988, for instance, indicate a high degree of goal attainment, as well as strong agreement between the different groups.

Mentoring can be an important component of career exploration programs for gifted adolescents. *Exploring Careers in the Community Program*, initiated in Jefferson County (Colorado) (Brown & Crusey, 1981); *The Dallas (Texas) Independent School District Internship Program* (Cox & Kelly, 1989); *The Mentor Connection Program* in Minnesota (Beck, 1989); and *The Dade County Leadership and Training Program* in Miami (Florida) (Passow, 1990) are several examples of such programs.

These programs have one central feature in common: they attempt to integrate classroom learning with community experience. Thus, they provide gifted adolescents a chance to acquire basic skills, such as independent study and communication skills, as well as life skills, such as decision-making and personal social skills, in school learning centers. In *The Exploring Careers in the Community Program* (Brown & Crusey, 1981), students visit various community sites—such as hospitals, courts, and industrial plants—where they get a chance to observe various professionals at work, and then they choose an internship. In *The Mentor Connection Program* (Beck, 1989) students choose a mentor and then they prepare their interaction with the mentor in school. During the actual internship or mentoring phase, students participating in all of the above programs work for part of the school day as interns, "shadowing"

the professionals and working on various independent projects. In addition, they also participate in some group activity with their peers to discuss their experiences and progress. This enables ongoing feedback and changes, according to the students' needs.

The *Mentor Connection Program* (Beck, 1989) was evaluated using self-report questionnaires examining personal benefits, academic benefits and effects on career development. Results comparing the classroom experiences to the mentorship experiences show that the latter were rated significantly more effective in promoting academic, personal, and vocational skills essential to career development, including utilizing research and technical skills, examining lifestyles and characteristics of professionals, and investigating job routines and responsibilities. Classroom experience was rated to be significantly more effective in looking at ways to find jobs, especially acquiring interpersonal communication skills and written communication skills, such as writing a resumé.

In Israel, mentoring programs are offered by universities and research institutes (Burg, 1989) as well as the Society of Industrialists, which represents various industries in the country. These institutions offer mentoring in the form of professional guidance to high school students who choose to work on an independent research project instead of taking a matriculation examination in that field. The students, together with their high school teachers, formulate the project and set out to find an expert who can guide the student on an individual basis.

In the sciences, the Israel Agricultural Research Authority operates research centers in different parts of the country. At these centers, interested and able high school students assist researchers in gathering and analyzing empirical data as part of their work on their independent study project. A similar mentoring program is offered at the New York City Bronx High School of Science (Taffel, 1990). In this special high school, students gifted in the sciences are matched with professionals in the various areas of the sciences. They observe their mentors at work and develop with them an independent study project. Often, projects submitted to the Westing-house Science Talent Search Competition are a result of this type of mentorship.

Another type of mentoring in Israel occurs at summer science institutes, notably at the Weizmann Institute of Science, at Migal Research Center and at the Volcani Center of the Agricultural Research Authority. At these summer institutes, a group of highly promising students reside on campus for a few weeks. Researchers from these centers are matched with a pair of students on the basis of similar interests who work on various projects under the guidance of the scientists. In addition, the students lecture on their work and discuss various topics of interest with scientists in these centers and in industry. Students are given an opportunity to live and work intensively in a high quality research facility with instructors and peers who share the same enthusiasm for science.

In the performing arts, the Jerusalem Music Center program in Mishkenot Sha'ananim, offers outstanding adolescent performers on piano and string instruments a chance to work with internationally renowned musicians. The students meet periodically on weekends and vacations to work with and tour with the master teachers, interacting musically and socially throughout the year and to experience what it is really like to be a soloist or an ensemble player.

With respect to girls, in her evaluation of *The Mentor Connection Program*, Beck (1989) reported that the sex of the participants was related to their responses. Much more strongly than their male counterparts, adolescent girls felt that the mentorship helped them explore alternatives of integrating family life with careers.

A study of another program for young 7th and 8th grade adolescent girls, the *Academy in Mentoring* (Berger, Beard, Moore, & Van Voorhees, 1986), also attests to the beneficial effects of mentoring for girls. The *Academy in Mentoring* is designed to encourage adolescent girls to consider the possibility of choosing courses in the various sciences areas and to open up options for careers in these areas. Teacher-mentors are matched with high achieving girls with low career aspirations. The teachers meet with the girls in workshops in school and discuss with them the various options of careers related to the sciences as well as courses in high school that may lead to these careers. They also visit various educational and vocational facilities in the community and "shadow" local professional women.

Reports from the participants and their teacher-mentors indicate that the girls gained practical knowledge about how science courses may lead to nontraditional careers. Further, they were encouraged to explore new directions as a result of the high expectations and sense of commitment that the teacher-mentors conveyed to them. However, no data pertaining to actual enrolment in science courses are available.

A number of programs attempt to mentor gifted adolescents from socio-economically disadvantaged backgrounds. One such program, *Project Redirection* (Branch, Riccio, & Quint, 1984), uses women volunteers from the community to provide affective and social support in afternoon sessions. Silverstein (1986) and Kwalick, Sanchirico, Collymore, and McNoir (1988) report about mentoring programs matching adolescents at-risk with college students who receive college credit for their mentoring effort. At the *City University of New York/Board of Education Mentor Program* (Kwalick, Sanchirico, Collymore, & McNair, 1988), student/mentors are even graded on their commitment to making the mentoring work.

The above programs provide some form of extrinsic incentives for participating mentors. As Flaxman, Ascher and Harrington (1988) note, this may create difficulty in attracting mentors who are less interested in the extrinsic reward and more interested in the mentoring relationship. One way of dealing with this

problem is suggested by Richardson (1987). In the *City University of New York's Mentoring Program*, the protégés choose the mentors on the basis of meeting them in a group workshop and hearing them present their personal profiles. This may help mentorships become more in tune to the protégé's needs.

Another type of mentoring program uses professionals to mentor minority students. In the *Penn Partners Program*, socially conscious graduate students with unconventional educational background and careers mentor aspiring minority students (Theophano, 1988). *The Allies in Education Program* in Atlanta (Georgia) encourages corporate employees to mentor minority students (Snyder & Rosenblum, 1987). A follow-up of *The Allies in Education Program* indicates that this type of mentoring is beneficial when mentors and protégés have a common perspective, "speak the same language" and share a similarity in attitudes and aspirations.

The programs described above regard the gifted adolescent as the protégé at the receiving end of the mentoring relationship. However, there have been attempts to broaden the scope of mentorship and to utilize community mentors to help gifted adolescents become mentors to others. One such program is *The Mentor Academy Program*, developed at Lord Elgin High School in Canada (Runions, 1980, 1982). This program contains some of the more conventional practices of mentoring programs that were described before, including the acquisition of various study and problem solving skills and engagement in various career exploration activities, such as visiting community sites and working as apprentices with mentors. However, the *Mentor Academy Program* goes further by providing specific leadership training to students. This program helps students identify mentors, negotiate with them and eventually become mentors themselves, forming their own mentor network. For example, the students produce cable TV programs on various community issues and other topics of interest, identifying the relevant professionals and working with them. Students may design and operate enrichment programs for younger children. They may also serve on local committees to plan various projects. Further, they may create computer networks of community human resources to serve the needs of various groups, such as senior citizens and students.

The *Mentor Academy Program* was evaluated using self-reports of students, parents, teachers, and professionals, as well as looking at products generated by the students. These self-reports indicate that the program had very beneficial effect upon students. But no quantitative or longitudinal data are presented. Although this model seems very promising in promoting the concept of stewardship among gifted adolescents serving the community by assuming leadership positions and initiating projects in various areas, more information on its long term effects would enhance its validity.

Mentoring Programs for Gifted Young Adults

Mentoring programs for gifted young adults may be found in institutions of higher learning and in various professional work places. Many attempts have been made to formalize mentoring arrangements in various organizations and agencies.

Cosgrove (1986) reports on a mentoring-transcript program for freshmen students in the university. In this program, students assessed their skills and interests in various areas. They were then matched with volunteer faculty and staff members who acted as resource people to guide them in pursuing their areas of interest by using college services and activities outside of classes. No significant differences were found between students who participated in the program and a control group that did not, in terms of using college services and satisfaction from these services. However, significant differences were found in favor of the experimental group's confidence level in the students' ability to set and achieve goals, to solve problems and make decisions.

A more ambitious mentoring program, the *Undergraduate Research Opportunities Program* has been in operation since 1969 at the Massachusetts Institute of Technology (McGavern & MacVicar, 1990). The program has spread to other universities as well, such as Stanford University, The University of California in Los Angeles and Imperial College in London. In the MIT program, undergraduates receive a booklet listing names of all staff members who are willing to work with them on ongoing projects. Each department appoints a faculty member to match interested students with perspective mentors and to follow up on that relationship. Once students have been matched with mentors, they discuss the research plan and reach an agreement about the amount of time the student will spend on the project, leading to a "letter of intent". Student contact with mentors lasts, about a year and a half. Students receive credit or payment for the project.

Feedback on the progress made on each research project, as well as on the goodness-of-fit between mentors and students, is obtained via semester reports of both students and mentors. Although long-term effects of the programs have not been measured, the growing rate of participation in the program, which presently encompasses about two-thirds of the MIT undergraduate student body, attests to its attraction and effect.

McKenia (1988) describes a program in the University of Connecticut where volunteer faculty members, sensitized to the academic and social needs of disadvantaged students, serve as their mentors. Rodriguez's (1986) study of faculty mentoring showed positive effects on student attitudes toward their college studies. Oestereicher's (1987) study of peer mentoring showed an improvement in college grades. No information pertaining to college completion was provided.

After reviewing several mentoring programs in professional organizations, Phillips-Jones (1983) distilled features

that are important for success in mentoring programs. These features include: support by top management, integration into a larger training program, voluntary participation, careful selection, and orientation of mentors and protégés, ensuring best fit and clear understanding of roles, encouraging flexibility in using individual styles of interaction, and consistent monitoring.

Alleman, Cochran, Doverspike, and Newman (1984) and Kram (1985) suggest the creation of conditions promoting naturally occurring mentorships within professional organizations, including providing incentives rewarding human resource development, using cooperative work designs and building an organizational climate and norms of behavior that encourage mentoring.

The Model of Life-Stage Mentoring

Theoretical Rationale

In the discussion of mentoring programs, various alternatives were offered to deal with needs of gifted individuals. These alternatives focused on specific populations at a certain stage of life, often without establishing continuity between stages. In this final section, a model offering a broader and more systematic view of mentoring is proposed. In line with this theoretical view, the model will delineate ways of integrating different kinds of mentoring into programs for the gifted at different stages of their development. In this model, mentoring is conceptualized as a process of psychological and social identifications with role models that involves accumulating knowledge and skills that are appropriate to the developmental phase that the protégé is in (Flaxman, Ascher, & Harrington, 1988). In considering mentoring for the gifted, the model takes into account both the cognitive stage that the gifted individual is in as well as the psychosocial challenges that the gifted individual faces in different phases of development.

What are the implications of the cognitive and psychosocial developmental phases for mentoring the gifted? What does the evidence pertaining to the effect of various role models on gifted individuals at different developmental phases imply? Several implications may be drawn including the following:

(1) Mentoring may be distributed over a wider time span, in order to help highly precocious children actualize their potentials better.

(2) Mentoring may be performed by different role models, who possess resources that can meet the cognitive needs and psychosocial circumstances of the individual.

(3) Since mentoring is often focused on a certain talent area, it may not stand out by itself. Rather, it may be perceived as a program option, operating in tandem with other essential program features, such as the acquisition of basic knowledge and problem-solving skills in various areas.

These implications provide basic guidelines for a life-stage model of mentoring which may be incorporated into existing programs for gifted individuals in various ways.

Since gifted children are quite a heterogeneous population, varying in interests and rate of intellectual and psychosocial development, it might be worthwhile to assess periodically the strength and weakness points of each child from cognitive as well as psychosocial perspectives. Following this assessment, role models that can meet these needs best may be considered, sometimes with the child. In line with the individual needs and circumstances of the child, the bond with an existing role model, such as the parent might be strengthened or a meaningful relationship might be formed with a new role model, such as a teacher, an older peer, or a paraprofessional (college student or teacher in training). Specific goals may be set for such a relationship, whether they may be instrumental or affective in nature. A careful monitoring system should be established. The monitoring may consist of oral or written reports about what is accomplished, how the mentor and the mentoree feels about the relationship, and how other significant others in the child's environment view the relationship.

As gifted children approach adolescence, one may consider the principles set forth by the *Wisconsin Career Development Model* as an organizing structure for mentoring (Pulvino, Colangelo, & Zaffrann, 1976). This model integrates classroom ability and interest assessment, as well as skill building activities with on-site experiences with various professionals, in order to accomplish the following goals: raise the awareness of one's potential and abilities; formulate a life orientation—a philosophy and style of life; explore various alternatives to achieve goals consistent with the life orientation; formulate decisions concerning career and life orientation; pursue and appraise these decisions following actual internships or apprenticeships with professionals in identified areas of interest.

Since it is difficult to discover an aptitude or a gift without having the opportunity to exercise it, it may be worthwhile to extend the above model by providing a longer period of exposure to various fields, that are applied in a variety of professions. In addition, it may important to expose gifted students to the world of professions from junior high school onward. This exposure may be performed by utilizing both classroom and community resources. The exposure is essential for all gifted students, especially for gifted girls or gifted students from disadvantaged backgrounds who may acquire negative attitudes toward particular fields such as the sciences.

After gaining some realistic sense of one's abilities via the phase of exposure, students may decide, together with their teachers, if they would like to have mentors to help them explore various alternatives. This may be done by shadowing the mentors, assisting them to perform their job or working on an independent

study project. Careful consideration should be given to choosing mentors, whether they be older peers (such as college students) or professionals, that are most suitable in terms of learning style and social proximity. Both sides should clarify their expectations from the relationship in terms of their goals and the amount of time and effort that they can invest. A monitoring system should be established, as well, to ensure best-fit and well-being. Longitudinal data on the effects of the relationship on both parties may offer important information that is presently lacking concerning mentoring practices.

This process departs from the more conventional approach to career development which regards vocational choice in terms of aptitudes and skills. Rather, it regards career development as a process integrating personal, social, and vocational goals in the cognitive, affective, and societal domains. Moreover, it may help gifted students discover their potentials, gain more insight into their feelings, attitudes and goals, and assume more responsibility in making wiser choices concerning their direction in life.

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Nurturing Giftedness in Non-School Educative Settings— Using the Personnel and Material Resources of the Community

NETTA MAOZ

Weizmann Institute of Science, Rehovot, Israel

I have always felt a deep need to respond, in any way I could to younger people who had an urge to understand nature better. I have always believed and still do that in a broad way, this is the main mission of the Weizmann Institute

The late Prof. Amos de Shalit, a physicist, a leader and an educator.

Much attention has been drawn to the education of gifted and talented children, mainly in primary schools. All over the globe, many options have been offered to such children, using the formal schools resources. However, the use of special sources of knowledge such as research institutions, museums, community centers, and media organization has been relatively neglected. These organizations have a valuable infrastructure with which to nurture special talents in science, music and the arts and other areas.

Highly able youngsters can easily find a “common language” with a professional in his or her field of interest. It is always enjoyable to watch youngsters in science fairs defending their projects and conducting scholarly conversations with the judges.

Programs offered to gifted and talented in the formal education framework often do not cater for children with a special talent to the extent that this can be done in professional centers. While these kinds of nurturing are still neglected in many countries, they are quite popular in Israeli universities, science centers and museums. This chapter deals with examples of out-of-school education which illustrate the possibilities of such opportunities (Maoz, 1990a).

Delivery Systems

There are many approaches or “delivery systems” for educating the gifted which are implemented by many alternative organizational arrangements (Milgram & Goldring, 1991). The term “delivery systems” is useful in distinguishing among various venues and frameworks for the special education for the gifted.

Delivery systems can be divided into two groups: (1) replacement systems—programs within the formal

education structure and (2) supplementary systems—programs which do not exist to replace school studies, but provide an addition or enrichment for that which is taught at schools: these include programs such as

(1) *Dual university enrollment*. Highly gifted children in specific academic disciplines have the opportunity for meaningful advancement by taking university courses and receiving credit while they are still at high school.

(2) *Extracurricular education in the universities*. The universities offer the youngsters science clubs and summer programs, during the academic year or in school holidays, for which pupils receive no academic credits.

(3) *Classes in public settings*, such as schools or community centers. These classes usually take place in the afternoons or in holidays.

(4) *Internships and mentorship programs*: Internships and mentorships provide the student with some career experience in the real world rather than the classroom, in a specific area of interest.

Although a relatively small country, Israel has a variety of all kinds of the educational programs mentioned above.

It provides many educative programs for the gifted and talented using the personnel and materials of the universities, research institutions, science centers and museums—settings outside the school and classroom.

Programs in Universities, Science Centers and Museums

Passow (1991) has observed: “Our challenge as educators is to create the conditions and an environment in which the intellectual, cognitive and affective potential of individuals will be nurtured so that those individuals are both able *and* willing to fill society’s need for creative, imaginative and productive persons” (p.1).

A personal example or model can encourage youngsters to aspire towards high achievements. Scientists in the universities serve as mentors who set high standards and challenges to the youngsters.

Tannenbaum (1983) has observed that “Ability alone cannot facilitate great accomplishment. It also requires

a confluence of various nonintellective factors such as ego strength, dedication to a chosen field of productivity or performance, willingness to sacrifice short-term satisfactions for the sake of long-term accomplishment, and many others. These traits are integral to the achieving personality regardless of the areas in which the talent manifests itself" (p. 88).

Universities and research institutes, as well as science and art museums, can be treated as "professional centers" regarding education for the gifted and talented. The importance of these centers is discussed below.

Personnel: University and Research Scientists as Educators

The personnel who interact with the youngsters are the most important and unique factor in the educational programs in universities and research institutes. This fact can be regarded from two points of view. The first aspect is the quality of the teachers: All "teachers" in this framework are either staff members or research students for higher degrees. All are active scientists, whose attitude towards teaching is often different from that of a classroom teacher.

These people tend to stimulate in learners a feeling of curiosity, a joy of creativity, the excitement of revealing new insights and the process of scientific thinking and discoveries.

They also set a personal example or model to the youngsters which reveals traits common to all scientists such as dedication and commitment. Another important advantage of this supplement to the formal education system is the availability of personnel resources not otherwise possible: working scientists cannot teach in the regular school system, but by being involved in extracurricular education they contribute their special qualities to those who can profit from this experience.

Flexibility and Diversity of the Curriculum

Teaching science always confronts the problem of updating curriculum. Science is always developing, but it usually takes a long time before innovations find their place into the curriculum. One of the most problematic aspects of updating a curriculum is to decide what to take out of the old curriculum in order to make a place for the new. Learning is built layer by layer. One cannot teach modern physics, such as "the zoo of subatomic particles", before teaching classic physics, but knowledge in physics (and in all other sciences) is always expanding.

A related issue is that of updating the teachers. This can be achieved through in-service training for teachers. Unfortunately, this process is not always realistic, since many teachers do not participate in these workshops.

Extracurricular programs at universities and other centers help to deal with these problems. The mentors in the extracurricular framework are "professionals", people who create innovations and who are up to date in their field of interest. They add their knowledge to the overall knowledge of the school system by teaching the gifted and talented children. The graduate students involved in the programs usually stay on for several years, until they finish their degrees. New students join in, so the curriculum often changes, and is very flexible. As new breakthroughs in science occur, the mentors try to incorporate these developments into the programs.

Equipment

Universities, museums and research institutions possess unique equipment and instruments for conducting research. The children who enroll in the extracurricular programs have an opportunity to use equipment which will never be available in schools. For example, students at the Weizmann Institute of Science are able to perform experiments on a nuclear accelerator, a very sophisticated machine which is used to find elementary particles of matter.

Neglected Resources

Since youth programs in universities and research institutes are relatively rare, they can be considered as "the neglected resources" in education of the gifted and talented.

Science and art museums are most active in extracurricular education. Almost every museum has an education department. These departments offer education to two types of population: first, for the general public in order that science and research become familiar to youngsters who in the future may be the decision and policy makers, and second to gifted and talented children in their areas of interest. These sites offer the gifted an enrichment or in-depth teaching in special interests. Thus the youth develop contacts with professionals and the use of resources not otherwise available.

Science museums with important, well-known education departments include the Ontario (Canada) Science Center, the Exploratorium in San Francisco, the Science Museum in Boston, Parc de la Villette in Paris and the Science Museum in London. The two science museums in Israel (in Haifa and Jerusalem) also offer many functional programs. A number of universities—such as Denver, Duke, Johns Hopkins, Northwestern, and Purdue,—offer programs on Saturdays, during the summer and at other times (Holahan & Sawyer, 1986; Ruckman & Feldhusen, 1988).

Some universities offer the gifted and talented university courses in the summer, or at weekends, which enable the pupils to achieve academic credits

while still in high school. Many such university programs, together with science fairs in mathematics, physics, and chemistry olympiads, existed in the former Soviet Union. In these programs the competitive aspect of education is emphasized.

Extracurricular Science Education in Israel

Israel offers its young gifted, talented, and science enthusiasts (4th–12th graders) a nationwide network of science activities, based in the universities and research institutions. The activities include science clubs, summer camps, mathematics and science olympiads, activities in science museums, etc. The programs in the academic institutions take up where schools leave off. They provide an important link between science-oriented youth and youth-oriented scientists, enabling the students to gain experience in thinking through and carrying out scientific experiments. Ten Israeli universities and research institutes cooperate to provide the youngsters with special programs.

Most activities are in the life sciences, medicine, exact sciences, computers, mathematics, and technology. About 16% of the students who participate are in humanities and social sciences courses. Most programs are offered to students, who enroll on an individual basis, in the afternoons and holidays. Some programs are offered to school groups.

The programs in the universities are offered to two groups of youngsters: children who were identified as gifted and science-motivated children.

One of the most important aspects of the programs for science-motivated children is the “self-selection” approach. The students *choose* to come to the academic center, and thus have a very high commitment to participate. These children give up their afterschool time, or sometimes their holidays, because they want to join the extracurricular framework.

Their parents must pay, at least partially, for the activities and in many cases they have to transport them to the center, which makes their commitment even higher. The ministry of education subsidizes the activities by 20%.

The courses for 7th–12th graders are not necessarily offered to children labeled as “gifted”, but to those who are challenged by high level courses. Thus, the children are not labeled, but the courses are. The topics are either an enrichment to the school curriculum or completely new topics.

Participation in such a course enables the highly intelligent youngster to meet with other children with the same interests and potential that he/she has. This meeting is very important to the children. Some highly intelligent children have few friends in their own neighborhood, while others do not like to make real efforts in learning since they acquire knowledge very easily. When they meet other children like themselves they are able to see their talent in its real proportion.

Science Projects

Students in Israel are encouraged to work on a special research project, instead of taking a final examination in one of their school subjects. Science projects like these in physics, chemistry, biology, mathematics, and computers are done at the universities and in the research institutes. The student works with a mentor at his laboratory, on a science project.

The work done in this framework is usually related to a real research project done by a scientist in a laboratory. At the end, the students summarize and report it to the school. This kind of research with a mentor is the upper level a youngster can get: being in contact with a research scientist at work.

One of the most important aspects of the programs in the universities and science centers is the fact that they provide high quality academic supervision which other institutions may not be able to supply.

Annual Science Clubs

All Israeli universities and research institutions offer science clubs in the afternoons to students 10–18 years old. The programs are different from one institution to another, with the differences related to the character of the institute.

A university can offer subjects in the life sciences, medicine, exact sciences, social sciences, and humanities, where a technical institute focuses on technical issues such as aerodynamics and computer engineering. A research institute offers courses mainly in its own specialty fields such as agricultural research, marine biology, environment, etc.

The subject matter is usually not very restricting. The mentors offer their curriculum and the main goal is to provide the children with thinking methods, to give them the feeling of science in real life, and to get them to understand how a meaningful experiment is planned. The mentors are also instructed to deal with new developments in their field or special events such as: Supernova 87, the nuclear explosion in Chernobyl, a discussion about this year’s Nobel laureates, etc.

The teaching in science fields takes place in laboratories and provides students with a “hands-on” approach. Usually it is conducted through discussions, viewing appropriate video films, presentations made by students, and last but not least planning and doing real experiments and reporting the results.

Summer Science Programs

Two types of science programs are held in the academic institutions and research centers:

- (1) Summer courses in universities and museums and
- (2) Residential programs.

Summer courses in universities and museums are

similar to those run in science clubs throughout the academic year. The students participate daily, for two weeks, in courses offered by the university in the same subjects that are given during the year. This enables children who do not live in big cities near university centers to participate in courses offered by the universities and museums.

On-campus *residential programs* are being provided by some institutions such as: Migal—a life sciences research and development institute; Volcani Center—an agricultural research institute; Soreq Center—a nuclear research center; the Hebrew University in Jerusalem; the Weizmann Institute of Science and the Technion.

The programs enable the participants to get involved in real research laboratories, experience mentorships, participate in presentations of their extracurricular projects; hear lectures of top professors of the hosting institute and engage in leisure time activities. Mentorship programs are offered to 16–17-year-old school students. At these programs students are involved in actual research projects and work in small groups with mentors who are scientists.

Special Residential Summer Programs at the Weizmann Institute

The Weizmann Institute of Science offers:

- (1) An international summer science institute for 11th–12th graders.
- (2) A science and music camp for 8th graders.
- (3) A national summer science workshop for 11th graders.

The International Summer Science Institute provides some 75 outstanding 11th–12th grade science students from Europe, Asia, the Americas, and Israel with an opportunity to work alongside top Weizmann Institute researchers, as well as to learn something about life in Israel today. Of necessity, participants come from the Northern Hemisphere, where summer vacations occur at about the same time.

This intensive program is conducted for 30 days, in English. The studies on campus are divided into the following fields: biology, chemistry, physics, mathematics, and computer sciences. The laboratory work centers on current research topics, such as structural differences in normal and tumor cells, applications of lasers and the use of computers in modeling and simulation. Students work with sophisticated scientific instrumentation such as the electron microscope, lasers and computers. Instructors are drawn from among the Institute's researchers and graduate students. Laboratory work is supplemented with lectures given by senior Institute scientists. At the laboratories, the students work in small groups of two or three students with a mentor, and are involved in real science research.

Working within small research groups of two or three, each participant can choose a subject in accordance with his or her own interests. At the conclusion of the

laboratory period, the student is required to present a seminar and to write a thesis on the work completed.

The schedule also allows for free time (including some weekends), social activities, discussion groups, etc. In addition, participants are also encouraged to conduct seminars on subjects in which they have some expertise.

After three weeks at the Institute in labs and lectures, the group shifts to an altogether different scientific focal point—a field school in the desert in the southern part of the country. Here the very essence of scientific enquiry is emphasized. That is, by observing life systems, geology, climatology, etc., in the field, students can formulate questions that will be explored in the laboratory.

Many of the students selected for this program are chosen when they excel in national science fairs. Others are selected by their teachers. The students are interviewed by scientists of the Weizmann Institute who are in those countries for sabbatical or postdoctoral work. Participants have come from the following countries: Italy, France, Belgium, Germany, Switzerland, Sweden, England, Yugoslavia, Canada, U.S.A., Mexico, Guatemala, Uruguay, Singapore, Japan, and Israel.

The Science and Music Camp. This special program is aimed at 14-year-old students who show potential to excel either in science or in music. The purpose of this program is to broaden the scope of youngsters mainly interested in one of these fields by showing them that other fields can be equally interesting, and establishing a connection between them even though this may not be obvious at first (Maoz, 1990b). For instance, it is well known that many professional scientists are very capable musicians or have a strong interest in music. Some outstanding scientists at the age of 18 or thereabouts had to make a very crucial decision whether to pursue science or music. On the other hand, many musicians were good students in the sciences and also had to make a career choice.

The objectives of the special summer program are:

- (1) To make participants of each group aware of new ideas in their own field of interest.
- (2) To allow each group to learn about the interests of the other group.
- (3) To involve all the students in an interdisciplinary program bringing together ideas from science and music.
- (4) To observe the interactions among students who have different fields of interest.

One of the distinguishing characteristics of the Science and Music Camp is the way in which the participants are chosen:

- (1) Students applying for the science group are given worksheets in maths and physics to complete at home. In order to solve these problems, the applicants had to have a high level of knowledge and demonstrate openness to new ideas. The background for the questions is given in the worksheets. Those who answer correctly are interviewed by the senior staff of the program. The interviewers examine mainly the scientific thinking skills

of the candidates, as well as their social suitability for the program. Knowledge in music is not a prerequisite but, not surprisingly, it has been found that 30–50% of the candidates played a musical instrument at a high level. The courses for the Science Group were built according to the main program themes such as: order and symmetry in mathematics; hierarchy of living structure in biology—from the unit cell to cancer; the thinking revolution in modern physics—from relativity to chaos. “Music appreciation for scientists” was given by a biologist, himself an amateur violinist. “Science for musician” was given by a scientist who studied in the music academy and plays a musical instrument.

(2) Students applying for the music group are recommended by their teachers. They are then selected by two composers who also serve as instructors for the music part of the program. Candidates have to display exceptional playing technique as well as creative composing and improvising abilities.

The details of the programs are changed each year, but the main principles remain.

The program consists of morning and afternoon sessions. The morning sessions are devoted to intensive studies in science or in music in groups, while afternoon sessions involve getting to know the interests of the other group and the interdisciplinary workshops. The evenings are devoted to lectures of general interest and to the workshops.

In the courses for the music group, the emphasis is on composing and improvising. Two courses, composing and improvising, given by two composers who introduce the students to topics that are not usually given by music teachers. The emphasis is on creativity and self-expression. During the program, the participants start to open up to new ideas and, at the farewell party, they play musical pieces which they have composed or improvised.

In addition, they play in small ensembles, do some chorus work and learn how to conduct.

During a recent camp program, one of the interdisciplinary activities was an organ-building workshop. Building a musical instrument brings together applications of scientific principles and a knowledge of music. In order to plan and build such an instrument, students must understand laws of acoustics and know principles of music. The assignment for the whole group of 40 students was to build two pipe organs made of simple components such as wood and cardboard. The instructor was an artist, a craftsman, and an organ builder himself.

This workshop started with theoretical explanations of acoustics in pipes and flutes of different lengths and widths and a discussion of how to build an organ. The participants began with woodwork for the keys and the sound box and afterwards designed and prepared pipes from cardboard. Each pipe had a movable-adjustable sleeve, made of cardboard as well, to enable adjusting the final length of the pipe. The work was somewhat tedious, but the day of the final assembly of the organ

was a celebration for all the participants and staff. The music students were very happy to play on it and some of them composed short pieces to play at the farewell party. This was followed by a short concert using the Weizmann Institute organ.

Other workshops for mixed groups during the 1991 Science and Music Camp included:

(1) Order and disorder—“fractals and chaos” using Macintosh computers

(2) Harmony and order in the universe

(3) Symmetry in art and science

(4) Order and its applications in the structure of matter and in the periodic table

(5) Architecture and music.

Evening activities included:

(1) A lecture on “Order and classification of big biological systems” given by a scientist

(2) A lecture by the conductor of a philharmonic orchestra

(3) Workshop on street theater

(4) A concert by a professional quartet

(5) Science demonstrations

(6) Visits to the Garden of Science and the nuclear accelerator of the Institute

(7) Sport and social activities.

Student activities started at 7 a.m. and ended at 10 p.m. with a 3-hour lunch break.

At the close of the Camp, the students organized a farewell party at which they had a chance to show off their talents and the knowledge gained in the courses including—original music performance by the music students and demonstrations of science concepts that had been acquired through the workshops.

In summary, it can be said that bringing together the two groups of science and music enthusiasts provides a unique opportunity to enrich and advance students in their own field of interest and open new horizons in other fields of interest. For example, in the science group about one-third of the participants played musical instruments at a high level, but the others had little appreciation for music; during the program, it was observed how their interest was stirred in this area. On the other hand, some of the music students had previously built a barrier between themselves and science. They became attracted to various fields of science and appreciated the connection between these fields and their music. Socially they did not have difficulties and very soon “musicians” and “scientists” were intermingling.

The National Summer Science Workshop, as the international summer science institute, provides some 30–40 outstanding Israeli students with an opportunity to work alongside researchers in a research institute. The participants stay in the institute for 13 days, working mainly in small groups of two and three with a mentor in the research laboratories, and become involved in the “real way of life” of a scientist. The evenings are devoted to students’ presentations of their fields of interest, lectures of top scientists and social activities.

The participants are selected by completing a worksheet in science, at home. Those who succeed then have to pass an examination and are interviewed by the senior staff of the program.

Importance of Residential Programs

Residential programs have special qualities for gifted children: they enable children to meet peers and make friends with other children who they are not able to meet in any other way. Many gifted children do not communicate easily socially, since they cannot find peers who understand them. In some cases they feel like the “ugly duckling” in their neighborhood, while in the camps they find that they are “swans” in a group of many more of their kind.

On the other hand, many gifted children do not bother to work at school; they acquire knowledge very easily. At the residential programs they find out that there are many more students like them and they must make serious efforts if they want to succeed in their fields of interest.

The international program has these qualities too, but provides, in addition to the international flavor, an opportunity to meet people like themselves from different cultures. The participants might be the leaders in scientific fields in their own countries in the future. Getting to know potential leaders from other countries may advance understanding among nations, with consequent benefits.

A common thread among these programs is “mentorship”. The student meets the mentor in an everyday situation, and learns about his or her career and way of life first hand, as the mentor sets a personal example. Mentor–student relationships are historically one of the oldest methods of educating the gifted and talented (Milgram & Goldring, 1991). Research has shown that this approach is very promising (Cox, Daniel, & Boston, 1985). Many highly gifted adults attribute great importance to their mentor’s influence. This method is limited by difficulty in matching a student with a mentor. Mentors are not easily available, and the student must have some more qualities than just being gifted—he or she should be very devoted and persistent; a creative, critical thinker; and willing to sacrifice short-term satisfactions for the sake of long-term accomplishment (Passow, 1991; Tannenbaum, 1983).

Mathematics Projects

Two universities run accelerated programs in mathematics in Israel. At Tel-Aviv and Bar-Ilan universities, gifted high school students in mathematics are accepted into university mathematics courses. The students get university credit for the courses and can even complete university mathematics while still in high school. In order

to be accepted to these programs, the students have to pass special examinations in mathematics.

Special enrichment programs for gifted children in mathematics are offered to students of grades 3–12 at the Weizmann Institute. The Institute also has groups which are trained to participate in the mathematics olympiads and a Math-by-Mail project. Competitions and olympiads include preparation and participation for local and national competitions for junior high school students; nationwide olympiad for high school students; the International Mathematics Olympiad and the binational competition with Hungary.

Math-by-Mail is a nationwide program for 3rd–10th graders. One to two thousand students participate annually.

Participants for on-campus math courses must pass a special examination in mathematical thinking. They then participate in weekly mathematics clubs in the afternoons.

The olympiad for junior high school students involves two stages. The first stage is carried out in the schools, where the best students are invited for the second stage at the Weizmann Institute of Science.

There are no prerequisites for participation in the national mathematics olympiad for high school students. Those who apply receive a sample questionnaire of previous olympiads, which gives them the basis to decide for themselves if they are on an appropriate level.

The best students of high school olympiads are chosen to participate in the international olympiads and in the binational competition with Hungary.

They meet every few weeks with a mathematician for the preparation towards the olympiad.

Math-by-Mail is a unique program in its objectives and the delivery system. The objectives of the program are:

- (1) to enable every math-enthusiastic child to work in mathematics even if he/she lives far away from academic centers;
- (2) to develop mathematical thinking, and
- (3) to identify and encourage highly gifted children.

The educational materials are specially prepared by mathematicians and mathematics educators. The problems, which emphasize the development of mathematical thinking, are written for each of four grade levels:

Level 1 (3rd–4th grades), Level 2 (5th–6th grades), Level 3 (7th–8th grades), and Level 4 (9th–10th grades).

At the beginning of the school year, youth magazines and newspapers advertise the commencement of this year’s Math-by-Mail program, with a thought-provoking, though easily solved, problem. Students interested in learning to solve such problems are asked to send in their name, address and grade level.

The worksheets demonstrate the program’s objectives and provide some background material prior to the problems. The subject matter is new to the children and differs from that studied at school at a higher level and employing a different approach. For example, problems may deal with graph theory, number theory, statistics,

topology, set theory, etc. The solutions are corrected, graded and returned to the students with a printed solution and another worksheet. Four such rounds occur during the year.

At the end of the year the best students are invited to the Weizmann Institute to participate in a hands-on mathematics experience. They are given worksheets of the kind which provide mathematical clues, and groups compete.

Experience indicates that this program is widely circulated all over the country. Teachers use these questionnaires to enhance lessons for gifted children in their schools and many times the whole family works together to solve the problems.

Some highly gifted students were first found in the Math-by-Mail program and were invited to participate in the National Mathematics Olympiad for high school students while still in junior high school. It is interesting to note that the "Science by Mail" program run by the Science Museum of Boston originated in the "Math-by-Mail" program in Israel.

The Field School of Science is a program not for individuals who enroll in the extracurricular education framework, but is available to whole classes during the school year. The program is oriented at high school youngsters who are majoring in either physics, chemistry or biology. This program offers 11th–12th grade students and their teachers intensive science programs. The courses provide specialized instruction, equipment and material which are not usually available in regular schools. The instructors are mainly university graduate students and faculty members. Lectures, demonstrations, laboratory work and visits to the Institute's research laboratories are provided. The goals of the programs are:

- (1) to acquaint students with subjects at the frontiers of science and new developments,
- (2) to provide direct contact between school students and scientists, and
- (3) to make available advanced science equipment.

Each program lasts about 5–6 hours. Samples of the topics presented are listed in Table 1 below. This program exemplifies how a university or a research center is able to enrich the formal educative system.

Garden of Science is a "hands-on" outdoor science park located on the campus of the Weizmann Institute. It includes interactive exhibits which have been developed in the fields of energy, mechanics, and waves. The exhibits illustrate everyday physics phenomena.

The program is offered to 5th–12th grade classes and includes illustrated lectures and visits to the Garden of Science. Examples of this program are given in Table 2.

The size and scope of these educational programs can be seen from the numbers in Table 3.

Industrial Research Laboratories are also becoming involved in working with school youth. A beginning has been made in Israel in opening up industrial research laboratories for the coaching of interested young people,

TABLE 1

 Typical Topics Offered in the Field School of Science

Physics

Nuclear physics—the Rutherford experiment
Lasers and holography
Elementary particles
Chaos—or why the weather forecasters make mistakes
Modern physics

Chemistry

Photography chemistry
Methods for separating materials from mixtures
The sun as energy source—present and future
Plastics and composite materials

Biology

Genetic engineering—theory and practice
Tissue cultures and genetics engineering in plants
Introduction to immunology
Learning and the nervous system
Medical biology
Marrow transplantation

TABLE 2

 Typical Programs Offered at the Garden of Science

Grades 5th–7th

Energy—basic concepts
Sound
To see and be seen—angle of sight (light)
Astronomy
Visit to the Garden of Science

Grades 8th–9th

Energy—basic concepts
Visit to the solar system
Energy sources
Life and death of stars

Grades 10th–12th

From classical gravitation—to space-time curves
Newton laws
Waves
Astronomy
Astrophysics
Cosmology
Ballistics, Kepler Laws, and planets

along the lines of science clubs. Despite special problems arising from the commercial rights to intellectual property and health insurance, the basic response by industry is most encouraging. Industry is definitely on the lookout for talent.

Research and Evaluation

Research and evaluation of extracurricular education for the gifted has been sparse. First, the number of extracurricular programs is very small, compared to

TABLE 3
Number of Students in Youth Activities at the Universities and Research Institutes (1992)

<i>Programs/ Institute</i>	<i>Science Clubs</i>	<i>Summer Courses</i>	<i>Residential Summer Programs</i>	<i>Field Days</i>	<i>Garden of Science</i>	<i>Research Projects</i>	<i>Math-By-Mail</i>	<i>Total</i>
Weizmann Institute of Science	1000	—	170	3700	8200	10	1100	13180
Hebrew University Tel-Aviv	1550	920	420	—	—	10	—	5400
University Bar-Ilan	1100	900	—	2900	—	—	—	4900
University Ben-Gurion	500	—	40	2500	—	—	—	540
University Migal	1000	200	—	—	—	10	—	1210
Technion	720	—	40	1000	—	90	—	1850
Volcani Center	1200	300	80	5500	—	—	—	7080
The Holon Center for technological Education	400	—	65	750	—	100	—	1315
Soreq Nuclear Center	150	—	—	—	—	—	—	150
	—	40	—	—	—	—	—	40
Total	7620	2360	815	16350	8200	220	1000	35665

programs within the school framework. Second, most of these programs do not lend themselves to quantification of achievement.

Eylon et al. (1985) studied the questions of why students enroll in extracurricular science courses in the universities, what their expectations are and what the outcomes affective of these courses are. It was found that:

(1) The students who enroll in the extracurricular science courses are really interested in enrichment beyond school science. Social, parental, or teacher influences were not the causes for participating in the courses.

(2) The students expected that the activities would be student-centered, involving an emphasis of laboratory work. They also expected that the science clubs would include information on contemporary science and be different from the content presented in school.

(3) The students perceived the extracurricular science courses to be very much "real science," and very different from their school science studies.

In summary, Eylon concluded that this study "indicates that science as taught in science clubs (in the universities) is indeed a unique mode of instruction which gives highly motivated students a chance to become acquainted with science as it is done and seen by scientists" (p. 89).

Ziv and Shailovsky (1987) studied pupils of 7th–11th grades who participate in science clubs at Tel-Aviv University. They were compared to their peers in junior high school near the university. The most conspicuous finding in junior high school students who enrolled in the out-of-school science clubs is the variety and diversity of their fields of interest. They are interested in astronomy, cosmology, physics, chemistry, mathematics and electronics. But many of them are also interested in areas such as history, literature, music, snake breeding, computer languages, aeromodeling, etc. Sixty-four different areas of interest were found among these children, compared to 23 areas in the control group. Leisure time interests of the gifted children are also remarkable. They are more involved in developing special interests in their free time than their peers in the control group. The pupils of the science clubs are more engaged in reading and computing while their peers are primarily engaged in sports activities. Although the two groups read daily newspapers about the same, 14% of the science clubs' students read magazines such as *Science*, *Scientific American*, *People and Computers*, *Music*, *Prose*, compared to only 3% of the control group. Students in the science club also read more classic literature, biographies and science books than the students in the control group. These findings are

similar to those found for gifted children in the U.S.A. (Tannenbaum, 1983).

Moreover, there was a major difference between the two groups in the creative domain: 12% of the club group wrote prose and poetry, less than 1% of the control group did so.

Ruckman and Feldhusen (1988) evaluated the university-school district consortium for gifted education involving Purdue University and seven rural school districts. They found that significant positive changes occurred in teachers, administrators, counselors, and media specialists in knowledge level and attitudes toward gifted education. Overall project satisfaction was high, as perceived by both school district personnel and university leaders.

Ariel (1990) conducted a retrospective follow-up study of "gifted pupils, now adults, beginning their careers", comparing the opinions of adults (average 26 years of age) who had been identified as gifted children and who participated in the extracurricular clubs at the universities as well as other delivery systems, regarding the "best method" for treating gifted children.

Eighty-three percent of the sample majored in physics and mathematics while in high school, compared to 18% in the general population. While doing their military service, 39% successfully completed flying school as compared to 10% in the general population. Ninety-three percent went on to study at universities where 63% earned degrees in science or technology. Acceleration and special schools for the gifted were perceived as less appropriate for educating the gifted. Graduates of special classes in regular schools, who also participated in enrichment courses in the universities, thought that this was the best framework for the gifted. Those who participated only in special classes in a regular school and were not involved in enrichment courses in the universities preferred the special classes.

Since very little research and evaluation has been done concerning education in nonschool educative settings, it is not still clear what the limitations are. The experience suggests that the advantage of studying with mentors and professionals is most strongly felt by older children (grade 7 and up). The younger children benefit primarily from the stimulating environments provided in the activities.

In Summary

Such special resources as universities, research institutions, museums, and other professional organizations are still neglected in educating the gifted and talented children. These bodies have the knowledge, the personnel and the equipment that can cater for highly intelligent students and give them insights into attractive and challenging areas and methods. These places can also supply mentors for gifted individuals. Globally, there appears to be only sporadic efforts to

use these resources. Israel provides a good example of a national network of extracurricular science education in all its universities and some research centers, but even there more can be done in science, music and the arts.

Science, natural history, and art museums are active now in the field of education, while music institutions do less. A promising sector is the science-based industries with research and development departments. These industries can adopt youngsters into their research and development departments and enable them to work with their professionals.

Implementing such programs in most universities and other institutions is neither complicated nor expensive. The most important factor—the personnel—is already there, together with the body of knowledge and the equipment. Only good will is needed to implement unique education programs, according to the strength and interests of the individual institute.

Experience regarding the universities has shown that education programs for the youth succeed where there is a good will of the leaders of the institute. In such cases the scientists are ready to cooperate and do their best to make youth programs successful. The proper attitude on the part of the leaders in the professional centers will enable the advancement and proliferation of activities for the gifted.

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PART VI

Examples of Country Efforts, Policies, Programs and Issues

Current Status of Gifted Education in the United States

JAMES J. GALLAGHER

University of North Carolina at Chapel Hill, North Carolina, U.S.A.

Introduction

The purpose of this chapter is to provide a portrait of gifted education in the United States while providing some historical background. Although early evidence of educational concern can be found in the establishment of special educational programs in St. Louis in the 1860s and Cleveland in the 1920s, the first *widespread* attention to the special needs of gifted students in public schools probably can be identified as the Sputnik era of the late 1950s (Tannenbaum, 1983). The challenge provided by the Soviets to the United States' superiority in scientific fields energized major efforts in many states and stimulated major curriculum reform through substantial investments by the National Science Foundation, and later by the U.S. Office of Education (Goodlad, 1964). Although such efforts were not exclusively directed toward gifted students, the emphasis in these curricula on major systems of ideas and in providing actual practice in doing research fit well into the educational needs of gifted students (Gallagher, 1985).

The emphasis on education of gifted students went into a decline from the mid 1960s to 1970s, while public attention and the attention of educators shifted to issues of student equity. However, there was continued interest in the education of gifted students, largely due to the recognition of the need for a large and continuing supply of highly talented individuals to maintain U.S. leadership in business, industry, higher education, the sciences, etc., into the 21st century (*America 2000*).

The attitude toward gifted students at a personal and societal level has often been ambivalent, in both the educational setting and society at large. We may love the creative products of their mental processes, but still feel the sting of envy when we observe some persons doing, with apparent ease, what is so difficult for others to accomplish. Such conflict between the public interest and personal feelings has been felt in many societies, and has been a barrier to their education (Gallagher, 1984).

Definition

There are numerous competing definitions abroad in education today (see Sternberg & Davidson, 1986).

Many of these definitions are theoretical in nature and difficult to transform into educational practice. Two definitions, representing differing points of view, currently seem to have the most influence over educational practice. One focuses upon individuals with outstanding intellectual potential, the other definition emphasizes demonstrated productivity and creativity.

The definition of the gifted child represents a conceptual understanding of the construct itself. The definition listed below as the "Marland definition" emerged from a national review of the issue (Marland, 1972). It reflects how many states approach the issue, although there are reasons to believe that this definition will change as new knowledge about intellectual development is established and accepted.

Marland Definition

Gifted and talented children are identified by professionally qualified persons as those who, by virtue of outstanding abilities, are capable of high performance. These are children who require differentiated educational programs and services beyond those normally provided by the regular program in order to realize their contribution to self and society.

Children capable of high performance include those with demonstrated achievement and/or potential ability in any of the following areas:

- (1) General intellectual ability;
 - (2) Specific academic aptitude;
 - (3) Creative or productive thinking;
 - (4) Leadership ability;
 - (5) Visual and performing arts;
 - (6) Psychomotor ability.
- (Marland, 1972)

The sixth ability, psychomotor ability, was later dropped from the list, since many persons felt it referred to athletic ability, which was already well supported in our society.

Renzulli (1986) has, in contrast, presented a three-ring conception of giftedness, in which a combination of interaction of *task commitment*, *above average ability*, and *creativity* are necessary to produce gifted or productive performance. Renzulli prefers to discuss

“gifted behaviors” rather than “gifted students” and, as a consequence, has devised the following definition:

Gifted behavior reflects an interaction among three basic clusters of human traits—above average general or specific abilities, high levels of task commitment, and high levels of creativity. Persons who manifest, or are capable of developing, an interaction among the three clusters require a wide variety of educational opportunities and services that are not ordinarily provided through regular instructional programs (Renzulli & Reis, 1986, p. 218).

Renzulli also insists that these behaviors be applied to potentially valuable areas of human performance. It would seem that both definitions recognize the need to extend the regular educational program in order to provide adequate stimulation, whether for gifted students or for students manifesting gifted behaviors.

Both definitions leave considerable leeway in terms of how one actually identifies a student or performance, in a concrete fashion, so as to certify a gifted student or gifted performance. It is in the actual attempts to identify such students or behaviors that much of the current argument and discussion about giftedness takes place.

What is Superior Intelligence?

From World War II until the mid-1960s, there appeared to be no serious challenge to the concept that, “Intelligence is what an intelligence test measures.” This circular, and generally nonproductive, approach to understanding intelligence has been replaced, during the last couple of decades, by a series of attempts to explore how the developing child comprehends information, stores it, scans the stored information for relevant data, and makes decisions or solves problems. Many of these information-processing models were based upon research on artificial intelligence and information processing studies by Sternberg (1986), Gardner (1983), Simon (1978, 1979), Borkowski and Kurtz (1987), Weinberg (1989) etc. Such models promise a greater understanding of how information is received, stored, and retrieved—though it still might not be clear from such models as to why one child is gifted and another child is mentally retarded. Nevertheless, a better understanding of general intellectual functioning can be of special interest to educators who work with gifted students.

The reason for the long predominance of the IQ test as a device for indicating high intelligence is that it largely did what the schools asked of it. These IQ tests, many of which are heavily weighted with vocabulary, simple reasoning, and analogy questions, predicted very well which students would learn rapidly and which would learn more slowly than their classmates. This was particularly true since memory, association, and reasoning—the characteristics measured by the IQ

test—were also the abilities predominantly demanded of students in the classroom.

Is the Gifted Child Qualitatively Different in Intelligence?

Robinson (1977) has pointed out that it is often not *what* the gifted child does that is so remarkable, but rather *when* in the developmental process he or she does it. For example, the child who plays competitive chess at the age of five or six will naturally be seen as gifted, but is doing only what other children might do at the age of twelve or thirteen. The basic question of interest to educators, is “Can gifted children accomplish some mental tasks that other students cannot perform at all?” If the answer to that is “Yes,” then the stimulation of such special abilities becomes a major responsibility of the educator.

In a review of the existing literature, Rogers (1986) suggested that gifted students are quantitatively different from the average student in their intellectual performance, but also that these *quantitative* differences may result in *qualitatively* different performance. For example, a student who masters calculus can achieve levels of problem-solving that are not available to students who have not mastered or had the opportunity to master calculus. There is a point, therefore, where quantitative differences seem to result in qualitatively different performance.

The Role of the Family in Promoting Giftedness

It has long been recognized that the social envelope in which the gifted student resides has a great deal to do with shaping the interests, educational motivation, and even the full realization of his or her intellectual potential itself. One of the recent investigations, done by Bloom and his colleagues (1985), involved a retrospective analysis of families of world-class performers in the arts and sciences. In this group, Bloom found a consistent history of strong and early family identification and promotion of the talents of the child. The parents, in many cases, sought special instruction for these students. There were many instances of public performances of the child’s talent—which reinforced the child’s interest in continuing the often difficult practice of their talents. Other reviews of the literature (Olszewski, Kulieke, & Buescher, 1987) confirm that parents of gifted students tend to stress the importance of academic achievement, hard work, and the full development of one’s talents.

What is not fully recognized is that the converse of great attention and encouragement of talent can result in sizable negative consequences for talent development. In families where there is a lack of interest in intellectual development, or where the parents are not able to provide either the resources or

the intensity of interest and encouragement, it is likely that even outstanding talent will remain substantially undeveloped. Therefore, in groups where economic disadvantage is a pattern—where there is a surplus of poverty, divorce, one-parent families, etc., we would expect a lesser percentage of such students reaching the full realization of their talents—a sad event for the child, and a potential tragedy for the society (Maker & Schiever, 1989).

Gifted Averages or Gifted Individuals?

There are two general strategies for attempting to characterize a subgroup of the population such as “gifted students.” One is to report how this group differs from other groups in the society on the basis of the mean or average performance of the two groups; the other is to report the range of characteristics in this special population. Such group comparisons leads to statements such as, “Gifted students tend to be more physically able, socially popular, and emotionally stable, than average students.” Such statements, reflecting averages, ignore or omit information about the wide range or variation of performance *within* the subgroup of gifted students. We can have, at one and the same time, a statement that gifted students are more emotionally stable than the average student together with significant reports of teen suicides or emotional maladjustment in gifted students (Delisle, 1990; Cornell, Callahan, & Loyd, 1991).

If there is a concern for the individual development of each child, then it is the range, or *variation*, that also needs special attention. It can be said, with perfect validity, that gifted males, as a group, perform better in mathematics than gifted females. Such a statement, however, tends to ignore the also observable fact that many gifted girls can outperform the “average gifted boy” in mathematics. Also ignored is that many gifted boys will fall below the average of gifted girls in mathematics. Another example of averages vs. variations is that the literature on student acceleration is highly positive when group results are considered, but, of course, one can still find individual instances of a student who was accelerated and did not achieve well or achieve good emotional adjustment (Gallagher, 1985; Davis & Rimm, 1989). If educational decisions are made or educational policy is constructed based upon the information available, then a clear portrait of the range or *variation* within the group, as well as a comparison of averages of this group with others is needed.

School Adaptations for the Gifted Child

The accumulated evidence on the characteristics of gifted students provides the basis for the differentiated program elements noted below. The gifted student has advanced academically, far beyond his/her age peers

and is often bored and unproductive in the normal school setting (Galbraith, 1988). Some change or school adaptation that allows these students to interact with each other, to be challenged by material at their developmental level and to learn skills useful in independent learning is being sought by educators (Passow, 1982). Over the past few decades, a wide variety of changes, or adaptations to the general program of the schools, have been made to try to meet the special needs of gifted students. Gallagher (1985) divided these adaptations into three major areas: *the learning environment, curriculum content, and skills mastery*. These adaptations, however, often interact and are combined with each other in active programs.

Learning Environment

The variety of special environments created for the gifted (e.g., resource rooms, teacher consultants, special classes, magnet schools, summer programs, Saturday programs, etc.) tend to distract attention from the two common purposes for such changes. First, there is a desire to bring together pupils of similar ability so that instruction can be pitched at the appropriate conceptual level for the student and also so that the students with special abilities can stimulate each other. The second major reason is to place them with competent staff or outside personnel who could continue to challenge them intellectually and academically.

One of the interesting developments during the last decade has been the development of residential schools for talented students in mathematics and science. Beginning with the North Carolina School of Science and Math in 1978, ten states have established such programs and more states are planning such schools.

Changes such as resource rooms or special classes have the potential for creating political difficulties to educational administrators, since these adaptations essentially impact all of the students and teachers in the school. Current evidence suggests that learning environment changes alone, unless the curriculum or skills to be mastered are also changed, does not yield impressive gains in achievement or performance (Kulik & Kulik, 1991).

Student Acceleration

One of the earliest devices in educational adaptation for gifted students has been to move the student more rapidly through the school program. This issue has been argued about for over six decades. What are the potential virtues and dangers of student acceleration? The desire to reduce the duration of an educational program which, for some gifted students, can extend to a quarter of a century or more is understandable. If an educational program can be reduced one or two (or more) years from the extended time for career

preparation, would it not be to the benefit of the student, family, and society to do so?

Yet, student acceleration has not been a popular, or heavily-used, device in the educational plans for gifted students (Clark, 1989; VanTassel-Baska, 1986). There have been many fears raised about possible negative consequences. Southern, Jones, and Fiscus (1989) have recently surveyed over 1200 educational practitioners on this question, and found a substantial body of opinion concerned about: possible social problems for such accelerated students; the possibility of extra stress caused by the advancement; the possible loss of desirable childhood experiences; and the availability of other, more desirable, strategies (e.g., enrichment). In contrast to these concerns, the available literature on this topic reports strongly favorable outcomes of student acceleration (Gallagher, 1991) and it appears that many of the fears noted above are unfounded in the vast majority of cases (see *Averages vs. Individuals*).

Content Differentiation

As noted above, changing the learning environment without changing the content of lessons seems nonproductive and leads to the clarion call of many gifted students that, "School is boring." Can just any additional information serve the purpose of educating gifted students? Does teaching the physics of "chaos" equate with the history of ping pong? Obviously, some curricula content seems to serve educational purposes for gifted students better than others.

Gallagher (1985) has identified four major ways in which curriculum content has been modified to meet the special needs of gifted students. These categories are: *acceleration*, *enrichment*, *sophistication*, and *novelty*.

Content acceleration refers to the presentation to gifted students of curricula that were intended for older students. In this way, algebra and geometry can be presented to gifted students still in the elementary grades. There has been substantial demonstration of the ability of advanced students to master such a program. The early study of calculus allows the student to address a much more complex set of problems in biology and chemistry that cannot be mastered without calculus (Stanley & Benbow, 1986).

One of the organized efforts to provide systematically more challenging material to gifted students at an earlier age has been the Study of Mathematically Precocious Youth (SMPY). The original purpose of the project was to find students who reasoned very well in mathematics before the age of 13 and provide them with special accelerative opportunities so that they could move ahead in mathematics (Stanley, 1991).

Some of these advanced students entered college early, others were given special experience through curricular flexibility at high school plus out of school experiences. This emphasis on identification and stimulation of outstanding talent has been adopted by a

number of other universities (e.g., Northwestern, Duke, Denver, etc.), and SMPY youth are reported to be successful in international competitions, Westinghouse Talent Searches, etc. (Stanley, 1991).

Content enrichment refers to the variety of extra lessons or assignments used to elaborate the richness of understanding the student has of the existing curriculum goals. Such an approach is often taken when the gifted child is kept mainly in the regular classroom, where content enrichment extends the regular program (Parke, 1989). While the rest of the class is studying the Western Movement across the early United States, the gifted student could be doing a project on the diaries of wagon-train members or the special perspective of Native Americans as they see the influx of settlers. Content enrichment gives gifted students material designed to broaden their understanding within the general educational goals.

Content sophistication refers to attempts to challenge gifted students to learn more complex and sophisticated information from the curriculum that the average student might not be able to master. Such an approach is most easily utilized in special class or resource room settings, where the teacher can instruct a group of gifted students at a higher level without fear of leaving other, less rapidly developing, students behind.

Examples of content differentiation of sophistication would be to take major social trends as proposed by Naisbitt (1983) such as the migration of business from North to South, and think about the consequences that stem from that move, or to focus on a new system of ideas such as the physics of chaos and what the implication of these ideas might be. Both examples require a wealth of prior knowledge—which gifted students may have, but that other students do not.

Content novelty refers to curriculum efforts that present content that is not covered in traditional school curriculum. Topics focusing on cross-disciplinary areas, such as the impact of technology on American society, or the demographics of poverty, would be examples of such content topics not traditionally dealt with in the regular curriculum but which may have special meaning for the gifted student who generally likes to tie apparently unrelated facts together.

It is considered important for gifted students to reflect on the linkage between bodies of knowledge so that they are aware of the potential consequences of one field on another (e.g., the effects of the VCR on social patterns of youth) and reflect on what might be done to forestall possible negative consequences.

Skills Mastery

One of the tools that educators of gifted students have tried to provide over the last two decades has been the mastery of cognitive skills that will increase the ability of the student to think productively (Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956). Much of that work

has focused upon the stimulation of *divergent thinking*, increasing the fluency, flexibility, and originality of ideas (e.g., Meecker, 1976; Guilford, 1967).

Direct attempts have been made to instruct students in the use of the creative problem-solving model (Parnes, 1981), or problem-solving strategies through the Schoolwide Enrichment Model (Renzulli & Reis, 1986). Additional stimulation in thinking has been fostered by student team competitions in such programs as the Odyssey of the Mind, Future Problem Solving (Torrance & Torrance, 1978; Crabbe, 1982), and models of creative thinking (Treffinger, 1991).

Whether the application of these strategies lead to an increase in educational attainment or skills and lead to a more creative adult remains an unanswered question. There is a substantial body of knowledge reporting that creative individuals, as adults, differ in a number of personality traits from average adults. The most outstanding of these traits are the willingness to take risks, a strong ego that can go against the social tide, and a persistence and commitment to their own special area of interest (Feldhusen & Treffinger, 1980).

The variety of attempts to instruct gifted students in skills that can enhance their creativity, their problem solving abilities, and their problem finding abilities will, almost surely, continue and increase. It might be expected to hear increased calls for accountability for such programs to prove that they not only increase these thinking skills in isolation, but that such increases lead to demonstrably superior performance in real life tasks.

Current Issues in Gifted Education

There are an impressive number of issues that can be identified as affecting the education of gifted students, either directly or as an unintended consequence of striving for other educational goals. These issues listed here represent the author's attempt to identify the most critical topic of current concern in this special educational field.

Issue—"Dumbing Down" School Programs

One of the current trends which seems to compound the problems that gifted students face in finding an adequate challenge for their abilities in school is a process that has been referred to as "dumbing down" the curriculum (Renzulli & Reis, 1991). In this "dumbing down" process, the textbooks for a grade level are written in overly simplified terms and ideas are presented in a simplistic way, even for the average students of that age group. Unless the teacher provides alternative reading materials of adequate complexity, the gifted student is likely to be extremely bored and remain unchallenged by such simple texts.

Renzulli and Reis (1991) reported on the Second International Study of Mathematics by the International

Association of Educational Achievement as follows: "The most able U.S. students scored the lowest of all these countries (Hungary, Scotland, Canada, Finland, Sweden, New Zealand, Japan, Belgium, England, and Israel). Average Japanese students achieved higher than the top 5% of the U.S. students in college preparatory mathematics" (p. 27).

Part of the reason for such poor performance would seem to be an observable trend to "dumb down" the curriculum to make an already conceptually easy set of lessons even more simple! Kirst, for example (1982), found no textbook publisher ready to provide a textbook that would challenge the top one third of students.

The reason for such simplifications in the textbooks seems related to the process of textbook approval, in which states or local communities may decide upon an approved list of textbooks at any given level. The publisher is engaged in an attempt to make the material so elementary in nature that even the slowest learning student would be able to grasp the material. The hope would be that this would cause the textbook committees to react favorably. The continuing of this process results in a serious "simplification" of content material, which compounds the boredom and frustration of gifted students looking for challenge and intellectual adventure.

Issue—Educational Reform

One of the major movements in education, over the past decade, has been a series of attempts to build major reform elements into the American educational enterprise. These would involve changing both structural and programmatic emphases. This reform movement appears to be generated by a major and continuing public dissatisfaction with the performance of the schools. The generally poor performance of students has largely been considered a school problem, rather than a societal one. Apart from the general merit of such reform elements as the Middle Schools Movement, or Cooperative Learning, or Accountability, there is the additional issue of how these reforms integrate with or affect the program needs of gifted students (Gallagher, 1991; Renzulli & Reis, 1991).

There are a number of proponents of the process of *cooperative learning*, who differ somewhat among themselves about precisely how the concept is to be implemented into the school system (Slavin, 1990; Johnson & Johnson, 1990; Kagan, 1988). Slavin, for example, emphasizes two essential features that must be present in his version of cooperative learning. The first is a *group goal*, or positive interdependence, in which the cooperative groups of students work together to earn recognition (grades, rewards, etc.). The second is *individual accountability*, in which the group's success depends on the individual learning and performance of all group members. Slavin strongly recommends the

formation of heterogeneous groups by ability in the classroom, with the possible exception of mathematics. Robinson (1990) has pointed out three specific problems with this approach as it relates to gifted students. Cooperative learning:

(1) will likely limit instruction to grade-level materials, to take into account the average and/or slow-learning students;

(2) will be presented at the pace of the slowest of the learners in the group; and,

(3) will be evaluated on mastery of basic skills, rather than more sophisticated concepts;

Renzulli and Reis (1991) have pointed out the direct concern of many persons in gifted education about the overall impact of cooperative learning when these small groups are heterogeneous in ability and where, inevitably, the gifted students will become tutors to those slow learners in the group, since the entire group's performance will be judged by the individual scores on some outcome measure.

You don't produce future Thomas Edisons or Marie Curies by forcing them to spend large amounts of their science and mathematics classes tutoring students who don't understand the material. A student who is tutoring others in a cooperative learning situation in mathematics may refine some of his or her basic skill processes, but this type of situation does not provide the level of challenge necessary for the most advanced types of involvement in the subject (p. 34).

It is currently unclear how, or even if, apparently desirable instruction strategies such as cooperative learning can be implemented in the best interest of gifted students. The same might be said for the Middle Schools Movement.

The focus of the Middle School concept includes the following elements:

(1) A strong affective component, with teams of students and teachers organized to foster a sense of belonging.

(2) An interdisciplinary focus on content.

(3) A curriculum emphasizing inquiry, exploration, and discovery.

(4) A schedule characterized by flexibility. (George, 1988)

Many of the Middle School programs also place emphasis on heterogeneous grouping and, once again, raise the question about whether the gifted students can be sufficiently challenged in these settings. However, Sicola (1990) sees no reason why special programming for gifted students cannot form a component of the middle schools program. She believes that the honors courses, independent study, magnet schools, and other well-established programs, can be effectively integrated with the middle schools concept, in order to provide an effective education for gifted students.

The reform movements have rarely mentioned the special needs of gifted students in their goals or

objectives. Unless rigorous efforts are made to integrate the best of gifted education with these movements, we will likely see a major erosion of gifted programs and an unintentional "dumbing down" of the school program for advanced students.

Issue—Creativity

There has been a major effort, in special programs for gifted students, to emphasize the stimulation of creative thinking. While this effort has extended across the nation in gifted programs for three decades, it is still unclear as to what constitutes "creativity" (Is it a product? Is it a process?), or how best to enhance it. The theoretical models of Guilford (1967) and Bloom et al. (1956) have had a major influence on school's attempts to stimulate creative thinking. The translation of the Guilford model into school-appropriate experiences has been the significant contribution of Paul Torrance (1977) and Mary Meeker (1969). Much of that work has focused on the nurturing of *divergent thinking*, or improving the gifted student's intellectual fluency, flexibility, and originality.

While the emphasis has been on improving the cognitive strategies in the case of younger children, the study of creativity in adults focuses more upon personality traits. The most outstanding of these traits appeared to be the willingness to take risks, a strong ego that enabled the individual to go against the norm or social tide, and a willingness to persist in the face of difficulties in their area of particular interest (Barron & Harrington, 1981).

While there is substantial evidence that direct training can improve student production of a number of ideas, and of original ideas (Mansfield, Busse, & Krepelka, 1978; Feldhusen & Treffinger, 1980), there remains a question as to whether such training will result in improved creative behavior in adults. Still, there is a continued emphasis on student mastery of strategies for attacking complex problems, and these approaches would seem to have some face validity to them. This refers particularly to the creative problem-solving model of Parnes (1981) and the problem-finding concepts made popular by Getzels and Csikzentmihalyi (1976).

While creativity has often been thought of as an exclusively internal process, there is now opinion that creative products may well result from a complex interaction between a particular environment and internal thought (Greeno, 1989). Thinking, while obviously an internal process, must operate within a responsive social context, which can be influenced positively by carefully devised educational environments (Gallagher, 1991).

Just as the society is ambivalent about how it views giftedness, it is also unsure about creativity. Tannenbaum (1983) described the mixed feelings of modern society regarding human creativity as follows:

On the one hand, the public has demonstrated an almost insatiable demand for newness in the Arts, Sciences, and Humanities, and has, consequently, lavished encouragement and renown upon people with great ideas. On the other hand, it has manifested a tenacious will to remain culturally conservative, and often views the creative spirit with suspicion and disdain (p. 4).

Issue—Underserved Populations

CULTURAL DIFFERENCES

Until recently, one of the most embarrassing secrets in the education of the gifted was the differential prevalence of ethnic and racial groups in identification and in placement in special programs. The embarrassment stemmed from the inappropriate assumption that intelligence tests measured only genetic potential, and that such a difference in proportions would then suggest superiority or inferiority in native ability for such groups, an intolerable political problem (Gallagher, 1991).

While the objective fact was that there were fewer minority students being identified through traditional methods (except for Asian-Americans), the reasons for such low numbers were not universally agreed upon. There are two major explanations given for such results:

(1) *The instruments and procedures used for identifying gifted students are flawed and biased against those students who are not middle class, white Americans.*

Such an argument rests on the proposition that there can be no true differences that exist in levels of aptitude at the time of assessment so that any group differences that are found are the fault of the measurement. Further, the choice of gifted students from the mainstream culture for special educational programs is an attempt, some may even see it as deliberate, to limit the opportunities of children from some minority groups (Richert, 1985). The intelligence tests that have been used by the schools may more aptly be referred to as academic aptitude tests and their predictions of lower performance for minorities as a group have, unfortunately, turned out to be quite correct for many minority students (Mercer, 1979).

Bias of test instruments needs to be demonstrated by more than group differences on the test. Just as there may be differences between ethnic and racial groups on athletic aptitude or musical aptitude, based upon greater opportunity and experience, so the same may be true of academic aptitude. The excellent performance of Asian-Americans, on both tests and school performance, tends to indicate that there are factors operating here that go beyond simple differences from the mainstream culture (Zappia, 1989). Nevertheless, the current style of identification tries to cope with this issue by adopting

multiple criteria for giftedness, of which IQ tests are only one.

(2) *Differential prevalences reflect differential opportunities and limited practice on key elements of intellectual development.*

There is considerable evidence to support the importance of the role that practice and experience plays in later measures of aptitude. If one can extend the general principle that “we are good at what we practice,” to include “we avoid tasks where we perceive ourselves as not competent or situations where we are not comfortable,” then it is not hard to see how, progressively, some minority students who may have begun life with equal aptitudes with their majority group age-mates, in terms of a responsive central nervous system, will fall farther and farther behind on measures of academic proficiency and aptitude. Such evidence of differential prevalence, the argument continues, does not speak to differences in native ability so much as it does differences in the availability of responsive environments to crystallize an individual’s native ability.

The most reasonable position, given current knowledge, is to accept explanation (2)—different experiences and opportunities are what makes the difference—and operate as though it is true. The obvious step to be taken, then, is early and intensive provision of experiences that can help talented minority students to more fully develop their potential.

The current child development position is that there is a complex interaction pattern between genetics and environment, as shown in Figure 1, that tends to progressively facilitate or inhibit the full development of youngsters with special talents (Plomin, 1989; Weinberg, 1989). As noted in Figure 1, the development of symbolic systems such as language lie at the heart of more sophisticated intellectual development. Children who have been raised in an atmosphere where language is not extensively used, or in which the parent is not present to interact with the child, will quite probably result in limited language development, which, in turn, will lead to less than full potential academic performance and possibly a consequent lack of interest in school and school-related activities. The combination of all of these

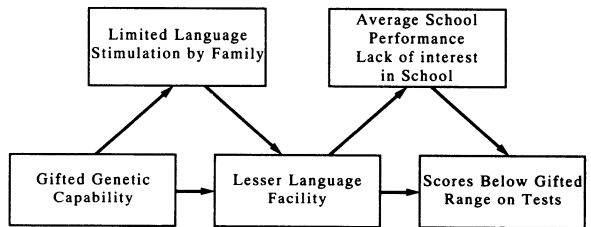


FIGURE 1. The interaction pattern between genetics and environment.

successive interactions, then, could result in a lower score on intelligence or aptitude measures than would have been likely under more optimum conditions.

Just as a series of unfavorable environmental forces can result in less favorable educational and psychometric outcomes, so can the opposite be true. If the family is encouraging and supportive, if the learning environment is superior, then there may be an opportunity for students from particular groups to show a greater than average prevalence of high ability or aptitude (Bloom, 1985; Olzsewski, Kulieke, & Buscher, 1987). Higher than expected prevalences of being identified as gifted would appear to be the case with another minority group, children from Asian families. The high prevalence of Asian-American children in programs for gifted students, as well as in other areas of performance such as music, arts, etc., have been a reminder of the attention paid, in many Asian-American families, to the importance of education and of setting high expectations for children's performance. Such departures of prevalence from normal expectations appear to demonstrate the power of the family and the culture to influence—both positively and negatively—the long-term performance of students. Such findings have stirred major efforts to develop procedures or instruments that would help identify the underserved gifted minority students (Baldwin, 1987; Sisk, 1989; Frasier, 1987).

Maker (1989) summarized program suggestions for minority students from a wide variety of specialists as follows:

- (1) Identify student strengths, and plan a curriculum to develop those abilities;
- (2) Provide for the development of basic skills and other abilities students may lack;
- (3) Regard differences as positive, rather than negative, attributes.
- (4) Provide for involvement of parents, the community, and mentors or role models;
- (5) Create and maintain classrooms with a multicultural emphasis.

These principles represent mainstream thinking on programs for minority students, and reflect an interest in integrating minority gifted students with the larger society (Sparling, 1989). There remains strong interest in some quarters, however, to maintain a separate cultural identity for Hispanic or Native American students, and this would, naturally, result in a very different program and curriculum (Kitano, 1991).

GIFTED GIRLS

One of the major groups of underserved gifted is gifted girls. They are traditionally less represented in programs for gifted and talented, particularly in programs in mathematics and science (Stanley & Benbow, 1986). The traditional role of women to be childbearers and

stay in the home has clearly been modified, but the new freedom has not yet resulted in remarkable change. Reis and Callahan (1989) point out how far the society needs to progress:

Why, for example, are less than 2% of American patentees women? . . . Why are there only two females in the United States Senate, one female on the Supreme Court, and one female cabinet member? Why do women constitute less than 5% percent of the House of Representatives, own only 7% of all businesses in the country . . . occupy only 5% of executive positions in American corporations, hold none of the leading positions in the top five orchestras in the United States? (pp. 101–102).

Some of the suggestions for changing this situation have included programs that exclude boys, at least until gifted girls have gained much needed confidence in their own abilities (e.g., Rand & Gibb, 1989). Girls with outstanding potential would seem to be the largest untapped resource in our country at this time. One striking statistic is that though women are 51% of the population, they only comprise 11% of the scientists and engineers in the U.S., reflecting the vocational and societal tilt against women in these occupations (Smiedler & Michael-Dyer, 1991).

GIFTED HANDICAPPED

The idea that gifted students could also have specific handicapping conditions has been a relatively recent idea. The visibility of outstanding scientists such as Christopher (author correct?) Hawking—a quadriplegic—and a variety of gifted individuals with presumed learning disabilities, such as Einstein, Rockefeller, Churchill, etc., has opened new areas of investigation and special education (Whitmore & Maker, 1985).

We do not know the degree to which the sensory disabilities of vision and audition have disguised the intellectual aptitude of children, and a new sensitivity to special talent is being sought from the educators who specialize in these specialized fields.

The majority of recent attention has focused upon gifted/learning disability students who have some type of information processing deficit which interferes with learning, despite superior general aptitude. In a study of such students, Coleman (1992), found that gifted/LD students showed differences from LD students of average ability in their use of coping strategies designed to deal with academic problems. The gifted/LD students used more “planful problem solving” to overcome barriers, while the average aptitude group reported more “escape avoidance,” “distancing,” and “helplessness.” Nevertheless, the direct instruction of coping techniques to meet common school problems, such as taking exams, would seem to be a clear need for all students with learning disabilities, regardless of ability level.

UNDERACHIEVERS

Most of our knowledge of underachievers comes from the longitudinal studies of Terman and his associates (Terman & Oden, 1947) and a variety of case study and clinical study reports (e.g., Rimm, 1991). Such students, predominantly boys, seem to have a variety of self-concept and family conflict problems which are translated into ineffective academic strategies.

Some recent attempts to intervene educationally with such students have proven successful (Whitmore, 1980; Butler-Por, 1986). The amount of time needed for such remediation to become effective is impressive and confirms the notion that chronic underachievement is a complex syndrome of behaviors that is very difficult to change, once well-established.

The gifted underserved clearly represent a major loss in our community and national potential, and the strategies for recovering that loss is different for each of the subgroups.

Issue—Accountability

The question of the effectiveness of gifted programs has been one posed quite often (Callahan, 1983). One approach has been to measure the effectiveness of ability grouping, which has been a part of many programs for gifted students. Articles running into the hundreds can be identified in the ability grouping domain (see Slavin, 1990b, for example). However, common evaluation design flaws have prevented us from making more definitive statements about program effectiveness. Callahan and Caldwell (1986) identified four specific flaws that tend to invalidate a large proportion of the evaluation papers, as far as gifted students are concerned:

(1) The use of standard achievement tests in such evaluations underestimates knowledge and understandings of gifted students;

(2) The use of standard measures will not reveal the mastery of specialized content that is at the heart of special programs for gifted students;

(3) A major curriculum emphasis, in many gifted programs, is developing problem solving, problem finding, and creativity skills. Few evaluation efforts have included any attempt to measure these key processes;

(4) Few of the evaluation programs take into account the personal views of the students themselves. When that is done, themes of excruciating boredom in regular programs come through quite clearly. (See also Galbraith (1985) and Delisle (1990).)

A recent metaanalysis on ability grouping and gifted students was completed by Kulik and Kulik (1991). They summarized their findings as follows:

The evidence is clear that high aptitude and gifted students benefit academically from programs that provide separate instruction for them. Academic benefits are positive, but small, when the grouping

is done as a part of a broader program for students of all abilities. Benefits are positive and moderate in programs that are especially designed for gifted students. Academic benefits are striking and large in programs of acceleration for gifted students (p. 191).

It would appear that merely grouping gifted students together without, at the same time, changing the content and the instructional strategies, will not yield much in the way of benefits. On the other hand, a well-constructed program that brings gifted students together and provides them with an intellectually stimulating and important set of ideas, together with giving them practice to use their own ability to problem-find and problem-solve, seems to yield very tangible results.

Policy Issues and Gifted Education

Public policy consists of the rules and standards by which the society allocates its scarce resources. Education of gifted students remains a policy issue debated at local, state, and federal level except for the higher educational levels, where major resources are set aside for graduate and professional programs with little protest (Reis, 1989).

Equity Versus Excellence

For the past three decades, the American educational system has struggled to reconcile two significant values of the American society within the American educational system. The first of these is *equity*: the promise that all children shall receive an equal opportunity for education. The second value is *excellence*: that full attention and stimulation will be given to the very best of the students—those who demonstrate their ability and superiority in the educational domain.

The Fairness of It All

One of the most elusive, but seemingly most powerful, inhibitors of programs for gifted students involves the value issues of *fairness* and *equity*. Many people seem to wonder whether special programs for gifted students fit into their own value systems. The feeling is often expressed in this way: "Is it really fair for some children to have so much ability while others have so little? Is it fair for us to be giving special education opportunities for students who already have so much going for them? Isn't this type of special educational programming akin to giving tax breaks to the rich?"

Such problems seem to be made worse by the additional realization that minority groups have a lesser presence in programs for gifted students than their proportion in the general population, with the significant exception of Asian-Americans. This enhances

the image that programs for gifted are really designed as “special privileges for special people.”

The only answer to all of these value statements is that, “Of course, it *isn't* fair.” Abilities are not equally distributed, nor are the opportunities to enhance aptitudes that are present in the child. But this isn't the only unfair thing in the world. It is unfair that so many people live in poverty and disease-ridden environments while others live in opulent wealth. It is unfair that wars continue and many people are needlessly killed. It is unfair that some countries have continuous droughts, while others prosper under good growing seasons for their crops.

But who will do something constructive to combat those massive unfairnesses? The track record is clear. Those students that we call gifted will have the best chance, when properly educated, to do something about these array of social problems that are sure to face the next generation. Just as medical schools and law schools are supported since a good doctor or lawyer may be needed someday, enlightened self interest argues for a solid preparation for the most talented of our students.

The National Educational Goals

This ambivalence, or attempt to achieve the two apparently competing goals of equity *and* excellence simultaneously, is seen, in substantial clarity, in the national educational goals established by the Governor's Task Force on Education and the President, and accepted as targets toward which the system should strive for the year 2000. Table 1 indicates these goals. It can be noted that goals 3 and 4, requiring high competences in content fields and promising top

performance in math and science, represent a major emphasis on excellence and would be highly relevant to gifted students. Goals 1 and 2, in contrast (“that all children will start school ready to learn” and “that 90% of the children will graduate from high school”), represent efforts at achieving equity (America, 2000).

There are strong threads in America's cultural heritage inclining us toward *equity*. Many of our ancestors broke away from an elitist society in Europe. America's most treasured documents, the Declaration of Independence and the Constitution, take great pains to ensure that power will not once again reside in the hands of a small elitist group. People are loathe to do anything that they believe would strengthen elitist tendencies.

The drive for excellence, in contrast to equity, seems based upon societal needs. In the modern, postindustrial, information society into which we are emerging, the need for large numbers of well-educated and extensively prepared students is manifest, as is the need for a large pool of creative scientists, managers, communicators, etc. The education of gifted students is clearly a high priority for such a society. Unfortunately, the messages that are now being received about current student performance are pessimistic, when American students are compared to students of other advanced nations.

A series of comparisons of American students with students from other countries (Jones, 1989; Crosswhite, Dossey, Swafford, McKnight, Cooney, & Travers, 1985) has also revealed the sorrowful state of our students' learning—and concerned those current leaders who realize that *student* noncompetitiveness in the educational scene will likely translate into *adult* noncompetitiveness in the economic and political world in the near future.

There have always been educators who have eloquently urged attention to be paid to such youngsters because their needs required it (see Hollingworth, 1942, for example), but it has been the economic arguments that have generally impressed decision-makers to pay special attention to these students.

If policy represents the rules and standards by which there is agreement to allocate scarce resources to specific needs and persons, then the emergence of public policy related to gifted children becomes a particularly significant topic. Since special education provisions for gifted students cost more than the average costs of education (though significantly less than special education for other exceptional children), then the question becomes, “Where will such resources come from?”

In the case of almost half the states, the extra resources for such programs are allocated, by the state, to local districts through the general legislation concerning exceptional children for that state. In other states, resources reimbursing local school districts or the assignment of state leadership personnel to gifted education are made available through a variety of other state education authorities. Every state has some type

TABLE 1

National Education Goals

1. By the Year 2000, all children in America will start school ready to learn.
2. By the Year 2000, we will increase the percentage of students graduating from high school to at least 90%.
3. By the Year 2000, American students will leave grades four, eight, and twelve having demonstrated competency over challenging subject matter, including English, Mathematics, Science, History, and Geography.
4. By the Year 2000, U.S. students will be first in the world in Science and Mathematics achievement.
5. By the Year 2000, every adult American will be literate and possess the knowledges and skills necessary to compete in a global economy and exercise the rights and responsibilities of citizenship.
6. By the Year 2000, every school in America will be free of drugs and violence and offer a disciplined environment conducive to learning. *America 2000* (1990)

TABLE 2
Federal Policy and Legislation Regarding the Gifted

1958	Following the Soviet Union's launching of the first satellite (Sputnik) in 1957, Congress declared an educational emergency and enacted the National Defense Education Act (P.L. 85-864), which allocated funds to develop potential for talent in math, science, and foreign languages.
1965	The Elementary and Secondary Education Act (P.L. 89-10) passed in Congress; Titles III and V related to the development of model gifted programs and the hiring of state-level gifted education personnel.
1968	President Johnson established a White House Task Force on the Gifted and Talent; the formal report was never published, but a 50-state survey was completed.
1969	Federal bills were introduced in both houses of Congress that would have established a federal definition, provided support to states to expand programs, and directed the U.S. Commissioner of Education to conduct a study on the needs of the gifted.
1970	Federal bills introduced in 1969 were included as section 806 of the Elementary and Secondary Educational Amendments of 1969 (P.L. 91-230), which mandated a report to Congress on the status of and need for programs for the gifted.
1971	Sidney P. Marland, Jr., U.S. Commissioner of Education, submitted to Congress the report mandated by P.L. 91-230. <i>The Marland Report</i> (1972) included a national assessment of educational programs for the gifted and talented and a federal definition of gifted and talented students.
1973-1974	Several federal bills introduced in both houses of the 93rd Congress resulted in the establishment of an Office of Gifted and Talented in the U.S. Office of Education, annual appropriations for the office, grants for training, research and demonstration projects, grants to state and local agencies, and the establishment of a national clearinghouse related to gifted.
1975	<i>Only \$2.5 million was appropriated for federal efforts; funding remained at this level for several years.</i>
1977-1978	Federal bills supporting the education of the gifted and talented were again introduced in both houses of Congress. The proposed Gifted and Talented Children's Education Act (P.L. 95-561) passed as Title IX-A of the Education Amendments of 1978.
1978-1980	Appropriations increased from \$3.8 million to \$6.2 million in 1980. President Carter supported continuing \$6.2 million funding.
1981	Congress provided \$5.6 million in fiscal year 1981. The consolidation and improvement provisions of the Omnibus Budget Reconciliation Act of 1981 consolidated 20 programs into a Chapter 2 block grant for state and local educational agencies; funding decreased 42% for programs.
1982-1983	The National Commission on Excellence was established; hearings were held around the country on six aspects of public education including gifted education, the National Business Consortium was established to put business and education into a partnership for the promotion of education of the gifted.
1983	The report of the National Commission on Excellence in Education, titled <i>A Nation at Risk: The Imperative for Education Reform</i> , was published; education of the gifted was mentioned in several sections.
1983-1984	In the 98th Congress, the Senate established a caucus on children that explored (among other issues) the impact of federal budget cuts on highly talented children, especially special populations.
1987-1988	Both houses of Congress overwhelmingly passed virtually identical bills regarding education of the gifted. The Senate passed House Omnibus Bill, S. 373. The House bill was also included in the House Omnibus Bill, H.R. 5. Funding of \$7.9 million was appropriated for the reestablishment of a Federal Office of Gifted and Talented, for grants for training and demonstration projects, for grants to state and local agencies, and for the establishment of a National Research Center.

Date obtained from DeLeon and Vandenbos (1985), Radcliffe (1987, 1988), and Tannenbaum (1983).

of special program or designated resources related to education of gifted students.

The major thrust for special programs underwritten by state education departments came largely on the heels of the Sputnik challenge of the late 1950s. Many states, seeing the U.S. falling behind in key technological areas, wished to strengthen the educational output of the U.S. and saw improving programs for gifted students as one vehicle to that goal. The major curriculum

reform efforts, largely stimulated by major projects funded by the National Science Foundation as well as the U.S. Office of Education, turned out to be an advantage for gifted students, since such projects placed an emphasis upon high level conceptualization and the learning of science by doing science (Bruner, 1960; Goodlad, 1964).

The involvement of the federal government in specific policy for gifted students was delayed for another

decade, primarily due to the general reluctance of the Congress to get involved in education, which had been seen as primarily a state responsibility. However, the overwhelming needs of economically disadvantaged students helped to propel federal action to aid education, which then also included children with handicaps as part of the total federal effort. These provisions led the way for subsequent legislation for other groups of school children.

As seen in Table 2, there have been a variety of federal efforts devoted to special concerns for gifted students, beginning in 1958 with the National Defence Education Act. Predominant among those initiatives have been the 1969 bill which called for a major study of the education of the gifted student in the U.S. and a report to Congress and spawned the Marland definition of gifted students, which has been copied by many of the states.

In 1973, an Office of Gifted and Talented was established in the U.S. Office of Education, and small sums of money were made available for research and demonstration projects. In 1983, the National Commission on Excellence in Education brought forth the noted report, *A Nation at Risk*, the alarming results of which spotlighted the need for programs of excellence, which indirectly aided programs for gifted students.

By far the most significant of the federal actions has been the passage of the Javits bill in 1987, which reestablished a federal office, provided grants for training and demonstration projects, and established a National Research Center on the Gifted. A major theme of this program was the discovery and stimulation of underserved and undiscovered gifted students. Meanwhile, the collective state investment in these program efforts now exceeds over \$250 million annually.

It seems clear that the concern for the economic viability of the country is fueling a gradually increased effort and support for state and federal responsibility for greater stimulation of excellence in our schools.

Future Research Directions

The earlier parts of this manuscript make it clear that there are many fruitful investigations that could be carried out which would help us understand the gifted child more thoroughly, experiment with differing educational techniques and settings, and understand the societal role that is being played with regard to education of these students. Horowitz and O'Brien (1985) developed a research agenda for the gifted which included three major areas of investigation.

Understanding Intellectual Processes

This would require investigations of knowledge acquisition, storage, and retrieval, as well as problem identifica-

tion and solution. Efforts to describe these information-processing mechanisms should extend across the lifespan.

Differentiating Social and Personality Characteristics

These would include investigations that could determine why some highly intelligent individuals lead concomitantly creative and productive lives, whereas others do not. Variables of socialization, motivation, energy, and personal perceptions appear to influence the degree to which intellectual gifts are fully realized. Again, it is important to look at such characteristics across substantial bites of time.

Assessing Educational Strategies for Gifted Students

It is important to determine what kinds of programs most benefit what kinds of gifted and talented children, so that our scarce educational resources can be better targeted. Programs should be supported to the degree that they give evidence that they make a real difference.

The newly established National Center for Research on Gifted and Talented will, undoubtedly, develop a research agenda of its own (Renzulli, 1991). The following represent areas of investigation of special interest to this author.

INFORMATION PROCESSING

One of the most potentially fruitful lines of investigation seems to be to continue and extend the various investigations on *information processing* in human beings, particularly children. There has been little written about the "executive function" or the control mechanisms by which we pay attention or how we choose between various cognitive strategies, or decide on our mode of intellectual expression (Borkowski & Kurtz, 1987). Decision-making is a poorly understood process, from an information processing standpoint, and one that could be studied fruitfully in young children, where it can be seen in a more observable process than in the complex network of forces affecting decision-making in adults.

One element of the executive function operation is the area of problem-finding, or of choosing the most significant problem to be attacked. This is an important act for researchers, but also for politicians, and artists, and parents! The right choice can lead to significant findings or products; the wrong choice can lead to months, or even years, of wasted effort. How does this process of decision making work, and how can it be enhanced? This is a key area of investigation.

FAMILY SUPPORT

We now have a significant body of investigations demonstrating the importance of family encouragement and support for the full development of the intellectual

capabilities of talented youngsters. One line of investigation would be how to provide support for families who are not now encouraging their talented youth, in the hopes that they would begin to play this role more assertively. Another line of investigation is whether other persons in the environment of the child (friends, relatives, teachers, etc.) can provide the type of support and encouragement necessary to promote full development of these talents, if the parents are, for some reason or other, unable to do it.

School Program

When attempts are made to evaluate the impact of a particular school environment, such as the resource room (Vaughn, Feldhusen, & Asher, 1991), or ability grouping, or a particular instructional method such as creative problem solving, the range and diversity of results is impressive. It is clear that resource rooms work well sometimes, and not at all well at others. The enrichment triad is a great success in some places and a disappointment in others. Merely placing youngsters in a particular setting, or providing them with a particular set of activities, does not necessarily lead to success. Therefore, it would seem most important to document, in some detail, what works.

If a resource room is doing an outstanding job by all accounts, then the particular way in which it is operating needs to be carefully analyzed and studied to understand the ingredients of this recipe for success. If an honors course in Philosophy is achieving visible and tangible success, then the nature of that total setting needs to be examined. Is it merely a creative teacher, or are there other elements in the situation that need to be recognized? By studying the staffing patterns, the history, the processes, the staff, and the students, it may be possible to emerge with some better idea of what the recipe for success is, within a given structure or program.

A second area of concern is the nature of the alternative curriculum for gifted students. Much of the curriculum that is presented to the gifted student goes beyond the regular program. This alternative curriculum is designed, currently, on an *ad hoc*, program by program, basis. Should there be a scope and sequence established for programs for gifted students? Should there be a set of specific curriculum goals for history, or language arts, or economics, for gifted students? Deliberate attempts to develop sophisticated curricula should be supported and encouraged, as a means for moving toward some more organized set of program activities and curriculum options for students at various educational levels.

Societal Interests

Many of the adaptation problems of gifted students and gifted adults come from the love/hate relationship that

such talent generates in the larger society. Socrates, Galileo, and many others, have demonstrated what happens to the talented person who runs astray of the larger society or power groups within the society.

It seems reasonable to suspect that envy and dislike have always been part of the price that the talented person pays for the expression of his/her talent. With Bach or Verdi, this was probably not terribly important, since they needed to please only a relatively few people in order to continue doing what they wanted to do.

In a democracy, where large numbers of people have a "say" in what happens, it becomes increasingly important to understand societal ebbs and flows in attitudes toward these students and adults. What are the dynamics of societal concerns and reservations about such individuals? Is it fear that gifted individuals will use their abilities to gain control over them? How can such feelings be counteracted?

These are some possible topics open for investigation. Funds have not always been available to address these issues seriously, and doctoral dissertations alone cannot be relied upon to answer some of the most complex of our educational problems.

Summing up

The last quarter of a century has seen a quantum leap in our understanding of the student who is labeled as "gifted or talented". Many myths have been dispelled. There has been an increased level of sophistication on the nature of high intelligence itself, as well as the educational methods that can enhance its development. As more becomes known about giftedness, there has been a greater emphasis on some of the subgroups with special needs, and that emphasis will certainly continue into the near future. One thing that clearly has not changed much has been the ambivalent societal view of how giftedness and gifted individuals should fit into a democratic society.

Gifted behavior may still be seen as an uncomfortable presence, as well as a great advantage. However, increasingly it can be seen that to deny its presence in youth is done at the nation's peril. America is neither so rich, nor so blessed with natural resources, that, as a nation, it can afford to ignore educationally the human potential that is embodied in the minds of our gifted students.

This generation will place its signature upon the poetry, the science, the art, and the business prosperity of the next generation, in large measure, by how enthusiastically is the response to the educational challenge of these students.

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Right to Education for the Gifted in Canada

LÉONARD J. GOGUEN

Université de Moncton, New Brunswick, Canada

Introduction

The purpose of this chapter is to describe the current status of the education of the gifted in Canada by focusing on its protection through the policies of provincial and territorial departments of education. A historical perspective will provide the background for a better understanding of the status of the educational rights of Canadian gifted and talented students. Following an analysis of departmental policies, concerns for future development will complete this chapter.

Historical Perspective

Canada has a population of more than 26 million people scattered over a vast territory of close to 10 million square kilometers. In addition to matters under federal jurisdiction, various programs and services are delivered by ten provincial and two territorial governments. Since Confederation in 1867, over 125 years ago, education has been defined in the British North America Act as an area of provincial authority. To present the status of the educational rights of the Canadian gifted and talented learners it is therefore important to look at provincial and territorial policies. Early in this century, developments in the field of gifted education emerged at the provincial level.

Early Developments in Education for the Gifted

Two provinces, one in central Canada, Ontario, and a western province, Saskatchewan, showed an early interest in programs for gifted learners.

As early as 1914, in the province of Ontario, a definition of giftedness could be found in special education administrative policies. Three years later, in 1917, the Auxiliary Class Act of the Ontario Legislature recognized special (or auxiliary) classes for above-average students among other exceptionalities (Smyth, 1984).

One of the earliest reported programs for gifted learners in North America was in the province of Saskatchewan. In 1932, Dr Samuel Laycock, an advocate for the gifted learners needs' and professor at the

University of Saskatchewan, offered a special program for the gifted in Saskatoon (Hengen, 1984). Both of these early developments were based on the belief that gifted learners had specific educational needs requiring special resources not available in the regular classroom environment, thus creating a need for special classes or programs.

Impact of the Charter of Rights and Freedoms

In spite of a tradition of decentralization in the field of education in Canada, policy development is not immune to federal jurisdiction. The 1982 Constitution Act, known as the Charter of Rights and Freedoms, had an impact on provincial legislation through its guarantee of an appropriate and fair education for all children. According to the Constitution Act,

Every individual is equal before and under the law, and has the right to the equal protection and equal benefit of the law without discrimination . . . (Section 15).

This Act has been interpreted as the new yardstick and as binding on schools (MacKay, 1986; Poirier, Goguen, & Leslie, 1988). In addition to its impact in court decisions related to the equal right of exceptional children to education, the Charter fostered the development of policies to assure appropriate education to all children and prompted provincial and territorial jurisdictions to revise educational laws and regulations.

Educational Rights of Exceptional Children

Over the last twenty-five years, the status of provisions for exceptional children has shifted from an expressed need to a welfare right. In addition to the Charter of Rights and Freedoms of 1982, other major external and internal influences helped the provinces and territories of Canada focus on the rights of exceptional children.

The declarations and promulgations of the United Nations, of which Canada was a member, gave credibility to the rights issue. Even if these agreements

are not legally binding on Canada, they nevertheless confer a moral obligation. Among the United Nations declarations, three made people aware of the causes of children: the International Declaration of the Rights of the Child (1959), the International Covenant on Economic, Social and Cultural Rights (1966), and the Declaration of the Rights of the Mentally Retarded (1971). The proclamations of the International Year of the Child of 1979 and of the Disabled in 1981 also contributed to the increased sensitivity to children's rights.

Another important external influence that contributed to the growing awareness of the needs of exceptional children has been the proclamation of the United States Public Law 94-142, the Education of All Handicapped Children Act in 1975.

Even if United States legislation had no binding effect on Canadian legislatures or court actions, the United States mandatory law of 1975 became the major thrust in regard to the rights of exceptional children in North America. This law prescribed appropriate education in the least restrictive environment with parents' involvement in the design of individualized educational programs. In conferences and publications, Canadians were informed by their southern neighbors of the focus on the rights provided by their new law.

Since 1969 all of the provinces and territories of Canada have developed major policies to guarantee the provision of education to all children, including exceptional children. All the provinces have enacted legislation guaranteeing education to exceptional children (Goguen & Poirier, 1991).

Giftedness as an Area of Exceptionality in the Provinces

In three Canadian provinces, Ontario, Alberta, and Saskatchewan, both legislation and major department policies provide guidelines for education to the gifted. In Ontario and Alberta, giftedness is explicitly identified as one of the particularities or exceptionalities accepted for the designation of the exceptional pupil. At this point, the reader might already have noticed that two of the three provinces with specific legislation on education for the gifted, namely Ontario and Saskatchewan, are the ones in which early developments in gifted education go back more than six decades. An analysis of the legislation and departmental guidelines in terms of its specificity concerning education for the gifted may provide clarifications as to the educational rights of the gifted in Canada.

PROVINCE OF ONTARIO

The province of Ontario has a history of providing services, including enrichment and special classes, to the gifted and talented, especially in the urban areas. Through its various publications, the Ontario Ministry

of Education (1978, 1985) provided curriculum ideas and guidelines for the planning of special educational programs within a framework of affective and cognitive development.

In its major revision of the education act in 1980, known as "Bill 82", the government of Ontario made school boards responsible for providing programs and services that meet the needs of the exceptional pupil:

"Exceptional pupil" means a pupil with behavioural, communicational, intellectual, physical or multiple exceptionalities who is identified in accordance with the regulations as in need of placement in a special education program (Ontario Education Act, 1980, 1991, S.1, 1, 21).

The Ontario Education Act requires school boards to provide programs and services to exceptional pupils and also defines giftedness in its legislation. In addition to free and universal access by all exceptional pupils to appropriate education programs, programs must include specific objectives and services to meet the needs. Ongoing identification, continuous assessment, review, and appeal procedures are also prescribed.

In Ontario, giftedness is defined as:

an unusually advanced degree of general intellectual ability that requires differentiated learning experiences of a depth and breadth beyond those normally provided in the regular school program to satisfy the level of educational potential indicated (Ontario Ministry of Education, 1985.)

The definition of gifted children in the mandatory law appears more restrictive than a previous one published. Whereas the 1978 definition of gifted specified esthetic, kinesthetic and psycho-social as well as intellectual talents, the 1985 guidelines focus on an "unusually advanced degree of general ability" (Ontario Ministry of Education, 1978, 1985.)

PROVINCE OF ALBERTA

The second province where the educational rights of gifted students are protected in its School Act (1988) is the province of Alberta. Exceptional children are defined as any student educationally disabled, gifted or talented. School boards are required to provide programs to meet the educational needs of the gifted and talented. The funding formula specifically includes programs to meet the needs of the gifted and talented. A gifted or talented student is

one who by virtue of outstanding ability is capable of exceptional performance, and who therefore requires special programs beyond the regular school program to realize his/her contribution to self and society (Alberta Department of Education, 1985).

The above definition was adopted in Alberta, following a 1983 Report of the Minister's Task Force on

Gifted and Talented Pupils commissioned by Alberta Education. A second part to the definition specified that:

Children capable of exceptional performance include those with demonstrated achievement and/or potential ability in one or several areas:

- (1) general intellectual ability
- (2) specific academic aptitude
- (3) creative or productive thinking
- (4) visual and performing arts.

In the 1986 Resource Manual for Teachers, Alberta Education adds two areas to the definition: leadership ability and psychomotor ability (Alberta Department of Education, 1986).

Of special interest to policy planners, Alberta Education has devised an inservice package for teachers based on their manual (Alberta Department of Education, 1987). Put together by a team of educators under the direction of an Alberta Education Provincial Coordinator for the gifted, a model incorporating key teaching areas with enrichment and gifted education was developed. In a framework of activities ranging from enrichment for all students to gifted education for gifted and talented learners, nine key teaching areas were identified: personal growth, creativity, critical thinking, communication, forecasting/planning, decision-making, computer skills, leadership and organization, and independent study.

PROVINCE OF SASKATCHEWAN

Since a 1971 legislative revision in the province of Saskatchewan, every person between the ages of six and 21 has the right to attend school and to follow an appropriate education program at no cost to parent or guardian.

Appropriate education program is designed to develop the potential of the individual . . . it is arrived through a process of comprehensive assessment, planning and consultation with educators, parents and pupils . . . results in a personal program plan . . . (Saskatchewan Education, 1989).

The Saskatchewan Education Act (1978) has been interpreted as being among the first Canadian mandatory laws (as opposed to permissive) obliging school boards to provide programs and services to exceptional children. Whereas the obligation appears explicit for all exceptional children, it is not guaranteed for the gifted.

A specific section of the Act states that in the case of pupils of superior natural ability or exceptional talent, school divisions may provide:

Where the ordinary programs of instruction of the school are considered by the board of education to be insufficient to meet the educational needs of certain pupils of superior natural ability or exceptional talent, the board may make provision for such special

programs as it considers feasible and appropriate (Saskatchewan Education Act, 1978, S. 185).

A review of the Special Education Policy Manual of 1989 shows that six pages deals with the services delivered in the "Educating Gifted Learners" section. Aside from the definition, other policy issues are defined: identification procedures, service delivery with various options, personnel qualifications, review process, allocated responsibility to school jurisdictions and teachers as well as the provision of support services by Saskatchewan Education and the Education Development Fund. The specified areas of responsibilities of the Department of Education, the School Division and the direct classroom level may be of special interest to the reader. The Department offers professional development, program planning and support for the administrators, whereas the School Division professional support staff, through consultative collaborative services with catalyst teachers, resource centre specialists, itinerant or direct support, provide program support and participate in identification and selection at the school-based classroom program level.

In regard to funding, gifted learners are not identified as a category for designated pupil funding as are the chronic health impaired, hearing impaired, multiple disabled, orthopedically disabled, trainable mentally retarded or visually impaired. Neither are the gifted learners identified as a category under Established Program Funding, as are the learning disabled, the socially, emotionally (behaviourally) disabled, and the low cost disabled.

In fact, there is nothing in the law nor in the definition of exceptional pupils (defined for funding purposes) to indicate that gifted learners are recognized as exceptional pupils in Saskatchewan. Funds to support gifted learner education are provided through the general school division budget. According to the Special Education Policy Manual (Saskatchewan Education, 1989, p. 75), since 1985 gifted learner programs have been identified as a special target area of the Education Development Fund. The Education Development Fund is designed to finance new initiatives for educational improvements.

A 1981 policy statement on the education of gifted students in the province of Saskatchewan defines giftedness as:

a characteristic of students who have demonstrated high performance or who show potential in at least one of the following areas: specific academic aptitude, reasoning and divergent thinking, visual or performing arts, psychomotor ability (Saskatchewan Education, 1981).

In its Special Education Policy Manual of 1989, Saskatchewan Education revised the provincial definition of giftedness to reflect practices by eliminating "at least", changing "reasoning and divergent thinking" to "advance thinking ability" and adding a fifth area

of giftedness: "psychosocial and cultural leadership ability".

This definition, like Marland's (1972) definition in the United States of America, may be interpreted as including a wider parameter of gifted and talented students than one which focuses only on intellectual exceptionalism such as the Ontario definition. However, the Ontario school boards are mandated to provide services to the gifted whereas the Saskatchewan boards are allowed to serve a potentially larger population.

While the province of Ontario went from a wider range of giftedness areas to a more restrictive one with the passage of the mandatory law requiring school boards to provide for gifted learners, the Saskatchewan definition was recently expanded. Further study could identify the number of gifted learners receiving special services in the two provinces to further clarify the impact of this tendency.

Whereas three provinces include programs and services for the gifted and talented as special educational provisions for exceptional learners in their educational legislation, some of the other seven provinces and the two territories have legislative provisions for the education of exceptional pupils or claim to have a noncategorical perspective ensuring proper education to meet the needs of all learners, but they do not explicitly name gifted learners in their education acts.

Legislative or Departmental Policies on the Education of the Gifted

Apart from the three provinces with legislation on the education of gifted, six other provinces have issued departmental statements in this area. This brings the total number of provinces with departmental policies on gifted learners to nine, since the provinces with legislative policies also have departmental policies.

Table 1 identifies the status of policies on gifted education in each of the provinces and territories of Canada, whether these are in the Education Act, in departmental policies or guidelines or they have

no specific policies on the gifted. The ten provinces are listed in order from the eastern-most province in Canada, the province of Newfoundland, to the one furthest west, the province of British Columbia. The provinces are followed by the two northern territories of Canada, the Northwest Territories and the Yukon. The six provinces and the territory with departmental policies are Newfoundland, Nova Scotia, New Brunswick, Quebec, Manitoba, British Columbia, and Northwest Territories. The eastern province of Prince Edward Island as well as the two territories have no legislative nor departmental specific policies relating to gifted. However, departmental officials reported a practice of early admission to the University of Prince Edward Island and enrichment courses in senior high schools.

An analysis of the departmental policy statements will further clarify the programs and services provided.

Departmental Policies Without Explicit Legislative Provisions Concerning the Gifted

While the legislative thrust in the field of the education of the gifted has brought detailed departmental level action and policies in the three provinces studied above, in this section we will analyse provisions in provinces with administrative policies at the departmental level but no legislative provisions. These departmental policies are classified as minimal or moderate depending on their level of guarantee and degree of comprehensiveness.

Minimal Departmental Policies

A review of policies on the gifted indicates that four of the five eastern provinces and one territory have minimal policies on the education of the gifted: Newfoundland, Nova Scotia, New Brunswick, Quebec, and Northwest Territories.

The departments of education of both the province of Newfoundland and the Northwest Territories have

TABLE 1
Provincial and Territorial Legislative and departmental level provisions on the education of gifted learners

Provisions	Provinces or territories											
	Nfld	NS	PEI	NB	QUE	ONT	MAN	SASK	AL	BC	NWT	YUK
Legislative						X		X	X			
Departmental	X	X		X	X	X	X	X	X	X	X	
No policy			X									X

Nfld = Newfoundland
NS = Nova Scotia
PEI = Prince Edward Island
NB = New Brunswick
QUE = Quebec
ONT = Ontario

MAN = Manitoba
SASK = Saskatchewan
AL = Alberta
BC = British Columbia
NWT = Northwest Territories
YUK = Yukon

guidelines on special education that include the gifted as special needs students (Northwest Territories) or exceptional students (Newfoundland).

In the province of Newfoundland, the most recent edition of the Special Education Policy Manual (Newfoundland Department of Education, 1992) defines an exceptional student as a person whose behavioural communicative, intellectual abilities, . . . require a special education program. In this 1992 edition of the policy manual, it is further added that exceptional refers to both disabled and gifted students. The manual describes responsibilities for identifying, screening, and development of individual program plans and advocates fairness in procedures involving students with exceptionalities, but no further guidelines are given on the education of the gifted. Nonetheless, this recent edition appears promising.

Although the gifted are not included as exceptional pupils in Nova Scotia's administrative policies, one of the three major goals in teaching children and youth is to develop skills that can help them to achieve their full potential mentally, physically, and socially. Furthermore, in their goals and policies in public school programs, a one-paragraph section on gifted/talented students states that:

Administrators should make every reasonable effort to ensure that individual students who display superior academic, musical, artistic, linguistic, or physical abilities are given the opportunity to develop these abilities. Special classes are not usually necessary nor in most cases practical, but personalized individual programs are both encouraged and supported (Nova Scotia Department of Education, 1988, p. 13).

In spite of the lack of guarantees for gifted learners, the policy allows the provision of advanced programs in mathematics and science. Special classes are not considered to be the needed nor practical option.

Enrichment as the Privileged Option

An examination of two departmental policies, one in Quebec, a French-speaking province, and one in New Brunswick, a French-English bilingual province, can clarify another form of guideline.

Rather than having a limited number of statements on the education of gifted and talented students in the administrative policies on special education or as part of the general educational policies, Quebec and the francophone section of the New Brunswick Department of Education published specific documents on giftedness.

The 1985 Ministère de l'Éducation du Québec document presents eight specific guiding principles, ranging from the need to identify, to provide programs and personalized teaching methods and to assure the

involvement of parents and the community. In terms of programs, enrichment activities within regular schooling are presented as the privileged option.

In New Brunswick, the francophone division of the Education Department presented its special document on *La douance* (Giftedness) in 1989. A brief historical perspective will situate the document.

The trend towards integration of exceptional children within the regular mainstream in the least restrictive environment has been one of the major thrusts of the 80s in Canada. In New Brunswick, the placement of exceptional children in the regular classroom had been contained in legislation and policies since 1986. A major amendment to the School Act stipulated in Section 20 that:

A school board shall place exceptional pupils such that they receive special education programs and services in circumstances where exceptional pupils can participate with pupils who are not exceptional pupils within regular classroom settings to the extent that is considered practical by the School Board, having due regard for the educational needs of all pupils.

Following this legislative change, policy statements on integration in 1987 and 1988 gave a high profile to the mainstreaming issue in discussions with parent groups, teachers' unions, and School Board officials. The definition of exceptional children, however similar to the ones in Ontario and Alberta, was not explicitly inclusive of the gifted and talented. The focus was on professional development and the organization of recently integrated handicapped in the regular classroom.

It is within this integration movement that the document "*La douance*" came out in 1989 with its general principles, definitions, identification, teacher training needs, and description of programs to be offered.

Like the Quebec document, the guidelines focus on enrichment within the regular classroom as the privileged option. Consequently, homogeneous grouping according to strength at the high school level has been discouraged without evidence of appropriate replacement.

The absence of resources (human and financial) and programs to ensure that the needs of the gifted are met in both Quebec and New Brunswick leads us to interpret these documents as minimal departmental policies.

Moderate Departmental Policies

Two provinces in Canada have a noncategorical perspective on the provision of programs and services to exceptional pupils or gifted learners, Manitoba and British Columbia.

It is the policy of Manitoba Education and Training to provide for all children in Manitoba access to learning opportunities which are commensurate with

their needs and abilities (Manitoba Education, 1989, 1992).

Both the 1989 *Sourcebook for gifted education and Gifted education—A parent's guide*, clearly state that gifted learners, like all students, have a right to an instructional program to meet their current individual needs. Basic information is given to parents within a comprehensive spectrum of program options which the school division might offer. The provincial leadership and the comprehensiveness of the definition and the program options lead us to qualify the documents as moderate departmental policies on the gifted.

Following the Report of the Sullivan Royal Commission on Education: A Legacy for Learners, published in 1988, the province of British Columbia made a major revision of the School Act (1989) and established policies and program foundations providing a mission statement for all learners:

The purpose of the British Columbia school system is to enable learners to develop their individual potential and to acquire the knowledge, skills and attitudes needed to contribute to a healthy society and a prosperous and sustainable economy (British Columbia Ministry of Education, 1991, p. 9).

Its philosophy recognizes that every child is unique and that proper assessment will enable children with special needs to receive the necessary modifications and enhancement within the general education framework. The focus is on the child, to allow learning through active participation in a noncategorical framework in partnership with parents and the community. This new approach to educational services to all learners, when implemented, might qualify as a major departmental policy on the gifted without categorizing these active learners and still providing the proper stimulating environment to foster maximum development of potential.

A Vision of the Future

The development of policies and programs in the provinces and territories of Canada varies greatly. While policies are not essential to the existence of programs for gifted learners in the classroom, the provinces which have legislation-based major departmental policies appear to offer programs tailored to the educational needs of the gifted and talented. Policies constitute the rules and regulations by which scarce dollars are distributed. Gallagher (1988) claims that policies are needed when something requires collective action.

Education of the gifted in Canada has shown signs of advancement over the last decade, but there is a danger that any such major thrust might become a panacea, in which case there is a risk that the needs of the individual would not be met.

With focus on excellence and efficiency as the year 2000 approaches, some of the main orientations appear to be:

- (1) Enrichment as a privileged option in a postintegration era.
- (2) Noncategorical care to enable all children to develop to their maximum potential.
- (3) Innovation and partnership to collaboration by regular and special education, parents, the teacher, the community and the learner.
- (4) Education is becoming special for all learners.
- (5) Cooperative learning for all.

To monitor the impact of these changes in policies and practices on the education of the gifted, ongoing research will be needed as well as a sense of advocacy on behalf of educators and parents. The major safeguard for the protection of the rights of gifted education is in the hands of the advocates. The historical development of policies for the establishment of the rights and protection of resources and procedures to guaranteeing services to the gifted in some Canadian provinces and territories has not come about without the involvement of various advocacy groups. Groups active on behalf of exceptional children and of gifted and talented students have been the Canadian Council for Exceptional Children with its Canada-wide and provincial TAG (The Association for Gifted) Divisions, the ABC (Association for Bright Children) and other provincial groups related to, or independent from, teachers' unions. Advocates can make sure that action on behalf of excellence does not become a panacea.

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Programs and Practices for Identifying and Nurturing Giftedness and Talent in Europe

KLAUS K. URBAN

University of Hannover, Germany

ANDRZEJ SEKOWSKI

M. Curie-Sklodowska University, Lublin, Poland

Introduction

The philosophy and the practices used for identifying and nurturing the gifted and talented always reflects the political, societal, economic, ideological, historical, cultural, and social framework and values of the environment within which the (potentially) gifted and talented grow up. Considering the many different geographical, ethnic, economic, cultural, and political facets of Europe it is difficult to give a general and comprehensive overview of research on and education of the gifted in Europe.

The label “Europe” does not in any way encompass a comparable or homogeneous status of education for the gifted in the various European countries. Each country has its own historical development as far as the education of the gifted/talented is concerned as well as its special recent status and development—or, as in several cases, its nonexistence. Nevertheless it might still be possible to form clusters of similar and comparable situations and trends.

Gifted education is a field of political and educational interest with a long history in mankind. But, in spite of the very old, humane and educational idea to foster various kinds of high potential, it is interesting to recognize that the actual status of gifted education in a given country is much more dependent on the dominating ideological and party-political ideas than on pedagogical and educational needs or on historical facts and achievements in education and research. The existence and amount of research on giftedness and related questions then seems to be closely related to the existence, amount, and variety of provisions for “more able,” “gifted,” or “talented” youngsters.

Historical Review

In Europe the idea to foster excellence can be found as far back as the Romans (Ovid, for example) and

the Greeks. Plato stated in “The State,” that it is part of the duties of society “to force all the best natures” to learn everything which might provide the best services and profit to society. His concrete proposal for selecting the gifted was: “We shall observe the gifted from very early on and let them do activities in which they probably will forget a lot or will be mistaken; those who will remember and will not become deceived, shall be selected and those who fail shall be rejected. This is the way.” Plato was convinced that the survival of the Greek democracy was dependent on the education of those excellent citizens who were going to work in leading positions. For centuries the idea that nurturing gifts and talents might be highly desirable from a social and societal point of view was maintained. In the sixteenth century, Suleiman the Great undertook intensive efforts to identify gifted adolescents in his Turkish empire. He established special educational instruction for them in Muslim religion, in fighting, in the arts, in natural sciences and in philosophy. His talent searchers, investigating the population at regular intervals, were successful in selecting and educating a large group of excellent individuals for the benefit of the Ottoman empire.

Probably the last true genius was Leonardo da Vinci who, in a universal way, in a wide variety of cultural and scientific domains, was far ahead of his contemporaries. For a contemporary man or woman it is absolutely impossible to have the whole cosmos of the historically accumulated knowledge at his or her disposal in a comparable way and at the same time be creative in both the sciences and the arts at such a high level.

Even though this article, as well as this handbook, does not deal with “geniuses,” one should recognize that some of the existing misconceptions of, and prejudices towards, the gifted and talented have their roots in studies and books about the personality of geniuses which were relatively popular during the end of the previous and the beginning of this century (Urban, 1991). In

particular, the notion that there is a relationship between giftedness and behavioral disorders or insanity persists up to the present, as popular assumptions and in sayings such as "Early ripe, early rot". This kind of myth has its origin in traditions and in descriptions of geniuses or in biographical research on the personality and career of people having been seen as geniuses, especially by Lombroso (1864), Ellis (1927), Lange-Eichbaum (1927, 1967), and Kretschmer (1931).

According to Cremerius (1971) a period of the devaluation of the genius in Europe started with Moreau's (1859) work defining the genius trait causally as a pathologic symptom of an increased irritability of the nervous system. By coupling the terms genius and insanity ("folia") Lombroso (1887) popularized this approach which then became programmatic for the following decades. Within psychiatry a special field of research arose which developed the biography to the patho-biography, trying "to diagnose scientifically the kind of mental disease" of/for all people who at least approximately could be seen as geniuses (Cremerius, 1971, p. 8). This development culminated in the broad and comprehensive work of Lange-Eichbaum (1927). In addition, he brought the sociological notion of fame/glory ("Ruhm") into the theory and considered being famous as a foundation and presupposition for the effectiveness of the genius. He did not see "insanity" as necessarily and generally synonymous with mental disturbance; instead, he formed the "value concept of the bio-negative" which includes everything unfavorably abnormal with respect to the function of living, i.e., "all biologically unfavourable dynamics" (Kurth, 1961, p. 96). The genius's "prickle of the bio-negative" becomes the origin, source, and impulsion of creating and of extraordinary achievement. This voluminous work and the kind of research it represents, which has been continued by a student of Lange-Eichbaum (Kurth, 1961), is evaluated by Cremerius as a "monumental emptiness" (1971, p. 9). "Nevertheless, such approaches and interpretations, even if they may not be defendable from a scientific point of view, have their long-term effects" (Urban, 1991, p. 14) up to today.

At the beginning of this century, other representatives of psychoanalysis worked on the problem of the genius under the motto "from patho-biography to psycho-biography". They tried to "humanize" the mystic entity and to bring back the "exterritorialized genius into the area of human being and presence, . . . to free the genius from his/her alienage and strangeness causing anxiety, fear and defense" (Cremerius, 1971, p. 9). According to psychoanalytic approaches everybody has to achieve in displacements during development and these are more or less successful; this is also true for the genius. The idea of a relationship between genius and abnormal power, or weakness of drive, or successful or unsuccessful defense, was denied by Freud. For him there are genius-like men with average, nondeviant behavior; but, there are others who are highly mentally disturbed. Such people may also demonstrate high achievement in spite of their neurotic

or even psychotic personality structure (i.e., by means of the non-pathological portion of their personality) or even because of the disturbed personality structure (Cremerius, 1971, pp. 16–17).

One important stimulus for Terman to start his historic and monumental, empirical long-term study of 1500 Californian children in 1921 was to refute the myth of a close relationship between genius and psychic abnormality, i.e., this so-called divergence hypothesis. One often finds the statement that the history of modern scientific and educational research on the gifted began with Terman's longitudinal study. However, even if one does not consider the pioneering work of Francis Galton in the second half of the nineteenth century, there were already very important precedents in research and educational provisions for giftedness in various parts of Europe at the beginning of this century.

Binet, together with his colleague Simon in France, devised the first intelligence scale which was later adapted by Terman for use in his long-term investigation. Though designed for a better identification of slow learners, Binet realized that his test could also be used for identifying gifted children. As early as 1909 he proposed the establishment of special classes for the gifted, although with no practical effect in France for the next 75 years (Terrassier, 1992).

First publications on the nature and nurture of giftedness are reported for Yugoslavia as early as 1910 (Maksić, 1992), for Romania in 1915 (Sekowski, 1992), for Czechoslovakia since the thirties (Dockal *et al.*, 1989), for Spain around 1936 in Barcelona (Cruz & Truño, 1992). In Poland a private school for the gifted was opened before World War II. In The Netherlands, academic interest in the gifted began with the famous Hungarian-born psychologist Révész in 1921. In contrast to other countries, a small but continuing sequence of research and publications can be found in The Netherlands since then. Mönks (1992) and Span (1992) provide interesting insights into that development, citing researchers like Waterink, Duminy, De Groot, Duijker, Ijzerman and others.

In Germany, Feger (1986) has given a comprehensive overview of early academic contributions to the field, for example by the famous psychologists William Stern, who introduced the intelligence quotient and is considered to be the founder of differential psychology (1911), or Meumann (1914) with his proposals for an "experimental pedagogy." In addition to progress in theory and research, several practical approaches and projects are reported; for example, the Berlin selection and placement program by Moede, Piorkowski, and Wolff (1918) or parts of the "Mannheim school system" (Sickinger, 1904), the establishment of special classes in Leipzig in 1920 (Cropley, McLeod, & Dehn, 1988). Such projects usually received strong and effective cooperation among all participants, including psychologists, educationists, teachers, administrators, and parents (Feger, 1986). The influential educationist and philosopher Spranger (1917) maintained a distance from the psychological

techniques of his time; he proposed the establishment of scholarships. The first and still working, institution of this kind was the "Studies Foundation of German People" established in 1925 supporting academically highly gifted university students regardless of their origin and economic background.

In spite of these early educational and research endeavors one can find only very few more or less direct links between that period and current activities. This has not in the least been caused by the interruption of academic activities and emigration during the time of the Nazi regime and World War II, not only in Germany, but in most other Western European countries as well. More recent academic activity has mostly been stimulated and influenced by American literature and practices (Urban, 1982, 1984).

The Current Situation in Various European Regions and Countries

In 1988 Freeman and Span characterized the European situation as follows:

European differences in approach towards concern for the highly able are mostly of ideological origin and tend to cluster in the East and West of the continent. Socialist countries in the East are more likely to place emphasis on the manifest value to society of high abilities, such as sport and the products of creativity. In Western capitalist countries, the colder regions such as Scandinavia, are still somewhat loathe to make special provision for the highly able and the warmer regions, such as Italy and Greece are just now in the process of getting interested people together. It is in the more temperate regions like Germany, The Netherlands and Britain, that research and provision are moving ahead, notably with concern for cognitive development and curriculum provision, as well as several longitudinal studies (p. 1).

With the exception of the dramatically changed political situation in the formerly socialist countries, this very short and highly generalizing description is more or less still valid.

Eastern European Countries

For political, economic, and ideological reasons, the first differentiation mentioned above, between Western and Eastern countries, could be made. In the systems of the Eastern countries education had to assist in shaping the society according to the ruling unitary (party-)ideology. The many different open or hidden provisions for the gifted/talented played an important role in the international competition between the economic and political systems (Urban, 1984). Generally, talent areas particularly effective with respect to publicity were more

obviously favored, but other content areas were also emphasized in a different manner.

The rapidly changing political and social situation in Eastern Europe is resulting in alterations to educational systems at all levels of teaching and in all age groups. The direction of these changes corresponds with new educational aims being adopted in democratic countries. A situation in which the systems and forms of education are subject to the needs of the individual is becoming increasingly common and is replacing the previously subordinate position of the individual in relation to the State and its political system. Since the changes have taken place only recently and their consequences are still in progress, reports about the new situation are rare and preliminary in character; see Alikperov (1992) for Azerbaijan; Burjan (1992), Dockal et al. (1992) and Hrabinska (1992) for CSFR; Cretu (1992) for Romania; Maksić (1992) and Sefer (1992) for (former) Yugoslavia; Sekowski (1992) for Poland.

SCHOOLING AND THE GIFTED UNDER FORMER COMMUNIST GOVERNMENTS

Under the former totalitarian system in Eastern Europe the ideological aims of education were particularly stressed. The conception of education and the forms it took in practice were expected to serve these aims. Privately owned schools were practically nonexistent: the state secured for itself full control over the syllabus, the course of education and upbringing of the youth. It is hard to say in which Eastern European countries this political indoctrination took a more severe form and in which it was less drastic; still, such differences did exist. Political pressure on the educational system was particularly strong in the periods following national and liberationist outbreaks, e.g., in Hungary after 1956, in Czechoslovakia after 1968 and in Poland after 1981 under martial law.

The Marxist theory of development eliminated the significance of innate, genetically conditioned factors. Consequently, it considered pedology a reactionary science which aimed at exposing the significance of and giving power to the wealthy classes, i.e., the exploiters whose children demonstrated high IQ and higher education levels. Stimulating the progress of those children as well as the development of giftedness were regarded as a class struggle hostile to the socialist system: the workers' and peasants' state. It was these two groups which, owing to the spread of cost-free learning and the dominant influence of cost-free purposeful education, were to be granted the possibility of reaching distinguished results and outstanding levels of intellectual development. The education of these children was made generally accessible and identical for all.

Thus, the individualization of teaching according to pupils' abilities and the creation of intellectual elites with specially designed forms of instruction, were all excluded on principle. Such activities would have been considered contradictory to the principle of people's equality. The

issues connected with gifted people received little official attention of the educational authorities. Their attitude towards these problems was marked by a great deal of reserve.

The situation in artistic and sports education seemed to be slightly different. The artistic field, to a larger extent than any other branch of knowledge, evaded the control of communist authorities. Artistic educators enjoyed more freedom but still had to overcome a number of incomprehensible difficulties. Sport, on the other hand, very often performed a propagandist function in support of the communist state. Therefore, great importance was attached to educating sportsmen who could secure international propagandist profits for the state through record-breaking athletic performances.

Lack of differentiation between schools, lack of privately owned schools, extreme unification of educational syllabuses—all these factors unfavorably affected the evolution of the system of educating gifted people. The youth could sense very well the atmosphere that impaired the unrestricted development and realization of creative abilities; in fact, outstanding abilities and achievements were often perceived negatively.

The major hindrance to the development of giftedness and high achievement was a difficulty in getting in touch with the educational theory and practice adhered to in Western European and other democratic countries and in making contacts with specialists and appropriate institutions in gifted people's education. Thus the system of educating the gifted could not develop well and many programs remained unrealized through the lack of such contacts. The communist authorities were particularly apprehensive of the influence of liberal thought imported from democratic countries upon young people's attitudes to life and work. The belief that some degree of independence could be achieved only in the artistic and academic field was very popular.

IDENTIFICATION, TESTS, AND PLACEMENT

In Eastern European countries subordinated to the USSR, the application of psychological tests had been strictly forbidden for many years, since tests were regarded as instruments of class discrimination. The origin of intelligence tests alone, mostly constructed in Western Europe or in the United States, was sufficient to brand them as inadequate. The tests were officially not used to qualify students, but in Poland, Czechoslovakia, and Hungary work on the normalization of psychological tests was being done and they were used in educational and vocational guidance. Besides the well-known intelligence tests, e.g., Wechsler Scale, Raven's Test, and others, new techniques which fulfilled the conditions of psychometric correctness were developed.

At present, the psychological identification of students takes place mainly in psychological counseling institutions when parents or teachers notice outstanding abilities or a learning aptitude in a given student. The role of the psychologist then is to give advice on the construction

of individual education programs for these students. The classic psychological criterion (intelligence tests results) is complemented by the psychopedagogical criterion, i.e., the student's achievements. The achievements are measured against results obtained at national and international competitions in mathematics, arts, and humanities and with school marks.

Gifted people can follow an individual course of study. Sometimes such students simultaneously cover the syllabus of two forms and, in this way, accelerate the process of their own education. At present, owing to the socio-political transformations in Eastern European countries, special forms are organized at secondary school level, e.g., mathematical-physical, or foreign language-humanities, following a broadened syllabus. The students can also engage in individually designed educational courses and follow individual syllabuses. In some schools, classes run by eminent academic specialists in a given field are organized and classes held at universities as well as at respected research institutions are arranged. At the academic level, the education of gifted students is more systematic; here, too, students can follow individually designed syllabuses. The best can undertake research and work together with the professional academics while still studying.

ACTIVITIES OF THE POLISH CHILDREN'S FUND

Since the role of the state in education is now much less dominant, there is more room, necessity and responsibility for private and out-of-school activities. One of the most attractive organizational forms for the promotion of gifted people in Poland are the initiatives undertaken by the Polish Children's Fund in Warsaw. The Fund has been dealing with the organization of assistance to disabled children. During the past few years it has also been undertaking initiatives aimed at helping gifted children. The need to create the optimum conditions of development for these children is becoming more and more evident. Gifted children are aided with scholarships, which not only improve their economic conditions but also create the opportunity for these children to make contact with eminent representatives of different fields of science and with scholars, artists and authors. While still attending elementary or secondary schools, they can participate in higher academic classes and may sometimes start their academic studies before they complete their secondary education, by following an individual program.

The activities of the Fund, including camps, are particularly important for students coming from small centers, towns, and villages, since the possibilities for them to reach the most valuable sources of knowledge and research are quite limited. The guiding idea of organizing help for these gifted children is to include them in the general educational schedule. They are not separated from their own social environment, but their development is being stimulated through material and thematic influence. It seems that the problems of

development of the children coming from rural or small town communities are characteristic of the countries written about in this chapter.

Apart from the Polish Children's Fund, other foundations aimed at helping gifted children are also being established. In keeping with current trends, not only professionalism but also initiative and enterprise of the organizers are valued. Moreover, the issue of reforming the educational system is being increasingly raised by both parents and teachers, since the existing system sometimes deviates from the real needs and capabilities of gifted persons. Education should be individualized and aim at stimulating independent intellectual work and original artistic activity.

PROVISIONS FOR SPECIAL TALENTS

Artistic schools have been particularly successful in educating gifted children and youth in Poland. It is the field in which the effects of pedagogical influence, to which extensive psychological research contributed a great deal, are probably most clearly seen. The system of educating musically gifted children allows for a relatively early and correct qualification of gifted persons for musical schools. Musical giftedness develops relatively early and improves mainly as a result of individual contact between a teacher and student. Children are admitted to a musical school at age seven, after a selection examination which includes both a test for musical giftedness and a psychological test for school maturity. The examination is often preceded by a few-days class held by the teachers of musical schools. Children admitted to such schools begin their music lessons and follow a general education program identical with that in standard schools.

The process of musical education is divided into two stages. The first six years of learning constitute the first grade musical school. The next six years in the second-grade musical schools aim at educating professional musicians. The general education program is slightly reduced; nevertheless, the graduates of this type of school, have the right to apply for admission to academic studies in other fields. Students of the second-grade school participate in many auditions and competitions where they can compare and test their skills with those of their contemporaries from other countries. It is interesting and characteristic of the Polish musical educational system that the general intellectual development as well as the development of students' personality is strongly stressed. In the present situation, new in both economic and political aspects, the goals of the educational system are becoming more pragmatic and the requirements for the students of musical schools will concentrate more on the musical aspect than on general development.

The system of educating artistically gifted persons is also based on two levels of education. There are secondary artistic schools which give the students a general secondary education and artistic trade education. A

higher level of artistic education is provided by the Academies of Fine Arts and in Higher Artistic Schools. Admission to the Academy of Fine Arts does not depend on completion of study in a secondary artistic school. There are artistic competitions organized for youth and the prize winners often begin professional studies in this field. There are many artistically gifted people who practice arts in a nonprofessional way. It is not the purpose of either the system of artistic education or the Polish Children's Fund to help such people. However, there is a system of so-called Culture Houses, which participate in the artistic education of amateur but often also gifted artists.

The education of persons gifted for mathematics in Poland, Czechoslovakia, Hungary, and the states of the former USSR is carried out in special education schools. A system of all-Poland competitions in mathematics provides a basis for selecting the most gifted students. There are special secondary schools with special programs in mathematics and physics. The educational program in these schools aims at an optimal development of mathematical giftedness. There are more hours of classes in mathematics and physics weekly than in other secondary schools. An expanded educational program is carried out and the classes are often conducted by research workers from universities. Exceptionally gifted students of mathematics and physics often take individual courses adjusted to the interests and gifts of the student. Moreover, in such cases the program of studies is expanded and the duration of studies reduced. Such students have more time for individual work as well as for contacts with their professors conducting the activities and their supervising tutors.

The educational process for persons gifted in the humanities occurs at all the levels of education. Among these persons, we can differentiate persons gifted in e.g., writing or languages. Often these two skills are correlated. Regarding the linguistic gift, one should stress the part played by foreign languages in the process of mutual communication between the scholars and the youth from different parts of Europe. In this period of political and economic changes, the importance of a command of English, French, German, and other languages can be clearly seen. Young people have an opportunity to prove their own skills and capabilities while taking part in language competitions. In secondary schools there are programs which specialize in the humanities and the syllabuses for subjects such as Polish, foreign languages and history, are substantially expanded.

Compared to mathematical giftedness, which appears sooner and seems to be much more easily and more objectively measurable, the diagnosis of giftedness in the humanities is often difficult. Sometimes, it is also difficult to establish appropriate criteria of evaluation of achievements in this field. However, the prize winners of all-Poland linguistic, historical, and literary competitions can be accepted and aided as gifted persons.

RESEARCH ACTIVITIES

Since gifted people's education had, for many years, more or less been neglected in Eastern Europe, there was a considerable discrepancy between scientific research and educational practice. Research on giftedness is much more advanced than is the practical organization of the help provided for gifted students. The direction of research conducted at universities and research institutions by psychologists and educationists clearly indicates the range of problems that are of particular significance in the process of aiding gifted people. Some of the research on gifted people now being conducted in Eastern European countries will be summarized.

The first specific research on giftedness in Czechoslovakia was carried out in the seventies. The research was concerned with sport (Kodym in Bohemia) and intellectual capabilities (Slovakia). However, there was a considerable increase of interest in this subject in the eighties. In that period, the Institute of Child Psychology and Pathopsychology was founded—a group dealing with this subject. Research on intellectual, musical, artistic, and physical talents was undertaken, with the principal subjects of interest being the theoretical analysis of giftedness, the identification of gifted persons, the development of giftedness, creativity, and personality. The first reports of this work in the west had been given at the Sixth World Conference on Giftedness (1985) in Hamburg. In addition to the research/theoretical aims, the practical aim, i.e., the improvement of the educational system for gifted persons, is also important. In other centers in Czechoslovakia, research on this subject, with particular attention paid to the issue of creativity, is also being carried out (Dockal, Laznibatova, & Kovac, 1992; Burjan, 1992). The new socio-political situation in Czecho-Slovakia has resulted in a growing differentiation in gifted persons' education.

Hungarian psychologists have made substantial achievements in research on giftedness. The research at the Hungarian Academy of Science concerning psychological conditions of giftedness and creativity is well known. Psychologists, educationists, teachers, and parents cooperate with one another. The achievements of Hungarian Artistic Education as well as the achievements of Hungarian youth in mathematical and language competitions are also well known, although opportunities and support for participation seems to be unequally distributed (Báthory, 1986). Hungarian psychologists are in close contact with specialists from Western Europe and are working very hard for quick integration of actions and research concerning giftedness carried out in the Western and Mid-Eastern Europe (Herskovits, 1991).

In Yugoslavia, research on giftedness has improved in recent years. One of the reasons for the previous stagnation was a strong influence of Marx's philosophy on the development of social sciences in this country. Attempts at using Wygotski's theory in the research on

giftedness are interesting. At present, a wide range of research is undertaken in many Yugoslavian research centers, such as at Zagreb, Belgrade, or Sarajevo, which hopefully will not have suffered too much from the civil war. The subjects examined concern psychological diagnosis, pedagogical issues, the educational process for particularly gifted pupils and the psychological determinants of achievement in different fields of academic and professional activity (Maksić, 1992; Sefer, 1992).

Research on giftedness in Romania has been mainly carried out by special educationists. The first publications on the subject appeared as early as 1915. Although both the number and quality of these publications is not high, one can notice certain tendencies which sometimes follow the general tendencies in this field of knowledge. The research reported in Romanian publications is mainly concerned with the issue of selecting gifted persons, but also address issues of educating the gifted children and their social functioning. Emphasizing the pedagogical aspect in research on giftedness has another very positive side effect. In the future it may exert a beneficial influence on the psychology of ability in this country. Other achievements in the field of aiding and developing talented children in Romania should also be noted. Outstanding achievements in sports, e.g., gymnastics, of Romanian sports(wo)men serve as one example. However, there may be some objections to the motives and methods used. Investigations by Romanian psychologists who—in this way—could increase the Romanian contribution in the education of gifted children and youth would be particularly important (Cretu, 1992).

Recently, there has also been a growing interest in giftedness in Bulgaria. Bulgarian specialists carry out interesting research concerning creativeness, cognitive styles, as well as psychological factors influencing outstanding achievements in various fields of activity (Sekowski, 1992).

Valuable research is being carried out in Poland in the fields of creativity (e.g., Necka, 1986) and the psychology of music. It is concerned with psychological predictors of musical achievement (Manturzevska, 1974; Sekowski, 1989), as well as with the issues of the perception of music and learning. The Department of the Psychology of Music, Warsaw Academy of Music, headed by M. Manturzevska (Manturzevska, 1974) has adapted a set of tests of various aspects of musical giftedness to the Polish environment. A psychological diagnosis of the degree of musical giftedness can be made at a high level, which has been verified a few times (Manturzevska, 1992).

There has been some interesting research on the opportunities and effects of special attention for gifted pupils within the regular classroom. In 1974 Bandura found that regular classes can provide sufficient opportunities for developing the potential of gifted children by means of modified teaching methods, ability grouping, encouraging creative thinking and the use of well designed and organized extracurricular activities. At the

same time, Nakoneczna (1974) began his intervention study with 10 elementary and secondary schools in rural, small, and large urban areas. The following three principles have since become standard educational practice:

- (1) acceleration of the development of individual abilities by individualized instruction and curricula,
- (2) promotion of independent studies, self-responsibility and self-assessment of the students, and
- (3) inclusion of more and deeper knowledge in curricula by organizing eligible individual instruction, clubs and summer camps for special interests, by contacting and working with local groups, scientific institutions and other resources.

Borzyn (1989) summarized some studies, conducted years ago in Poland, on instructional and teaching methods and their effects on gifted and nongifted students in normal elementary classes. All these forms of educational intervention, extension of curricula and improvement of teaching methods yielded positive results for gifted as well as nongifted students and deserve wider attention in the international academic community.

Western European Countries

Whereas the communist countries, because of their centralized and unitary school system, had focused

their efforts on special programs to identify and foster individual abilities in scientific and technical fields, as well as in sport, music and dance . . . [as] a means to attain the superiority in international competition . . . the rich European democracies tended to avoid elitism and selection based on talent in the name of equality of opportunities (Andreani Dentici, 1992b, p. 149)

for a long time and still do, to a very differing degree.

Concerning gifted education and research, Western Europe can be divided into three areas. There has been a great deal of interest and research in the central European countries. However, one finds almost no special provisions or research in the northern or in the southern countries. Whereas there is no obvious reason for this omission in the southern countries, the situation in the Scandinavian countries including Denmark can be explained by obvious political, ideological reasons.

Northern European Countries

Cohan (1985) suggests that there are very few provisions for the gifted child in Scandinavia because of the dominance of the "egalitarian ethic" and the view that provisions for the gifted are "a means of maintaining the privileged positions of certain groups." The official statement of the Norwegian "Royal Ministry of Church and Education" in a survey on the education of gifted in the "world community" (Mitchell & Williams, 1986) provides one example of this attitude:

The idea of segregating gifted/talented pupils in special classes or schools is contrary to the prevailing educational philosophy in Norway. This position is shared by a vast majority of politicians and educators. Norwegian educational policy, especially since World War II, has consistently attempted to ensure that more and more people have equal opportunities for education. Special attention has been paid to disadvantaged groups. According to school legislation in force, each pupil has a right to an education in accordance with his abilities and qualifications. Schools have to be responsible for all students, including the talented/gifted. A differentiated teaching approach should be adopted within the framework of the class (p. 28).

In Denmark there would appear to be complete agreement

that the objective of education is that all groups of pupils and each individual pupil, should be able to develop optimally. This also applies to the specifically gifted children (Jansen, 1992, p. 189).

Nevertheless, firstly, up to the end of the 9th year the school is nonstreamed and secondly, the focus is on a kind of differentiation which does not mean individualization and this is due to the primary principle that "the individual enriches and inspires the community while the community supports the individual" (p. 189).

The Danish position . . . is that more harm than good would be done by singling out certain pupils as being especially gifted/talented. The official position is that special instruction could be done on a private basis during leisure time (Jensen, 1986, p. 14).

In Finland a public debate has arisen during the last few years; but, even though recent legislation has emphasized that learning and teaching have to be individualized in order to match the students' abilities, there have not been any significant changes in broader educational practice. There are no special schools for the gifted, but some upper secondary schools have special branches for gifted students, for example, in music or sports. Some experimental forms of gradeless upper secondary schools allow gifted students to take more responsibility for their own learning and achieving and they can graduate in a shorter time. However, this opportunity is used only by 1% of the participating students. The other method of acceleration, grade skipping, also very rarely occurs (Väljjärvi, 1992).

With the exception of mathematical competitions, Edfeldt (1992) can find "no special educational procedures whatsoever for the specially talented school children" in Sweden at least since 1968 (p. 48).

Southern European Countries

A few conferences (e.g., at Madrid, Spain, in 1980, or the first Portuguese conference in Porto, 1986) and

the foundation of some associations and professional working groups are signaling a low but increasing interest in giftedness in southern European countries in recent years, even if education in schools is still not affected to any great extent.

In Spain (with the exception of an institution, founded in 1947, which offered scholarships to students with high academic achievements and a connected school which, through lack of funds, was closed in the early sixties) no attention had been given to the topic until 1981 when a psychological study on gifted children was published. Similar to the development in other countries, it was again a private organization, founded by a group of parents of gifted and talented children at the beginning of 1987, which initiated the first activities, mobilized public opinion, supported some practically oriented research studies and organized symposia for teachers, educationists, psychologists, pediatricians, and parents (Cruz & Truño, 1992).

In the region of Milan, Italy, a program for the identification and assistance of the gifted was started in 1962. This program investigated issues of identification, test design, development, and evaluation of enrichment activities for gifted and normal children and later on creative thinking and environmental factors (Dentici, 1992b). However, these studies have not affected public educational policy and practice which "claim to adhere to an egalitarian ideology" (p. 150). Only a few private organizations provide competitions for gifted pupils, some university colleges promote the development of selected students parallel to regular university courses. In the area of research a few interesting studies have been undertaken since the first program mentioned above, focusing on creativity and the development of social and moral reasoning (Andreani Dentici, 1992a, 1992b).

In Turkey a very special single project is in progress. An entire "learning village" for 250 intellectually gifted students from economically disadvantaged families and 30 staff members is being built near Istanbul, sponsored by a foundation of an eminent industrial Turkish leader. In close cooperation with the Ministry of Education a special differentiated curriculum is being designed to provide a sound general academic background as well as developing high performance in special areas without neglecting a harmonic holistic development of the students (Akarsu, 1992).

Middle European Countries

In the United Kingdom public and scientific awareness of the needs and possible problems of gifted children emerged earlier and more widely than in other neighboring countries. In the early 1960s there was still no official policy and there were only a few Independent Schools with appropriate opportunities for the intellectually gifted pupils. One starting point for public attention for gifted children was the

film "Exceptional Children" and the book "Gifted Children" by Branch and Cash in 1966. Important cornerstones for subsequent development were projects, studies, and publications, like Bridges (1969, 1973, 1975) with his "Brentwood" and "Millfield" experiments, Kellmer-Pringle's "Able Misfits" (1970), Ogilvie (1973), Hitchfield (1974), Rowlands (1974), Tempest (1974), Burt (1975), Painter (1977), Freeman (1979, 1991), Denton and Postlethwaite (1985), or Cassidy and Lynn (1991). The Department of Education and Science (DES) relatively quickly recognized the importance of the topic. As early as 1973 the DES offered the first course for teachers on the education of gifted children. Its activities and publications (DES, 1977, 1979) stimulated several of the LEAs (Local Education Authorities) to become involved in this area. A wide variety of local curricular and extracurricular activities, sometimes in cooperation with university staff members, have been carried out in the last 10-15 years; several of them have been described in issues of "Gifted Education International." In 1992 about 35 LEAs, out of a total of 108, employ at least one person with official responsibility for the gifted (Freeman, 1992) and 5 with sole responsibility for able children (Raffan & Short, 1992). Several efforts have been more or less successfully undertaken to at least consider or implement "gifted studies" into initial or in-service teacher training (Sherwood, 1983).

The National Association for Gifted Children (NAGC), founded in 1966 by parents, has significantly contributed to gaining public, educational and political attention and to providing out-of-school enrichment opportunities, like weekend and summer courses, in about 50 branches across the country. In 1982 the National Association for Curriculum Enrichment and Extension (NACE) was formed for and by teachers and provides extra help, ideas, and enrichment material for teachers and their gifted students. Both organizations now work very close together in The National Centre for Able and Talented Children at Nene College, Northamptonshire.

In spite of these promising movements "there is still no specific overall educational policy for this minority in normal schools in Britain, where teachers prefer to keep gifted children in the normal classroom," Freeman (1992, p. 67) sceptically summarizes. However, especially since the 1989 Annual Report by Her Majesty's Inspectors of Schools (DES, 1989), "interest in the gifted is growing slowly but steadily" (p. 59). Chances for improving facilities and provisions for the gifted are implied in the 1988 Education Reform Act which affects local management of schools, in open enrollment, in the new National Curriculum with testing and assessment and in the traditional flexibility of British education (Freeman, 1992) which has brought movements like the open school or open-plan construction to primary schools and which is spreading widely across the continent. According to Freeman further characteristics, which could make the British school system relatively well suited for the gifted, are

- flexibility in curriculum;
- thinking skills are trained by frequently writing essays;
- early school start: early reading and writing;
- efficient use of travelling specialist teachers (peripatetic teachers);
- there are many out-of-school extras such as competitions, school orchestras and so forth;
- the school system is highly selective by implicit selection procedures in society;
- higher education is free (Boxtel, 1992, p. 25).

Additional and more detailed information on the history and development of provisions for the gifted and talented in Great Britain may be found in the following publications: Gibson and Chennells, 1976; Marjoram, 1979; Povey, 1980; Sherwood, 1983; Freeman, 1989, 1992; Ralfan and Short, 1992; most issues of "Gifted Education International."

Without considering measures and publications in the beginning of the century (see above) and some minor school experiments with acceleration at the Gymnasium ("express classes"), the significant starting point for special activities in favor of gifted children in West Germany the "Gesellschaft für das hochbegabte Kind" (DGfHK), the German Association for the Gifted Child, which was founded in 1978 by a group of parents, teachers and psychologists. The DGfHK was relatively successful in launching information campaigns and offering out-of-school activities in several branches all over the country. Before that time, with the exception of some competitions for school students, only five larger foundations were offering scholarships for (about 10,000) excellent university students.

The first academic conferences in the beginning 1980s and the World Conference in Hamburg, 1985, stimulated public and political interest. Position papers of the federal government, specifically the Ministry for Education and Science (BMBW) described the situation and formulated perspectives, acknowledging the need and possibilities for the promotion of the gifted as an area of "special educational-political relevance" (Bundesminister . . . , 1986). Still, the problem with the federal system was/is that such governmental statements do not necessarily affect the educational policy in the various states which are in charge of the school system. Thus the BMBW only could/can support extracurricular provisions, such as enlarging the system of nationwide competitions or establishing summer camps and academies for extraordinary academically gifted students, as well as research projects.

Financed by federal grants and some other large public foundations, various interesting and important research studies have been conducted, like the program for identifying and fostering mathematically gifted students in Hamburg since 1982 (Wagner and Zimmermann, 1986) and the program for verbally talented youngsters (Schöpfel, 1992), the organization and evaluation of a special group with gifted preschoolers in Hannover (Urban, 1990), the "Marburg study" analyzing the

environmental frame of primary grade pupils headed by Rost and the large Munich study on identification, on analyses of giftedness and achievements in a school and leisure time context and on developmental perspectives of different types of giftedness and talents (Heller, 1992b), as well as field studies and experiments in the areas of technical creativity and technology assessment, to name only a few.

The number of publications has increased enormously, from a handful in 1980 to about 40 in 1982, which were still strongly influenced by Anglo-American literature, up to several hundreds today representing a broad spectrum of applied, basic, and theoretical work in education and psychology of the gifted. Practical provisions in school depends on the policy of the states' governments which is often determined by party ideology. Thus, there are some states which insist that the three-partite school system provides adequately for the needs of all children and are not at all interested in catering for the gifted. In contrast, other states have various smaller or larger projects, like additional courses for highly interested and able in Baden-Württemberg, so-called "express train classes" in Rheinland-Pfalz, "Plus-Courses" and financial support in Bavaria. The first and, for a long time the, only school with special classes for the generally intellectually gifted, has been operating since 1981 in Braunschweig, Lower Saxony. Since German unification there are about 10 special schools, most of them in the eastern states. Similar to Great Britain there is no general policy in favor of the gifted; in contrast, the teachers' union strongly rejects any idea of providing "privileges" for highly able children. Hopefully, the recently founded "Working Circle Research of Giftedness and Promotion of the Gifted" (ABB) will be able to contribute significantly to the improvement of the educational and attitudinal situation towards the gifted. For further information about East Germany (the former GDR), see Drewelow (1990), Mehlhorn and Mehlhorn (1989), Schreier (1990); for West Germany (the Federal Republic of Germany) see Urban (1984, 1988, 1989, 1990a, 1992), Heinbokel (1985), Feger and Prado (1986), Heller and Hany (1986), Trost (1986), Wilms (1986), Wagner (1990), Heller (1992a).

In addition to the research activities mentioned above and described in detail by Mönks (1992) and Span (1992), the situation in The Netherlands can be summarized as follows:

In practice, attention for giftedness began in the sixties, but was interrupted in the seventies. In the eighties, renewed attention resulted in a number of research projects. The findings of these projects suggest that both traditional intelligence tests and teacher nomination are unreliable identification instruments, that there is great need for enrichment materials and teacher training and that gifted underachievers have very negative attitudes towards themselves and the school. At present, there is a clear

preference for teaching the gifted in mixed-ability classes. . . . Unfortunately, teachers are inadequately trained and enrichment materials are insufficient. These are problems that should be tackled immediately. In the meanwhile, the best alternative is streaming in secondary education (Boxtel, 1992, p. 23).

A strong and promising indication of the acceptance of the importance of identifying and nurturing the gifted was the establishment of a special chair for research and education of the gifted at the University of Nijmegen and of a Center for the Gifted, headed by Mönks, in 1990. Other information is available through Eldert (1976, 1979), Scharten de Voogd (1985), Mönks et al. (1986), Mönks (1992) and Span (1992).

In 1927 an attempt was made in Geneva, Switzerland, to start a special school for gifted students; the attempt, however, did not prove successful (Mitchell & Williams, 1986). At present, there are very few provisions explicitly made for the gifted in normal schools, although the organizational and legislative possibilities give much more room in principle (Stamm, 1992). In several cantons measures of acceleration, such as early entrance, grade skipping, or advanced placement in single subjects, are not possible at any stage in public schools. However, there are small studies in Bern investigating the possibility and practice of grade skipping for very special cases (Stednitz, 1989) and in Geneva concerning early entrance (Rieben, 1992). In 1989 a parents association (EHK) was founded and held its first summer camp in 1991.

An overview by Rieben (1992) shows an almost complete absence of research in the field of giftedness in both Switzerland and France. After 15 years years of continued efforts the first special class for intellectually precocious children was finally opened at the Las Planas School in Nice, France, in 1987, followed by a private secondary school in 1988 (Terrassier, 1992). While in Switzerland and France significant public and political interest as well as practical educational efforts is only beginning, some concrete programs are being successfully introduced in Austria (Gräupl, 1989; Grillmayr, Hübl, & Pusch, 1989). Of special importance was the inclusion of advancement programs for gifted children into the Austrian school system by law in 1989 (Grillmayr, 1992).

It seems, then, that even in the middle Western European countries the chances and opportunities for gifted and talented children differ widely. Closer cooperation and exchange of expertise, knowledge, and ideas among researchers as well as politicians, practical educationists, and parents, is badly needed.

Common and International Aspects and Developments

In this final section, attention shall be first be given to the international European organizations and provisions for giftedness which have been established and second to

some topics which, from a European–international point of view, have emerged as being of special interest.

Political and Organizational Developments and Provisions

Progress in the field during the last 10–20 years and the increasing public and political awareness, is partially due to the good contacts among European scholars and experts from several countries which have been fostered by the World Council for Gifted and Talented Children. The first world conference and the Council's foundation in London, 1975, was substantially dependent on the efforts of the honorable Henry Collis. In addition to this conference, of special importance for significant "movement" in Europe have been the 6th World Conference 1985 at Hamburg (Cropley et al., 1986; Wiczerkowski et al., 1986; Heller & Feldhusen, 1986), especially for the German situation where, for the first time, the "iron curtain" was lifted slightly and the 9th World Conference held at The Haag in 1991 (Mönks & Peters, 1992).

There are some new and promising developments on the European political stage. It is remarkable that recently a motion for a resolution (Doc. 6247) on gifted children in school systems has been submitted to the parliamentary assembly of the European Council—though still not passed. It is claiming that the right to individuality must also be exercised in education, particularly where gifted children are concerned.

In 1991 the Council of Europe, in its series of "European Meetings on Educational Research," devoted a conference to the topic of "Education of the Gifted in Europe: Theoretical and Research Issues." The participants came from some twenty European countries, from north and south, from west and east; there were also observers from various national and international associations as well as from some overseas countries. The comprehensive proceedings (Mönks et al., 1992) provide good insights into the diverse situations in the various European countries regarding the gifted as well as into commonly shared ideas, problems and perspectives, some of which will be quoted below. It is expected that the outcomes of this workshop will be helpful in advancing matters on the international European political stage.

In 1987 the European Council for High Ability (ECHA) was formed in line with the spirit of European harmony. ECHA, centered at Bonn, provides a medium for communication about aims and policies for the highly able and about research and educational provisions. This is accomplished through, for example, sponsoring European conferences, at Zürich, Switzerland, in 1988, Budapest, Hungary, in 1990 and Munich in 1992, sponsoring smaller conferences on special topics and by publishing a regular newsletter and the professional "European Journal for High Ability," edited by A. J. Cropley.

With very few exceptions, e.g., the "Our Lady of Mercy College of Education" in Blackwood, Ireland,

there have been no (obligatory) implementation of topics like "theories of giftedness" or "differential education for the gifted" into the regular initial teacher or in-service training courses at European universities or normal schools. In this context, ECHA has taken an important step, in cooperation with the "Preceptors College" (UK), to establish an "Advanced Diploma in Education" (AdDipEd) giving the opportunity for and the acknowledgement of additional studies and practical work with gifted and talented students. Another very active association in the south-west of Europe is EUROTALENT with its headquarters at Porto, Portugal. A very recently established association which works internationally, though it is mainly limited to German-speaking professionals, is the "Arbeitskreis Begabungsforschung und Begabungsförderung" (ABB; Working Circle Research of Giftedness and Promotion of the Gifted) in Rostock, Germany.

Furthermore, there are contacts between the various national associations, like the National Association for Gifted Children (NAGC) and the National Association for Curriculum Enrichment and Extension (NACE) of Great Britain, the German "Gesellschaft für das hochbegabte Kind" (DGfHK), The "Irish Association for Gifted Children" (An Oige Threitheach, founded in 1978), the French "Association Nationale pour les Enfants Intellectuellement Précoces" (ANPEIP), the Swiss parents association "Elternvereinigung hochbegabter Kinder" (EHK), the Dutch "National Parents Organization of Gifted Children, 'PHAROS'" and the "Asociación para el Desarrollo de la Creatividad y Talento" (CREDEYTA) in Barcelona, Spain.

Equality of Chances

One point which always recurs in discussions is the term "equality of chances" (EC), which is used by opponents of gifted education as well as by supporters. Modern society has to provide for a broadening basis of equal conditions and facilities for everyone. This was the reasonable intention of the school reforms in the sixties and seventies in Great Britain as well as in West Germany. At the same time the challenge raised of inequality must also be faced, namely special chances for special gifts as well as an openness and readiness for socially responsible ambition. The latter also implies a measure of self-determination. It is interesting to note that the slogan "equality of chances" has been particularly propagated by the OECD. What is meant is equal access to educational institutions for all children with the same measured abilities, independent of gender, race, residence, social origin, or other irrelevant criteria. Only the measured abilities shown through achievements, and nothing else, should determine the kind of schooling for the children. Equality of chances has been seen as an offer to free the individual from environmental restraints, chances or accidents and from its origin. The implications of this concept are clear, but have often

been overlooked, denied or pushed away. Increased equality of chances reduces social differences to the extent that the differences which exist independent of gender, race, residence, and social origin become clearer, thereby eliminating a false egalitarianism. To illustrate this point: as the number of runners who are allowed to start a race increases, there will be bigger differences between the running times of the first and the last runner. This is the problem, that equality of chances guarantees unequal results.

However, the opponents of provisions for the gifted generally do not take issue with equal chance of access. Rather, they take issue with the equality of the results. Countries in both the East and West with a unified school system have a lot of experience with the inequality of results. Regardless of ideological differences they have drawn conclusions and developed provisions for furthering the abilities of the gifted. Thus, for example, the former head of the Humboldt University in East Berlin, former GDR, had no problems in stating that the identification and development of differences was a necessary compensation to a total and complete equality of rights and justice (Klein, 1986). Interestingly enough, only a few of the special schools for gifted and talented (in math, sports, languages, etc.) in the former GDR survived after the German unification.

Summer Camps, Workshops, and Academies

In the absence of a general and special policy for a differential education of the gifted in schools, extra-curricular and out-of-school opportunities take on a special value. Such opportunities include competitions in various fields, weekend courses, summer camps, and student academies. The last two in particular are becoming increasingly popular in the United States, in Western Europe, and in other countries like Poland, as provided by the Polish Children's Fund. These alternatives make it possible to intensify the educational process. Furthermore, participation in a camp for gifted children allows for participation in high level classes. The lecturers are eminent representatives of various fields of knowledge. Similar to Western countries there are two types of camps. The first stresses education and development in particular topics, aiming at mathematicians, physicists, artists, or musicians. This type of camp engages the students' interest at a level substantially higher than that in the normal educational program at school. The second concept pays particular attention to the general development of the students. The participants of such camps are scholarship holders gifted in a variety of fields. Apart from the improvement of special gifts, the aims of such camps are the improvement and enrichment of personality, broadening of interests and improving various activities. The German foundation, Bildung und Begabung, is expanding its very attractive summer academies for gifted 10-13 graders from year to year.

Gifted Girls

Gifted and talented girls, for a long time a neglected group, has become a focus of increasing interest and research in recent years. Research conducted in several European countries (e.g., Ayles, in press; Beerman et al., 1992; Barriuso-De Ceuster & Moisan, 1990; Mahony, 1985; Wiczerkowski & Prado, 1990; Valabreque, 1989) has shown that gifted and talented girls and their particular needs are not well recognized and that their potentials are much less challenged and promoted than those of boys. Though awareness, and position, of girls and women in education and work in general have slightly improved through resolutions and action programs of the Commission of the European Communities, this does not mean that these efforts have affected the "underprivileged" situation of the exceptionally able and talented. At the recent educational research workshop on education of the gifted (Mönks et al., 1992), there was a stated need for more research, for better identification procedures and for increased awareness of both parents and teachers, with regard to better "recognizing the pressures which can militate against high levels of achievement in gifted girls of all ages" (Ayles, 1992, p. 160).

Gifted Handicapped

Another group in special need of support are the gifted handicapped people. In society as a whole, disabled people may constitute only a few percent of the population, but in absolute numbers this results in a substantial group. The history of science provides several examples of gifted invalids who, despite their handicap, achieved eminence in various fields of activity (H. Keller, L. Braille, M. Sizeranne). From the point of view of psychological research on giftedness, the results of investigations concerning disabled persons are particularly valuable, e.g., examining compensation processes for a loss of the sense of sight or hearing can facilitate our understanding of the mechanisms of mental functioning in a person without such a loss. Moreover, outstanding achievements of disabled persons indicate that it is not only the high ability as such which is most important, but also other, less evident personality traits which influence the emergence of high achievements. Research on the attitudes towards disabled persons can also be informative regarding psychological causes of prejudice against any dissimilarity, including towards minority groups, people dissimilar by their disability and by higher-than-average intellectual capabilities or achievements.

Gifted handicapped work under much more difficult conditions in their attempts at self-realization and optimum development. To improve these conditions for them is a duty of civilized societies. These conditions must not be the result of random decisions, but should result from scientific research and practical, considered

decisions. Such investigations are being carried out in Poland and they should constitute a subject of interest for both psychologists of giftedness and people providing aid for disabled individuals. Specialists from many different countries and parts of Europe still have a lot to do in this field.

Organizations of invalids, rehabilitation institutes, and higher pedagogical schools, require gifted disabled people both in essence and for organizational reasons. Literary creation, musical, or artistic giftedness and giftedness in mathematics or technology develop as a result of various forms of activities organized by such institutions. The "Stiftung zur Förderung körperbehinderter Hochbegabter" (Foundation for the Promotion of Physically Handicapped Gifted), at Vaduz, Liechtenstein, has for years been engaged in practical and financial support of handicapped individuals. In addition to individual help it organizes symposia, particularly about opportunities for gifted students with hearing difficulties (Stiftung, 1988; Kröhnert & Stiftung . . . , 1989) and other sensory deficiencies.

Identification and Diagnosis of Giftedness

Especially in the Federal Republic of Germany an important and large part of the theoretical and research activities during the last 10 years has been devoted to "models and strategies for identification of the gifted" (Hany, in press). This is reflected in a relatively large number of publications (for example, Hany & Heller, 1990; Heller, 1987, 1989, 1991; Rost, 1991; Trost, 1986; Urban, 1990c) which address all the various aspects of giftedness in relation to diagnosis, address highly abstract methodological and statistical questions as well as the practical evaluation of different procedures, address the development of strategies as well as the concrete design and examination of questionnaires for use in early childhood (Stapf, 1992) and observation schemes and the development of tests. Some interesting new developments in testing are in the area of creativity, a topic which has generally received increased attention recently (Urban, 1990d). For example, we can point to Facaoaru's instruments (1985; 1992), the two process-analytic, divergent-convergent tests ("TRE," a test of spatial perception and planning and "TZRA," working with sequences of numbers and analogies), Ruppel's (no year) computerized test for identifying exceptional inventive thinking in the natural and technical sciences and Urban and Jellen's (1986) "Test for Creative Thinking—Drawing Production" (TCT-DP), now in worldwide use and the two other versions for letter-verbal production as well as for playful movement and bodily expression.

Special work has been done regarding teacher judgment and nomination procedures. Wild (1991) gives an excellent overview of studies, including his own, investigating the correctness and exactness of teacher assessments (ratings and nominations) and stu-

dents' judgments (self- and peer-nomination) regarding intellectual giftedness (Urban, 1992b). In Great Britain, shortly after Lowenstein's study (1982), a large survey was conducted by Denton and Postlethwaite (1985). In investigating the validity and effectiveness of teacher's predictions for bright 13-year-olds in different subject areas, they found that results were mixed (Marjoram, 1990).

Looking at other countries, there were studies including identification as a major problem early in Italy (Andreani & Orio, 1972), in the United Kingdom (e.g., Freeman, 1979; Raven, 1991) and in The Netherlands (e.g., Mönks et al., 1986; for an overview, see Span, 1992). One major emphasis in the final report of the recent Educational Research Workshop (Mönks et al., 1992) was laid on the identification and diagnosis of giftedness. Though in the working groups no general agreement on what constitutes giftedness was reached, the following points, among others, can be summarized (Boxtel, 1992, pp. 30–32): Identification procedures in the various European countries show an enormous variety of methods and objectives. More qualitative instruments are needed. The data sources should be as broad and versatile as possible; process and action oriented information in a dynamic and continuous identification strategy is highly valued. This includes the provision of adequate learning and challenging situations, ongoing teacher training, early awareness already before school and the consideration of other critical factors like gender, minorities and socio-economic background. "Finally, the need for more basic and applied research" as well as for "more collaboration between researchers and practitioners" (p. 32) is expressed.

European Topics of Common Interest

Finally other important topics of common (not only) European interest will be quoted here in form of the "recommendations" from the above-mentioned final report of the European Council's conference (Boxtel, 1992, pp. 42–43):

(1) Individual differences have to be recognized and respected in legislation. On the basis of individual human rights, gifted individuals need adequate educational opportunities to develop to their full potential.

(2) The special and unfavorable position of gifted woman and girls needs additional attention.

(3) Provisions for the gifted and talented should preferably be arranged within the regular school system in the form of flexible curricula, internal differentiation, and enrichment activities.

(4) There is a great need for the development of adequate enrichment activities, special curricula, and learning material for the gifted.

(5) Adequate and effective teacher training is essential: differentiation in favor of the gifted should be a core element of all initial teacher training courses and

supplementary programs of in-service training in this area are badly needed.

(6) Acceleration in the form of early entrance and grade skipping is acceptable in individual cases in the absence of more suitable measures, provided that it is arranged in agreement between school, parents, and child.

(7) Special schools and/or classes for the gifted, in isolation from nongifted children are—as a rule—only to be established for a number of special talents (e.g., music and performing arts). Under certain circumstances, such as for political, geographical or educational reasons, establishing special schools or classes of wider scope for the academically gifted or advanced may be appropriate and desirable.

(8) Basic research in the field of giftedness has to be stimulated as a necessary basis for applied research.

(9) Applied research is badly needed in the areas of identification strategies and provisions for the gifted; results should be made effective through initial and in-service teacher training.

(10) Parent associations and other private initiatives in favor of the gifted should be encouraged.

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Programs and Practices for Identifying and Nurturing Giftedness and Talent in Asia (Outside the Mainland of China)

WU-TIEN WU

Graduate Institute of Special Education, National Taiwan Normal University, Taiwan, Republic of China

SEOKEE CHO

Korean Educational Development Institute, Seoul, Korea

Introduction

The gifted are considered to be a valuable human resource which can improve the standard of living and provide a better life for the countries in Asia. Nowadays, most of the countries in Asia are aware of the importance of maximizing the potential of gifted and talented children, in order to meet their special needs on the one hand and to enhance national competitiveness in the world community on the other.

However, each country differs in the actual practice of providing special education programs for gifted and talented students. A few countries started implementing gifted education programs in the 1960s and are now practicing it on a large scale at the national level. However, most countries became aware of the need to provide the gifted and talented with special educational programs only in the 1980s and are currently implementing enrichment programs, mainly on an experimental basis and/or at a private level.

In this chapter, the current status of gifted education in some Asian region countries, namely, Hong Kong, Indonesia, Japan, Korea, Philippines, Singapore, Taiwan (R.O.C.) and Thailand, will be reviewed with respect to programs, practices, policies, and issues for educating the gifted and talented.

Hong Kong

Since the 1970s the Hong Kong government has pursued a mass education policy and pays little attention to giftedness (Gifted Education Council, 1991). At present, provisions for the gifted are only available in the Hong Kong International School, although private tutoring by

others is done outside the classroom (Roldan, 1992; Yung, 1987).

In 1988, a group of educators, scholars, school principals, and teachers formed the Gifted Education Council (GEC), a nonprofit organization devoted to the provision of gifted education in Hong Kong. Since it was established, the GEC has conducted a survey on gifted education in Hong Kong, submitted a proposal under the request to the Education Commission and carried out several enrichment programs for the gifted.

Identification

In general, a battery of tests in addition to self/peer nominations is used in identifying and selecting gifted students for the limited gifted programs in Hong Kong. For example, the Hong Kong International School has developed a special needs identification spreadsheet, which focuses on day-to-day student behavioral characteristics. This information is transferred to a master chart. The master chart is then combined with achievement test scores and parent and student input so that potential candidates can be identified (Yung, 1987).

Programs

The Hong Kong International School has set up an Extended Learning Committee for designing gifted programs in the school. The focus is on curriculum enrichment, both horizontal extension of instructional strategies and vertical acceleration within subject areas. Extended learning material and strategies for higher level thinking skills are integrated into the regular

curriculum. A separate program that labels students is carefully avoided. However, students with similar needs are grouped through the day for specific instructional experiences. The school also provides a built-in audience for sharing and opportunities for mentoring (Yung, 1987).

The Gifted Education Council started an enrichment program outside school in 1990. Those who take part in the program have an opportunity to receive well-designed training on creativity, leadership, self-directed learning, and the pursuit of scientific inquiry. According to a survey conducted by the Gifted Education Council (1989), the majority of the respondents preferred enrichment activities, such as summer camps, science interest groups, and excursions, which are extracurricular in nature, which do not interfere with the regular curriculum and which are designed so as to satisfy the inquiring minds of the majority of gifted children (Gifted Education Council, 1991).

Problems and Perspectives

It is obvious that there is a shortage of provisions for gifted and talented students in terms of both quantity and quality in Hong Kong. This is attributable to a lack of public understanding or awareness, as well as to a lack of governmental support. However, it is encouraging to note that most heads of schools are willing to send their gifted and talented students to appropriate programs (Gifted Education Council, 1991). The Hong Kong International School has successfully started its pilot gifted programs and the Gifted Education Council, composed of interdisciplinary personnel, has vigorously launched its programs. By 1995, when Hong Kong hosts the 11th World Conference on Gifted and Talented Children, it is expected that a stronger support system and more differentiated programs for the gifted will have been established.

Indonesia

The Education Act of Indonesia articulates the right of the gifted and talented to receive special attention (Article 8, Clause 2) in order to meet individual needs as well as society's demand (Marat, 1992). The Indonesian government began devoting actual attention to the need for a differentiated program for gifted students in the 1980s, but only in the form of providing the gifted with educational grants. Most of the present services for gifted children remain competition-oriented. Other large-scale special services for gifted children have not yet been developed in Indonesia.

Identification

It is not easy for Indonesia, with a population of 180 million and composed of a large number of ethnic

groups distributed over about 3000 islands, to identify gifted children. It is equally difficult to extend special attention to them at the national level, both in terms of facilities and through infrastructural means (Marat, 1992). There is also a shortage of experts and testing equipment for the identification of gifted children at a national level. Early detection is frequently conducted by nonexperts, such as parents, and the identification instruments used are not yet fully reliable and valid for children in Indonesia (Munandar, 1992). Experts feel that for reliable and valid identification it is necessary to find behavioral indicators for gifted children which are appropriate for Indonesian cultural values and expectations (Marat, 1992).

Programs

The Department of Education and Culture began providing programs for the gifted in 1974, in the form of educational grants to students of elementary, junior, and senior high schools and vocational schools, as well as to students at the universities. However, differentiated curricula or programs, in the sense of opportunities or facilities that enable the gifted to do in-depth field studies outside those already stipulated in the curriculum, have been in place only since the late 1980s. Some of the activities or programs for nurturing giftedness are (Marat, 1992):

- (1) Scientific competitions and a competition of innovative productive work for high school students and university students, at regional as well as at the national level;
- (2) Gifted education programs conducted by private schools; and
- (3) Try-out schools established in 1983 for gifted children in Jakarta and Cianjur at the elementary and secondary school level.

Currently, efforts are being made to look for an alternative program model for the education of gifted children in Indonesia. Among more than 30 alternative models, teachers generally think that enrichment should be emphasized. However, Marat (1992) feels that the Acceleration Plus model suggested by Kartadinata is more desirable. This is a multidimensional acceleration model which is thought to enhance cognitive development through a varied learning-teaching process, as well as providing for social, affective/emotional, and values development, aiming at an adequate adaptation of the self to the environment. The special services may take the form of mentoring, individual study, guidance, and counseling and community based programs.

Problems and Perspectives

There are several factors which inhibit the development of gifted education in Indonesia. These include a shortage of experts and testing materials to identify a gifted

child at a national level, the absence of an alternative program model which parents can choose for their gifted children, a shortage of trained teachers, a shortage of professional people who are familiar with issues of giftedness, and a shortage of educational facilities and equipment for implementing enrichment programs. It is hoped that these problems will be overcome in the coming years by implementing the Acceleration Plus model and by the joint efforts of the government and professionals (Marat, 1992).

Japan

After World War II, Japanese education was reformed thoroughly. Its school system was changed from a "dual system" to a "ladder system." As a result, gifted education has been almost taboo throughout Japanese society (Chiba, 1980; Hirano, 1992) and there are no formal government programs aimed at cultivating the abilities of gifted and talented children. Special treatment, such as allowing a student to skip a grade, is extremely rare in Japan. Special classes for gifted students do not exist. Both educators and parents would regard such classes as displaying unfair favoritism, thus violating the egalitarian philosophy on which the education system is built (Stevenson et al., 1992).

Teachers often indicate that they do not especially appreciate having gifted children in their classrooms. The children they find more impressive are those who work hard (Stevenson et al., 1992).

Afterschool Activities

Special opportunities do exist in the public schools for students to enrich their education through afterschool clubs and classes. These extracurricular activities are open to all students and a high percentage choose to participate. While these activities are not offered especially for gifted and talented students, they do offer students a much broader scope of activities than those contained in the regular curriculum.

The private Research Institute of Education for Brilliant Children, established in 1965, has opened classrooms to intellectually gifted young children. With intelligence education disseminating throughout Japan since 1972, important achievements have been continuously made in this field (Chiba, 1980).

High School

Compulsory education in Japan extends through to the ninth grade. High school attendance is not mandatory, although over 95% of youths of high school age graduate from high school. In stark contrast to the egalitarian system that is strictly adhered to in elementary and junior high schools, a hierarchical order exists among

high schools. High schools, especially in urban areas, are ranked into four levels according to their quality. The highest ranked schools are the ones that have the greatest success in placing students in good universities; the lowest are those whose students specialize in vocational or technical education (Stevenson et al., 1992).

Students in Japan are admitted to a high school of a given level on the basis of results on entrance examinations. Competition for entrance into the top high schools is keen because they provide better preparation for passing the examination to a good university. All students take the same high school entrance examination and, in principle, have an equal opportunity to enter a top high school. It is primarily through entrance examinations, first for high school and later for university, that individual differences in ability among students become acknowledged (Stevenson et al., 1992).

In addition to public high schools, private high schools are also popular, especially those that have good records in placing students in top universities. Private schools are able to pay greater attention to individual differences and to develop programs that will promote special talents and skills.

Possible Reforms

In the last two decades, the Ministry of Education has tried to introduce more flexibility into the high school curriculum. The number of required courses has been reduced to allow students to pursue their own interests and teachers have been granted more flexibility to meet students' individual educational needs. The Ministry of Education has encouraged teachers to arrange classes according to student achievement so that all students would still be assured of learning the basic skills expected of high school students. To accomplish this, local schools were permitted to develop tracking systems, known as "seijukudo gakkyu hensei", in which a student would be placed in a slow, average, or fast class depending on that student's previous performance in the subject concerned (Stevenson et al., 1992).

This system was fairly widely implemented after the "second baby boom" in the mid-seventies, when schools were faced with a large number of students with wide variability in ability and preparation. By the early 1980s, about 40% of high schools practiced some degree of tracking; however, it seems never to have gained popular acceptance outside the urban areas of Tokyo and Osaka. The major objection has been that it appeared to be a return to an elite form of education (Hirano, 1992; Stevenson et al., 1992).

In addition to the current discussion about how high schools might implement more individualized education, there has also been growing interest in introducing reforms at the college level. In 1991, the Central Council for Education, an advisory body to the Minister of Education, discussed modifications of entrance requirements to universities that might foster the development of

students with special talents and interests. Furthermore, the report suggested that for those students showing distinguished growth of their abilities, exceptional steps should be taken. This may be the beginning of significant educational reform in Japan (Hirano, 1992).

Currently, students must obtain high scores on all aspects of the college entrance tests. This system selects students with overall ability, but ignores those with special talents (Hirano, 1992). The Council may propose that students who are gifted and talented in particular areas be admitted to universities, even if they do not have high scores on the total entrance examination. A related recommendation would be to allow highly talented high school students to enroll in university courses in mathematics, physics and a limited number of other fields. A third recommendation being discussed is to lower the age for university entrance—but only in the field of mathematics—below the currently legal age of 18. No one has gone so far as to propose comprehensive programs for gifted and talented students and the idea of providing special opportunities to gifted students below the high school level is still considered to be inappropriate (Stevenson et al., 1992).

Problems and Perspectives

It is not easy to predict whether Japanese officials will ever introduce a broad system of special programs for gifted students, but on the basis of contemporary Japanese philosophy and past educational practices it seems doubtful that this will occur in the near future (Stevenson et al., 1992). Special programs for gifted young children are unlikely to flourish in a culture where elementary school teachers are reluctant to tell parents that their child is gifted or academically advanced and where direct forms of teaching in nursery schools and kindergarten are avoided out of the fear that it would produce inequities in first grade.

However, some tension exists within Japanese society between egalitarian education and gifted education. One persistent theme is that all children should be given equal opportunities for a good education, but there is also the counter-theme that, like China, Japan should be producing able students “earlier, faster, and better” (Stevenson et al., 1992). The intelligence education programs based on Guilford’s Structure of the Intellect model (Chiba, 1980), the home-study Kumon lessons and the Suzuki approach to early musical training have become very popular as ways of enhancing public education for young children. Even the Chairman of the Sony Corporation has entered the argument and has suggested in a widely read book that kindergarten is too late for initiating formal education (Ibuku, 1977). According to Stevenson et al. (1992), whatever form the education of the gifted and talented may ultimately take in Japan, one thing appears to be sure: gifted education will not be part of the government-sponsored educational system, but will be something that highly

motivated parents will provide for their children through private lessons.

Korea

Since the 1970s Korean educators have become increasingly aware of the fact that gifted students need more challenges and special experiences to fully develop their potential. Studies on gifted education among educators started only during the 1970s and, with long discussion and effort, the first Science High School was established in 1983. Since then, gifted education has become a first priority project for the Korean government. In its most recent Five-Year Economic and Social Development Plan (1992–1996) the Korean government has endorsed a strategy of fostering continuous development of its own creative know-how and highly advanced technology, through the encouragement of creative and gifted students.

Currently, there are three different approaches for gifted education: special schools at the senior high school level, enrichment programs during after-school hours in regular elementary and junior high schools and competition in mathematics and science for encouraging intelligence and creativity (Cho, 1991).

Gifted Education in Special Schools

At present, there are 11 science high schools, established yearly since 1983, and 11 foreign language high schools, opened in 1991. The Korean National Institute of Arts was opened in 1993 for developing artistically talented students from age 6 upwards. At the junior high school level, there are also some art/music/athletic schools, but neither the level of instruction nor the students’ ability level is exclusively high enough for these schools to be considered special schools for the gifted and talented.

SCIENCE HIGH SCHOOLS

Currently there are 1020 students in each grade attending 11 science high schools and almost 1,000 students in two colleges exclusively for scientifically talented students. In 1993, two more Science High Schools will be opened with 90 students in each grade for each school. The Science High Schools are equipped with advanced educational facilities and most of the necessary experimental instruments. The teacher–student ratio in the Science High Schools is 1:8, which is much lower than the 1:31 ratio in general high schools.

The requirements for admission to the Science High Schools are:

- (1) in the top 1% in academic achievement for the last two junior high school years;
- (2) good performance on specially set entrance examinations assessing achievement in general subjects with high emphasis on science and mathematics (50%); and

(3) good physical condition. All students are required to stay in dormitories in each school.

The Science High Schools use the curriculum developed exclusively for the Science High Schools in 1990. This curriculum is based on a nongraded and individualized instructional system with provision of acceleration, ability grouping and enrichment. The major characteristics of the curriculum are

(1) more advanced levels of science and mathematics (more than 45% of the total units are dedicated to subjects related to science and mathematics);

(2) science laboratory activities and inquiry activities; and

(3) elective courses such as history of science, computing science, science workshop, advanced courses in science, philosophy of science and individual studies.

FOREIGN LANGUAGE HIGH SCHOOLS

In 1992, 11 special schools were approved and registered as Foreign Language High Schools for students gifted in foreign language. About 1500 students in each grade study a curriculum heavily focused on foreign language learning for three years, mostly at the senior high school level and some at the college level. These high schools use the same student admission and programming policies as the Science High Schools. However, only a few of the 11 schools can be considered as special schools for the gifted. This is because some gifted students do not favor these schools which are not equipped with well-trained teachers or school facilities and which provide limited financial support.

ACADEMY OF MUSIC

The Korean National Institute of Arts was opened in 1993 exclusively for musically talented students age 6 and upwards. Entrance examinations consist of music performance tests (90%) and a written test (10%). Students who are in Grades 1–11 and prescreened by an identification committee of seven professionals can apply for admission. The Academy has a nongraded system with an intensive curriculum for developing musical talent.

Enrichment Programs

Enrichment programs have been developed and disseminated to regular schools by the Ministry of Education in collaboration with the Korean Educational Development Institute. The programs are implemented during afterschool hours by about 10% of the regular schools at the elementary and junior high school levels. Science Camps are implemented by most of the school boards during summer and winter vacations for science-oriented students each year.

There are also two private institutions which provide enrichment programs for the gifted from age 2 up to the

junior high school level, namely, the Korean National Association for Gifted Children and Gifted Education Division at the CBS Cultural Center. These private institutions are currently accommodating a total of about 900 students (Cho, 1991).

Competitions

Annual Mathematics and Physics Olympiads have been carried out since 1988. These also aid in the identification of the gifted and talented in math and science. Those who receive awards at the National Olympiad receive further training for participation in the International Mathematics and Physics Olympiads.

Problems and Perspectives

The Korean Society for the Gifted was organized in 1991 to facilitate the development of theory and practice in gifted education through the communication of research and practices among teachers and professionals.

For the development of gifted education, some issues still remain to be resolved. They are:

(1) to increase the number of gifted students served by enrichment programs;

(2) to provide gifted education for younger students;

(3) to provide inservice training for teachers as a way of improving the quality of gifted education; and

(4) to obtain legislative support (Cho, 1991).

Philippines

The Philippines started its gifted and talented programs earlier than other Asian countries. The earliest seed was planted in 1966 with the opening of the Teacher Training Program for the Gifted at the University of Philippines Department of Special Education. The official commitment to gifted education was written into the 1987 Constitution. Currently, there are 3 high schools devoted to the education of students talented in either science or arts, in addition to some limited gifted programs in regular schools. Two nongovernment organizations, the Talented and Gifted Philippines (TAG Philippines) and the Gifted Philippines, Inc. (GPI), are committed to promoting and developing education for the gifted and talented.

Identification

The most utilized procedure in gifted/talented student identification is a combination of assessments, including standardized tests, classroom grades, teacher recommendation, and interviews with parents and students. For Science High Schools and Arts High Schools, the screening criteria are stricter and more relevant to their specific field of talents (Roldan, 1992).

Programs

With formal provisions for gifted education still a rarity in the Philippines, the challenge of meeting the special needs of gifted children must make use of limited resources. The Manila Science High School and the Philippine Science High School were set up as early as 1963 and 1964 respectively. Both Science High Schools provide challenging programs, and, each year, select the "cream of the crop" of young scientific minds from around the country. Scholarships are offered for deserving but underprivileged students and, recently, these schools have branched out to different regions of the country (Roldan, 1992).

Another prestigious special school in the Philippines is the National High School for the Arts. This institution trains promising young artists in music, dance and the visual and theatrical arts—while at the same time providing them with a complete secondary academic education. Selection is again very strict and covers all regions of the Philippines (Roldan, 1992).

The private Reading Dynamics Center, founded by the reading specialist Dr Aurora H. Roldan, has initiated an annual Children's Festival of Words since 1973. The Festival is actually a creative writing workshop for verbally-gifted children. It is gradually evolving into a vehicle for identifying children who are not only intellectually and verbally gifted, but also in other areas of excellence. It also resulted in the birth of TAG Philippines in 1983. This organization provides a support group for gifted young Filipinos and their families. Today, TAG not only provides identification and assessment measures for a variety of areas of giftedness, it also offers advice to parents, as well as to the gifted young individuals themselves.

The GPI, on the other hand, strives to promote and develop the general welfare of gifted, talented, and creative children, youth and adults. The GPI sponsors teacher training, seminars, workshops, and research projects. In 1989, the GPI organized a national conference on the gifted at the College of Education, University of the Philippines. This was in coordination with the UP College of Education and the Department of Education, Culture and Sports.

Problems and Perspectives

Being greatly influenced by America, the Philippines' gifted and talented education has been in a state of gestation for nearly three decades. Due to an unfortunate political situation and economic development, the government's investment in education has been too limited to support gifted education in public schools. Little improvement has occurred in this area in the past two decades.

It has been proposed that the development of the gifted be promoted to advance the country's aims for national renewal and growth. To promote gifted and

talented education in the Philippines, the 1989 National Conference on the Gifted called for the following actions:

(1) the strict implementation of legislation concerning the gifted;

(2) a bigger budgetary allocation from the DECS;

(3) stronger support from school authorities, government officials, parents, and other concerned sectors of the community;

(4) a networking mechanism among agencies, professional organizations and other groups concerned with gifted education; and

(5) special training for teachers handling gifted and talented students (U.P. Newsletters, June 15, 1989).

It is optimistically expected that the government will finally give "teeth" to the provisions in the Constitution mandating educational provisions for the gifted (Roldan, 1992).

Singapore

Gifted education in Singapore is represented by a gifted Education Program and a Science Research Program implemented by and in collaboration with the Gifted Education Unit, Ministry of Education (Singapore Ministry of Education, 1991). Since 1984, the Gifted Education Program (GEP) has been implemented by the Gifted Education Unit to cater for the needs of the intellectually gifted in Singapore. Four primary schools, the Anglo-Chinese Primary School, Raffles Girls' Primary School, Rosyth School, and Nanyang Primary School and three secondary schools, the Anglo-Chinese School, Raffles Girls' Secondary School, and Raffles Institution, are currently participating in the GEP program.

Identification

All Primary 3 (P3) pupils are given the option of undergoing an initial screening test in August. The objective of the screening test is to assess quantitative reasoning, reading comprehension and vocabulary. The top 5% of the pupils in the test (approximately 2000) are invited to take the Selection Test. The selection round, involving 3 tests, is held in October. The tests are aimed at a higher cognitive level to assess quantitative reasoning, language ability, and general reasoning ability.

For enrollment at Secondary 1 (S1), those who obtain A-plus in any 3 subjects at the Primary School Learning Examination (PSLE), comprising about 3–4 % of the P6 pupils, are invited to take the Selection Test which again involves 3 tests. The enrollment for S1 is much smaller in number than that for P4 as it is also that group of GEP primary pupils being promoted to S1.

The selection of pupils for the GEP in both cases is based on their performance in the selection test. Parents of the selected pupils are informed of results through their children's principals. The final decision to join the GEP rests with the pupil and his/her parents.

Programs

CURRICULUM

The curriculum in the GEP uses the existing curriculum as a starting point. This is because the primary pupils have to take the PSLE before being promoted to S1. At the end of the secondary program, i.e., at S4, the pupils take the GCE 'O' Level Examination. The retention of the existing curriculum has the additional advantage of allowing pupils who withdraw from the program to re-enter the mainstream easily. At both the primary and secondary levels, pupils follow the regular curriculum with enrichment in all the core subjects except for Second Language. In P6, they are required to do Social Studies as an additional examination subject at the PSLE. At the end of S2, pupils in the GEP choose one of two programs available: either a science-based or an arts-based program. All GEP pupils are required to take a minimum of 8 subjects at the 'O' Level Examination. Outstanding GEP pupils are permitted to take a minimum of 10 subjects. The curriculum is differentiated in terms of content, process, product, and learning environment.

PROMOTION

In P4 and P5 and from S1 to S3, the GEP pupils are assessed for promotion according to their performance in assessments and examinations of the GEP. In P6, the pupils have to take the PSLE at the end of the year, like all pupils in the regular stream. However, besides the 4 core subjects (English Language, Second Language, Mathematics, and Science), the GEP pupils also take the Social Studies exam. Promotion to S1 GEP is based on 3 criteria: performance in the GEP from P4 to P6; attitude towards enrichment and work in the GEP; and the PSLE results.

MENTORSHIP

The Science Research Program, a mentor program, was established in 1988 by the Faculty of Science at the National University of Singapore (NUS) in collaboration with the Gifted Education Unit of the Ministry of Education. The main objective of this program is to provide selected first-year Junior College Science students, who have an interest in and aptitude for scientific research, with the opportunity to participate in research projects under the guidance of scientists and engineers from NUS. Currently, mentors for the program are drawn from the National University of Singapore. The program is sponsored by the Shaw Foundation. First-year Junior College Science students are eligible for the program and selected on the basis of several criteria, such as recommendation by teachers and principals, demonstrated interest in science and/or mathematics and good secondary school academic records.

The program comprises 3 parts: Science Seminar,

Mentorship Attachment and Science Research Congress. The Science Seminar offers students an opportunity to experience recent developments in the world of science and technology. At the end of the Seminar, each student will be matched with a research scientist according to his/her research interest.

The Mentorship Attachment offers students the chance to work on research projects in Science, Medicine, and Engineering under the guidance of NUS mentors. Each student is expected to write a scientific paper which will be published as proceedings at the Research Congress.

The Science Research Congress offers students an opportunity to communicate their research findings to an audience of NUS scientists and interested Junior College (JC) Science students.

Problems and Perspectives

Special education programs for gifted children in Singapore have existed for only a few years. The government has put a great deal of effort into designing and implementing differentiated programs for the gifted. Though not operated on a large scale and aiming at "talent development for all," a notable achievement has been made and continuous progress can be expected.

However, the shortage of experts and well-trained teachers working for gifted education and the need for a more comprehensive gifted and talented program remain as challenges for educational authorities in the near future. How to extend the program without interfering with educational equality would be an additional issue of public concern.

Taiwan, R.O.C.

For the past several decades, Taiwan, R.O.C. has been undergoing a transition from an agricultural to an industrial industry and has given high priority to the development of its educational system. It is believed that economic success in Taiwan is closely tied to the acquisition of proper educational credentials. Because of this, getting a good education is considered to be the primary goal of all citizens during childhood and early adolescence (Stevenson et al., 1992; Wu, 1991).

The government's interest in education for gifted and talented students grew out of the recognition that an island with few natural resources must develop its human resources. Steps have been taken during the past several decades not only to improve education generally, but also to give greater attention to the education of all individuals with special needs (Wu, 1989, 1991, 1992). In 1968, compulsory education was extended from six to nine years and accompanying legislation specified that special education was to be provided for both gifted and handicapped children. In 1973, the Ministry of

Education launched a pilot program throughout Taiwan for intellectually gifted elementary school students. The experimental program was extended to the junior high level in 1979 and to the senior high level in 1982. All of these programs are operated through the public school system; the government plays an almost exclusive role in setting up and funding special education programs. Programs also have been designed for pupils with special talents since 1973. Different to the one for the gifted, these programs could also be administered by private schools.

Programs in Taiwan implemented for gifted and talented students are of three types according to the Special Education Law of 1984: programs for the intellectually gifted, programs in mathematics, science, and language and programs for students talented in fine arts, music, and dance.

Identification Procedures

In the classes set up for the intellectually gifted, subjects are first screened by the school itself through group intelligence tests, students' daily performances and teachers' observation. Then a series of group and individual standardized tests are administered to the upper 10% screened as potential candidates. The identification process is thus based on a multiple assessment procedure. The students finally selected must meet the following criteria:

(1) a score higher than two standard deviations above the mean on the IQ test;

(2) a grade point average in the top 2% of their school peers at the same grade, or a score higher than two standard deviations above the mean on an achievement test covering major subjects in the curriculum.

In order to be enrolled in the mathematically and/or scientifically talented programs, students must receive a score higher than one and a half standard deviations above the mean on an intelligence test and achievement tests in mathematics and/or science. In addition, they must have a grade point average in the top 1% of their school peers at the same grade in mathematics or science, or have demonstrated an outstanding performance in a national or international competition.

With regard to the special classes for the artistically and musically talented, children are assessed through their performance in fine arts, on musical instruments and through a series of artistic or musical aptitude tests. As to the talented in dance, the eligibility criterion is mainly focused on the dancing performance. Those who have ended up with distinguished performance in some national or international contest are also accepted. However, in order to be classified as talented, an above average IQ is an essential requirement.

Once students have tentatively been identified as gifted or talented, a committee made up of teachers

and administrators from the students' school submits a report to the county department of education. After further screening by the department, qualified students are placed in appropriate special programs or classes.

Current Programs

Currently, there are two main approaches to the education of gifted and talented students in Taiwan. In the "special class" approach, gifted or talented students are grouped in one class and the curriculum is enriched to meet their needs. The other approach, the "pull-out" program, keeps students in regular classes but gives them access to a special "resource classroom." Students in these classrooms receive tutoring to supplement the standard curriculum and have access to special materials.

The government has expanded the number of programs for gifted students greatly during the past decade. In 1991, 144 elementary schools, 117 junior high schools and 46 senior high schools were conducting programs for gifted and/or talented students (Ministry of Education, R.O.C., 1991). More than 25,000 students participated in these programs—a four-fold expansion since 1982, when only 5800 students were enrolled.

According to the Special Education Law of 1984, students who are deemed to be generally gifted and distinguish themselves in all areas of study are allowed to skip one year (or more in special cases) in elementary, junior or senior high school. Students who are identified as being talented in mathematics, science, Chinese or English, have the opportunity to take part in special camps and programs conducted by universities. Alternatively, they may qualify to bypass university entrance examinations and be directly admitted to universities majoring in pure science, such as chemistry, physics and mathematics or Chinese/English departments. Gifted students are not given privileged entrance into applied sciences such as engineering, medicine, or business.

Problems and Perspectives

As Taiwan has continued to develop economically, the government has placed more and more emphasis on improving the quality of education offered to its citizens. In fact, improvement of education is part of a new six-year national development project (1991–1997) that is currently being launched. Education for the gifted is likely to benefit greatly from this project, for the government considers the performance of gifted students to be an important indicator of the general quality of education being provided throughout the nation. Moreover, education authorities also hope to use teaching methods developed for the gifted with average students, especially methods for promoting problem-solving and creative thinking (Stevenson et al., 1992).

The current system of education for the gifted and talented is not problem free, however. It is believed that the rigid school examination system undermines gifted and talented education. Talented students, for example, are often torn between developing their special talents and preparing for the entrance examinations that are so important for their future success. Consequently, many parents and educators have become advocates for comprehensive programs of gifted education that continue from kindergarten through college (Stevenson et al., 1992; Wu, 1989).

Other critics believe that the programs for the gifted place too much emphasis on preparing students for the entrance examinations, rather than attempting to broaden their knowledge and abilities. Another objection is that students talented in mathematics and science should not be restricted to careers that emphasize only pure science. Some parents have actually kept their children out of such gifted programs so that they would later have the option of pursuing careers in other fields, such as engineering or medicine (Stevenson et al., 1992).

Concerning the "ability grouping" method, debate continues about the relative merits of the "self-contained" and "resource classroom" approaches. Students in self-contained classrooms performed better on assigned academic and creativity tasks than their counterparts assigned to resource classrooms (Wu, 1986). However, some critics have expressed concerns about whether appropriate affective development of students takes place in the self-contained classes (Kuo, 1983). There are also those who have complained that the curriculum from the resource classroom and the regular classroom are not adequately integrated and that trying to keep up with both overburdens students (Stevenson et al., 1992; Wu, 1986).

The immediate goals of gifted and talented education in Taiwan, R.O.C. are to deepen and broaden the expertise and materials available to the school. Enriched materials necessary to sustain sophisticated programs from early education through high school are being developed and field tested by university professors and school teachers across the country (Wu, 1991). Concurrently, teachers, administrators, university personnel, and government educational officials are being trained to understand, develop and direct programs for the gifted. It is hoped that these leaders will guide the programs for the gifted and talented in the following directions in the near future: program expansion, placement alternatives, program experimentation, program evaluation, program integration, preschool gifted education, gifted-handicapped, and ecological planning (Wu, 1992).

Thailand

Gifted education, as a discipline, is quite new in Thailand. The Royal Thai Government and King's

scholarships program has been in operation for over 60 years, providing for a few selected, outstanding high school students to study abroad each year. However, there has not yet been a national policy on gifted and talented education. There have been no opportunities for gifted students to participate in an enriched or in-depth study, outside of what is already stipulated in the curriculum.

Since 1980, recognition of the educational needs of gifted children has increased and a small number of educators have become interested in providing differentiated educational programs for the gifted and talented. There are two different beliefs among the promoters of gifted education in Thailand. The first group believes that every child is born endowed with different special gifts and that each child should be nurtured and encouraged. The second group believes that each child is different and the one endowed with special gifts should be identified and promoted through differentiated educational programs.

The model of the first group is to work with parents and teachers to bring out the full potentialities of each child. This group concentrates more on parent education, early childhood education and improved instruction in the classroom. The model of the second group is to identify the gifted and talented and to give appropriate assistance. This group works on testing and enrichment programs.

Programs and Projects

Three organizations have begun working in different areas of gifted education. They are the Foundation for the Promotion of Gifted Children; the Department of Special Education, Faculty of Education, Srinakharinwirot University; and the Institute for the Promotion of Teaching Science and Technology (Sunhachawee, Promboon, & Phothisuk, 1992).

The Foundation for the Promotion of Gifted Children, in association with the Department of Special Education, Srinakharinwirot University, works on training parents and teachers once a year, involved in summer programs in arts and creative writing for young children and in science for gifted high school students. The Foundation also collaborates with 10 schools and universities to prepare reading materials for students and teaching materials for teachers, in the gifted education program.

The Department of Special Education, Faculty of Education, Srinakharinwirot University has offered a M.Ed. program in gifted education since 1991. The Institute for the Promotion of Teaching Science and Technology works on the following projects:

(a) The Long-term Scholarship Project, which started in 1984, grants full government scholarships to outstanding high school and undergraduate students. This continues throughout their school and college years until they receive Ph.D. degrees and become scientists. Those who graduate are guaranteed positions

in government organizations, mainly in research and development sections, or in universities' schools of science. The total number of students in this program in 1992 is 439 (416 are studying and 23 are working). Six high schools and 6 Thai universities, constituting 6 pairs of school-university cooperative units, are participating in this project.

(b) The National Science and Mathematics Olympiads project was started in 1988 by a Thai observer at an International Mathematics Olympiad without any governmental support. Since 1991, the annual selection and training of high school students to compete in 5 international Science and Mathematics Olympiads such as Math, Chemistry, Biology, Physics, and Informatics has been carried out with the Government's full support. The Government has also agreed to sponsor the Sixth International Biology Olympiad in 1995 and provide 15 full scholarships to the finalists in National Olympiads for long term study from 1993.

Problems and Perspectives

Despite the fact that there are a number of national projects to promote giftedness and talent among Thai children and youth, most projects are oriented toward scholarships and competitions or contests. This results in a very limited number of children who are supported by special attention.

Thailand is in need of more experts in this area to design and develop educational infrastructure aimed at the identification and development of gifted and talented children at early ages. It is expected that there will be more activities and programs for the gifted and talented, and, in the near future, a well-defined national policy for gifted education in Thailand.

Summary and Conclusions

Programs for gifted and talented children in Asia are new, with the majority having been established during the last decade. The most vigorous efforts are being made in Taiwan. People in Taiwan, aware of its delicate economic position as a result of scarce natural resources, have promoted education as a means of advancing their society. In this effort, the governments have introduced a wide variety of programs for gifted and talented students during the regular school day as well as after school. Notable advances have also been made recently in Korea and Singapore, considering that gifted education programs are mostly found in public schools and have received strong official approval. On the other hand, Japan supports no programs specifically for gifted students prior to the high school years. In Hong Kong, Indonesia, the Philippines, and Thailand, gifted education is mainly operated by private agencies and/or on a small scale.

Political philosophy is obviously not a critical factor in

determining whether programs for gifted students will be established. The socialist government of mainland China promotes egalitarianism, but it also believes that well-trained scientists, mathematicians, and other professionals are important for the advancement of the country. The government assumes that the best way to develop such individuals is to nurture those students who give evidence of outstanding abilities (Stevenson et al., 1992). Japan, on the other hand, had a bitter experience with social elitism before World War II and since then has taken vigorous steps to avoid the emergence of groups that would dominate the political and social life of the country (Hirona, 1992). As a result, Japan makes strong efforts to ensure that all children begin school with equal knowledge and receive equal educational opportunities during their elementary school years. The Japanese explain that some children emerge as more effective students than others, but this occurs not because of their exceptionally high innate abilities or high social status, but because they have taken advantage of their opportunities and worked hard in school. Thus, high schools serving only highly able students are justified because these students have already shown that they are more likely to benefit from a more demanding curriculum than their average peers.

It appears that neither the level of economic development nor the quality of schools and universities determines whether or not programs for the education of gifted and talented students will be established in any particular country. The critical difference is the culture's philosophy of education (Stevenson et al., 1992). In an effort to promote egalitarianism, all elementary school students in Japan are required to remain with their classmates regardless of their level of intelligence or of academic achievement. In contrast, some countries mentioned in this article, seeking to enhance the contribution of gifted and talented students to their societies, have developed elaborate programs of special education. The natural experiments that are taking place in these cultures will provide information about gifted and talented students that will be of interest throughout the world (Stevenson et al., 1992).

It is obvious that some countries in the Asian region are not so blessed as to have official state backing for gifted education. In some, the gifted are lumped together under the rubric "exceptional children" which includes the handicapped. In others, gifted education is a matter of organizational commitment. There is, to be sure, the perennial problematic gap between rhetoric and action, between policy and implementation (Roldan, 1992). Nevertheless, the increasingly explicit endorsement of gifted/talented education in countries which previously frowned on it in the name of "egalitarianism" is perhaps reflective of a global realization that growth must now be measured in terms of human development, that is, the individual's realization of his or her inherent potential, as Gallagher stated in 1985.

What and who is considered intelligent or gifted/talented in our cultures, our nations, or region? At this historical

juncture, the question has been posed, but it has not been properly addressed. The answer is closely related to the vision and goals of gifted education and all schooling for that matter, in our particular context.

In the overview of gifted education worldwide, Passow (1985) gave two reasons for excluding the United States. His reasons were (a) because the diversity of practice is so great and (b) because anything found elsewhere in the world can be found somewhere in the United States. The converse may give a better picture of the reality. Practically all programs and curricula for the gifted and talented in Asia have been modeled, if not outrightly transplanted, from somewhere in the West. There is nothing essentially wrong with borrowing from other cultures. However, we should pause and look more closely at what and how we borrow. In the 1984 Asian survey (Roldan, 1985), for instance, the preferred model of gifted education among Asia/Pacific educators was "enrichment in the regular classroom." Thus we were borrowing, as it were, merely pieces or chunks. As a result, the kind of differentiated curriculum that is now seen as the hallmark of gifted education was—as of 1984—nonexistent in Asia. There are indications in the 1992 Asian survey (Roldan, 1992), that a distinct curriculum for the gifted, different from the regular school curriculum, has made its appearance on the Asian scene.

It seems that, with the acceptance of a differentiated and distinct curriculum for the gifted, rather than merely enrichment or acceleration, the question of the goals of gifted education in the Asian area becomes an acute one (Roldan, 1992). Admittedly, Asian countries are at different levels of development and, therefore, are at different levels in their capacity to help gifted children. But it may be at this point where the pooling of expertise and resources becomes important. We have so often heard of the "global village" to which we all belong. It is believed that a future of collaboration between countries and areas is indeed crucial and urgent, because there is so much that needs to be done and today's generation of gifted children are fast growing up!

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Programs and Practices for Identifying and Nurturing Giftedness and Talent in the People's Republic of China

ZHA ZIXIU

*Institute of Psychology, Chinese Academy of Sciences,
Beijing, People's Republic of China*

Introduction

In China, the selection and education of gifted children, called "child prodigies", dates from ancient times. An examination system for selecting gifted children known as "The Child Examination" had existed in the feudal dynasties since the Western Han Dynasty (206 B.C.). However, it is only since 1978 that a widespread, systematic and scientific research on and education of gifted children has been undertaken. The year 1978 marked an abrupt turn in Chinese history. The country energetically encouraged four areas of modernization—agriculture, industry, national defense and science and technology. Since then, large numbers of talented scientists, engineers and other experts have been urgently needed. In response to this need, a new research project on identifying, studying and educating of gifted children has been undertaken (Zha, 1985).

The purposes of the research are (1) to identify and distinguish extraordinary children who are gifted intellectually and to educate them so as to promote and accelerate the proper development of their potential; (2) to explore the factors which accelerate the development of intelligence in such children and analyze the process of formation so as to improve the education of all children and thus raise the level of mental development of future generations and (3) on the basis of the above results, to accumulate material for exploring theoretical problems concerning children's development, such as the relationship between intelligence and personality, the function of nature and nurture in the growth of children and so on.

A Cooperative Research Group of Supernormal Children of China (CRGSCC) was set up across the country in 1978 to study gifted children cooperatively. Under the leadership and influence of the CRGSCC, hundreds of gifted children and adolescents have been investigated and followed up; a series of comparative studies on cognitive ability and personality trait have been carried out; a battery of cognitive ability tests and personality trait questionnaires have been compiled; and various kinds of gifted education have been developed rapidly.

Identification

How can gifted children be identified? What are the criteria and methods to be used? These problems are closely related to the concept of giftedness. In our opinion, gifted children are not only highly developed in intelligence or ability but also possess greater creative potential and other positive personality traits. All these factors interact with each other to form the mental structure of the gifted. On the basis of this view of giftedness, the principles and procedures for identifying the gifted were explored and formed progressively (Zha, 1983, 1986a, 1990b).

Principles for Identifying the Gifted

In light of foreign experience (Roedell et al., 1980; Khatena, 1982; Tannenbaum, 1983; Freeman, 1985) and on the basis of our own practice and exploration for identifying the gifted, the following principles for identifying gifted children have been formulated.

(1) *Identification in a dynamic comparative investigation.* Since the intelligence of gifted children is developing rather than fixed and the development is defined by cultural, environmental and educational conditions, identification of the gifted was carried out in a dynamic comparison with normal children of the same age under similar conditions.

(2) *Identification with multi-criteria and multi-methods.* Since there may be different intellectual patterns of giftedness and since intelligence is multidimensional, a variety of criteria and relevant methods are needed.

(3) *Investigation of personality traits as well as intelligence.* Since excellent achievement depends on not only superior intelligence but also on certain personality traits, both intelligence and non-intelligence factors are equally important for the identification of gifted children.

(4) *Analyze the results of the children's responses as well as the processes, forms and strategies involved.* In viewing the development of intelligence as a dialectic

unity of quantitative and qualitative changes, the children are identified on the basis of both the results and speed of their responses as well as on the basis of the processes, forms and strategies of the responses.

(5) *Correlate identification with special education.* Identification is a means to serve the education of gifted children and education can not only raise the level of giftedness but also serves to continue the identification in the practical setting. Giftedness is influenced by the environment and education to which the children have been exposed. Therefore it is necessary to continue monitoring the gifted during the educational process as a continuation of the identification process.

Criteria and Methods for Identifying the Gifted

On the basis of the above mentioned principles, the following criteria and methods for identifying the gifted shown in Table 1 were adopted.

TABLE 1
Criteria and Methods of the Study and Identification

Dynamic comparative research		
	Criteria	Methods
Cognition	thinking, observation, memory	cognitive experiment, intellectual test
Creativity	creative thinking, creative imagination, ability to solve problems creatively	creative thinking test, analysis of the process of creative activities etc.
Learning ability	speed style depth firmness	test concerning learning ability and achievement, observation and analysis of learning process
	of mastery of knowledge	
Special talent	math, foreign language, leadership, drawing, calligraphy, music	test concerning special talent, assessment and observation of product (or home work)
Personality trait	interest, motivation, intellectual curiosity, confidence, persistence, independence etc.	questionnaire, observation, educational experiment, interview etc.

The Identification Procedure

The following five-step procedure was used to identify the gifted children:

Step 1. General survey. Children, who want to enter their name for a gifted class, or their parents/recommenders should fill a form, including children's

developmental history, facts of gifted expression, family education, family background etc.

Step 2. Primary screening test. To test either knowledge and ability concerning the major subject, or general intelligence. In addition to formal/informal intelligence tests, the Wechsler Preschool and Primary Scale of Intelligence (revised) has been used for measuring general intelligence.

Step 3. Retest. To test by means of the "Test for Identifying the Cognitive Ability of Supernormal Children" compiled by the CRGSCC. There are three criteria for the gifted: a score which is two or more standard deviations above the mean score of the same aged children; a score above the mean score of the children two years older; a score over the 95th percentile of the same aged children. For the children with special talents, their school works such as composition, painting, machine models, etc., should be appraised by experts.

Step 4. Further investigation. To understand the personality traits of the children who have passed the retest, former teachers of the children are questioned.

Step 5. Identifying through practice. Make a comprehensive analysis of the above information for the children who have passed step 4 and then predetermine whether the children are candidates. The children who have passed the predetermination are followed up individually or are enrolled in a special experimental class (for one semester or longer) where their ability to solve problems and personality traits are investigated. Here, further identification through practice (student's learning process) is emphasized. This idea is based on the view that high ability and non-intellectual personality traits are formed and expressed in the practical activity of a human-being. The major practical activity of children is learning, i.e., education. Hence, to educate them in equal conditions and environment and investigate their potential and actual performance levels, is a continuation of the whole identification procedure.

In China, the instruments and methods which could be used in the identification of the gifted are far from satisfactory. Our research implied that as there are different kinds of gifted children, they also differ from normal children in different ways. Therefore, various criteria should be determined for the design of effective tests and appropriate methods for identifying different kinds of gifted children. This problem concerns not only the need for better instruments but also requires a better comprehension of the concept of giftedness. Consequently, the solution of the improved instruments problem should be based on theoretical research.

Gifted Education

In China, attention has long been given to the talented children in the fields of arts (music, painting and dance) and special schools/classes have been established to nurture these talents. However, special education for intel-

lectually gifted children has not received much attention prior to 1978. The establishment of the gifted youth class in Chinese Science and Technology University (CSTU) in 1978 marked the beginning of experimental educational procedures for the gifted children in China (Xin, 1986; Zhu, 1987). At first, several schools permitted advance enrollment for gifted children or permitted grade skipping. Since 1984 several experimental classes for the gifted have been set up in primary and high schools (Zhou, 1986; Wu, 1987; Zha, 1990a).

Kinds of Gifted Education

During the past fourteen years, four kinds of special education programs have been in existence for gifted children and adolescents, which are summarized in Table 2

TABLE 2
Kinds of Gifted Education

<i>Kind</i>	<i>Description</i>
Enrolled earlier or skip	The gifted who have passed certain examination are allowed to enter primary/high school or university earlier than the normal, or jump into higher class.
Special class	Gifted experimental classes have been held in more than 50 primary/high schools overall the country; besides, more than 10 universities have set up gifted youth classes for adolescents.
Special activity within/without the campus	Special courses for computer and the Olympic school of mathematics (physics/chemistry) have been held in certain districts overall the country; children's palace has been set up to organize various science/arts courses; activities concerning scientific research, invention, and arts have been undertaken in school.
Instructed individually	The gifted, who are studying in the normal class, are instructed individually by the teacher/parents to learn in advance or undertake research work in leisure time.

Characteristics of the Gifted Experimental Class

The gifted experimental class differs from normal classes in the following ways (Tao, 1987; Di, 1990; Zha, 1990a).

(1) The establishment of the gifted experimental class is based on the intelligence or special talent of the children, while the normal class is based on age and cultural knowledge.

(2) The period of schooling has been shortened for the gifted experimental class. In both primary and high

school the period is four years for the gifted, while in normal schools the period is six years.

(3) In addition to the all-round development—morally, intellectually and physically—provided in the normal classes, gifted children are encouraged to develop analytic skills and to solve problems creatively and to develop good personality traits.

(4) There are elective courses which are appropriate for the interests and needs of gifted children in the experimental classes and these are intended to further develop their potential and abilities.

(5) Teaching materials are modified according to the cognitive levels and traits of the gifted children to promote the development of their creative ability and reasoning skills.

(6) The instructional strategy attempts to make full use of and promote students' ability to study independently. Heuristic, discussion and research methods are adopted instead of cramming.

(7) Attention is focused on the development of students' self-concept and self-evaluation. In addition, the students are supported in setting up high ideals and developing abilities of self-regulation, self-education and self-actualization.

(8) A proper balance is maintained in the relationship between collective education and personality development. Students should arrange part of their study time at school on their own, so as to develop their own interests and abilities.

(9) The assessment of the results of the educational program depends not only on academic performance (e.g., test results, proportion of students entering a higher grade school etc.) but also on appropriate criteria and methods which assess the all-round development of the gifted.

Effects of the Educational Programme

Remarkable progress in gifted education has been achieved in China since 1978. The main results are as follows.

Gifted children and adolescents completed their studies in a shorter period and with excellent results.

Gifted children, who studied in primary/high school, graduated from high school earlier than the same aged normal children with excellent results through either gifted classes or by skipping grades in normal schools. For example, in Beijing No. 8 high school, students of the first gifted class finished the curriculums of fifth and sixth grades of primary school together with all the curriculums of high school within four years, which is four years less than the normal period. They passed the unified university entrance examination with a total score 35.9 higher than the normal class of that school. Subsequently, 27 students (average age 14) out of 29 have been enrolled by key universities (Gong, 1990).

The gifted adolescents, averaging less than 15 years of age, have been enrolled in either gifted youth classes

or normal classes of universities as undergraduates since 1978. Results here have also been excellent. For example, up to 1988 the CSTU held eleven gifted youth classes, with a total registration of 407 students. Six classes of 190 students graduated from CSTU within six years (1983–1988). Among them 75% had been enrolled in domestic/overseas graduate schools. In addition, from 1981 to 1987, 45 students of the gifted youth class enrolled as graduate students of CUSPEA (a Sino-American cooperative program for training graduate students) (He, 1990).

Overall, gifted education has been beneficial in developing the potentials of gifted children and adolescents. The gifted children and adolescents, who showed extraordinary progress in learning, made further gains in intelligence through gifted education. For example, research has examined the students of the first class of the Beijing No. 8 high school shortly before graduation by means of seven tests, including creative thinking and analogical reasoning and compared the results with both same aged normal students and the older students of the same grade. The comparison showed that the gifted scored notably higher than the same aged normals on each test and scored higher than the same grade normal, who were three to five years older, on five tests.

A battery of creative thinking tests have been used to examine a sample of the gifted students of the third year gifted youth class of CSTU and the normal students

of the same age (sampled from freshmen/high school students). The results showed that mean scores of the students from the gifted youth class are markedly higher than those of the normal students (Kang, 1985).

Gifted children and adolescents were in good health during the course of gifted education. During the course of gifted education, physical examinations were carried out for the gifted children and adolescents. In general, the average values of height, weight and chest measurement of the gifted reached/exceeded those of the same aged normal children of the country. For example, the CSTU investigated the students from the gifted youth class by physique criteria issued by the State Education Commission, Ministry of Public Health and State Athletic Commission. Results showed that most of the students of the gifted youth class exceeded the criteria. This suggests that to enter school earlier or to shorten the period of schooling is not related in a negative way with the health of the gifted (Xin, 1986).

The meaning of the above results can be summarized as follows:

- (1) The gifted children possess tremendous potential and the potential could be thoroughly developed through gifted education in accordance with their levels and characteristics.
- (2) The gifted education experiments of primary and high school have been established and coordinated with gifted youth classes of universities. Though the gifted

TABLE 3
Types of the Developmental Processes of the Gifted

<i>Type</i>	<i>Presentation</i>	<i>Cause</i>
Skipping	The precocious either entered primary school earlier or skipped into higher class of primary/high school or university. In a word, leaped forward steadily in all the study period.	Appropriate conditions for development are provided by family/school for child who was possessed of good personality traits.
Waving	The precocious, who entered primary school earlier, dropped to an ordinary level for a time. Then again became the best among the successful students via appropriate help.	Suffered setbacks in school; parents took less care of the child who was lacking self-control; certain unhealthy behavior problems; or cut school too much.
Up-and-coming	Though not gifted in childhood, performed a brilliant feat on certain conditions (e.g. win a prize in an arithmetic contest etc.). Then received attention from teacher/parents and developed excellently and steadily.	Lack of early education; developed lately out of certain causes (e.g., nursed by the aged in the country-side etc.).
Dropping	The precocious though gifted in childhood (even in high school) helplessly dropped to an ordinary level (even under the ordinary) in high school or university.	Poor personality trait (e.g. lack of tolerance, lower self-control capability etc.) led to decline in development.

educational system is still in an embryonic form, it fills in the gaps in the normal educational system of China.

(3) The gifted experimental class and youth class in China provide an experimental base for systematic research on the mental development of gifted children.

The Developmental Processes of and Conditions for the Gifted

According to the educational experiments and longitudinal studies of the gifted children and adolescents, the developmental processes of and conditions for the gifted may be summarized as follows.

Types of the Developmental Processes

Analyses of the developmental processes of the gifted indicate that these may be out of balance. There are four types of processes as shown in Table 3.

Table 3 shows that three factors, which influence and correlate with each other, determine the development of the gifted. They are: (1) good heredity quality, (2) appropriate education and environment and (3) active personality traits.

The Developmental Conditions

There are three important conditions which are required for the development of the gifted (Zha, 1983, 1986b). First, a good family environment and early education provides the basis for the children's growth. Most of the subjects had a good early education. The average age of the gifted children who received early education is 3.5 and more than 70% of them began to be educated between 2 and 4 years of age.

Early education was carried out in a variety of planned ways, such as telling stories, or visiting zoos, museums and other places as a way of giving the child some understanding of nature and the environment. Many parents taught their child to read when he/she was just learning to speak and also devoted attention to counting and calculating, to promote the development of reasoning in their child. This attention also allowed the parents to notice any special talents in the embryonic stage. Many parents not only provided their child with various kinds of books, toys and other opportunities for learning but also were adept at guiding the child in accordance with his/her levels and traits. Thus, the child was encouraged to develop in an all-round way—physically, intellectually and morally.

Second, appropriate school education is the key condition for further development of gifted children. In China, children who are extremely superior are now allowed to enter school earlier or to skip to a higher grade. In addition to the gifted youth classes of universities, special education programs for gifted

children have been designed. Positive results have been obtained, as described above. Along with many extra-curricular classes (such as drawing, dancing, playing instruments, etc.), a variety of competitions (e.g., mathematics/physics/chemistry Olympics, composition, invention, etc.) also benefit the gifted children. All these educational initiatives facilitate the further development of gifted children and adolescents.

Thirdly, some personality traits are important factors for promoting development. The research results show that gifted children possess not only well-developed intellectual ability and high creativity but also wide-ranging interests, high curiosity, intrinsic motivation, confidence, independence and persistence. These personality traits serve the function of orienting inner drive and providing inspiration during the developmental process of gifted children.

Gifted children who possess some of these personality traits attempt to probe into matters which interest them until it is understood. Especially when they want to learn or do something they are so enthusiastic that they do not allow anything to disrupt their activity. They are able to avoid distraction and disturbance and thus show strong willpower. In short, the more the child thirsts for learning or doing the more he/she advances and develops. It shows that certain personality traits are very important for the growth of gifted children.

In taking all these results into account, it is clear that inherent endowment provides only the potential for development. It is the good family environment, early education, suitable school education and social conditions that transform possibility into actual supernormality. However, environment and education are only the external conditions: the children's own personality traits are important internal factors, through which the environmental variables can play their part.

In China the study of gifted children has only recently been started. Although the national cooperative study has achieved a great deal in a rather short period of time, many problems remain to be solved. For example, there is a lack of instruments for identification, there is a need for improved teacher training, the theoretical study of giftedness should be increased and so on. Chinese psychologists and educators are facing difficult tasks and must make great efforts to fulfill them.

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Programs and Practices for Identifying and Nurturing Giftedness and Talent in Australia and New Zealand

EDDIE J. BRAGGETT

Charles Sturt University, New South Wales, Australia

Introduction

A low-key movement to provide more adequately for gifted and talented students edged its way onto the Australian and New Zealand educational scene in the mid-1970s, a subtle blend of national and international forces. While it was a reaction to a wide spectrum of local policies which had extended and democratized educational provision over a period of 25 years, it also formed part of a worldwide movement which was increasingly concerned with the cultivation of gifted and talented behavior. Since the 1970s, the eight Australian states/territories and New Zealand (collectively known as *Australasia*) have grappled with the concept of giftedness within their egalitarian social systems, seeking to provide for individuality and excellence but striving to avoid the disparaging claims of elitism and privilege. The responses of the two countries have varied, as have the reactions of the separate states within Australia, often reflecting the strength of educational leadership and the ideologies of prevailing political factions. The following account analyzes the ebb and flow of these educational currents under four headings: (1) an egalitarian framework, (2) state and national policies, (3) educational provisions, and (4) future issues.

An Egalitarian Framework

Australia and New Zealand emerged from the 1940s with educational systems that provided mass education for students until 14 or 15 years of age, followed by a tapering provision for a minority who had college or university aspirations. While three Australian states had commenced a small number of primary (elementary) classes in the 1930s for "especially bright" pupils who suffered "injustice in classes where methods and curriculum were adapted to mediocrity" (Wyndham, 1932), there was no real attempt to provide for intellectual precocity in most primary schools which were characterized in general by uniformity and conformity. Secondary (high school) courses were academic and geared to university entrance requirements.

The population boom of the 1950s witnessed the eventual expansion of secondary education as retention rates increased, as the purpose of secondary school studies broadened, and as the majority of the student population increasingly aspired to further education. The 1960s and early 1970s were important in an evolutionary sense as student numbers soared, as class sizes swelled, as systems struggled to meet new demands, as facilities deteriorated, and as the goals of secondary education were recast. In a flurry of reform, schools were called on to provide for the full span of intellectual abilities, social (or age) groupings proved popular, and teachers were required to cope with a new breed of students from socio-economic groups not previously encountered in the senior years of the school system. There was a spirit of educational vibrancy in which teachers were expected to respond to a rapidly changing society.

To react to society's demands, the school was obliged to broaden its curriculum, to move away from the selective pathways of the past, to embrace issues of equity, and to assume a social function not formerly acknowledged. Selective schools gave way to comprehensive schools in some systems, many single-sex schools became co-educational, core curricula were developed, elective studies were devised, teaching was pitched at an *average* level, and teachers were asked to provide for disadvantaged groups in a multicultural society. It was a time of social reconstruction in which schools were called on to undertake, paradoxically, a leading but ill-defined role (Braggett, 1985).

In the zeal to meet society's challenges in a more equitable fashion, however, educators frequently ignored the needs of the most able—those who were academically or esthetically inclined—and assumed that gifted students possessed the qualities to ensure their own success. Resources were required to assist other students with special needs and it was not believed that gifted and talented students were included in this category. In its starkest form, the issue was seen in terms of alternatives: education could concentrate on the needs of disadvantaged groups or on the needs of gifted (often termed *privileged*) students. It could develop comprehensive schools

for all or provide differentially for separate groups. The prevailing spirit tilted the balance in favor of those with special needs, downplaying the equally legitimate claims of gifted students. In retrospect the Director General of Education in South Australia conceded in 1977 that we "let the highly gifted ride", an admission that "we could have done better for them" (cited in Braggett, 1985).

By 1975 a growing reaction was apparent from a variety of educational groups and from concerned parents who believed that more appropriate provision was required for gifted students. At least three New Zealand publications in the 1960s had concentrated on gifted children and these were followed by *Children with special abilities* (NZ Department, 1972), a handbook which brought together much of the earlier thinking. Within Australia, questions were posed in Western Australia, New South Wales, and Victoria, exploring the needs of able students and the type of education required for them. Hence, when a World Conference on Gifted Children was convened in London in 1975, the two countries collectively sent more than 30 delegates, and Professor Parkyn (1976) from New Zealand provided a keynote address on the *Identification and evaluation of gifted children*.

Almost two decades have now passed since the gifted movement surfaced, a period in which the two countries have sought to provide for gifted people in their individual ways. While there are similarities between the countries in terms of heritage, no common approach to gifted education has emerged and none is likely at present because of the diverse nature of the educational systems and the geographical distances involved. The Australian population of 18 million is scattered over a large continent equal in size to mainland U.S.A., the majority being found on the coastal strip with a preponderance in the south-east sector. Because education is a state right, Australia has eight distinct educational systems with different organizational structures, system networks, and curriculum development processes, and all are underpinned by political ideologies of varying shades. Twenty-five percent of the Australian school population is taught within church and private schools which have an additional degree of independence. New Zealand lies 2000 km across the Tasman Ocean to the south-east of Australia, a land of geographical contrasts ranging from pastoral plains to rugged alps and glacial rivers. Within this small country of 270,000 km², an area smaller than Italy and equal in size to the state of Colorado, the population of 3.4 million has developed a single (national) system of education in which there is considerable devolution of responsibility to the local school.

What is common to both countries is an egalitarian outlook that seeks to promote social justice, to remove handicaps, and to develop welfare systems for those in need. Such policies carry over to the educational systems where resources are made available for targeted groups who, it is believed, encounter difficulties in society. In New Zealand, for example, the Ministry of Education

aims to remove barriers to achievement, to break down cultural stereotypes that inhibit performance among minority groups, and to develop teacher awareness of the need to provide for a wide range of academic and social behaviors within the school. The Education Act of 1989 stipulates that "equity objectives shall underpin all activities within the school" and specifically mentions Maori, Pacific Islands, and other ethnic groups, as well as women and girls, students with disabilities, and students with special learning needs (NZ National Education Guidelines, 1990). Similar equity provisions are mandatory across Australia where particular mention is also made of Aboriginal students and those from the Torres Strait Islands.

While it may be argued that gifted education is itself an issue of equity, this is not always accepted by politicians or educators in Australasia. It is frequently stated that gifted and talented students do not need assistance beyond that provided by the traditional comprehensive primary or secondary school and that additional provision is tantamount to unwarranted privilege. Such attitudes are firmly based on an outmoded conception of giftedness in which it is assumed that ability is innate and fixed in quantity; that it is easily measured; that it will exhibit itself in normal life; and that it will enhance the person's chance of success in competition with others. As a consequence, there are many who believe that it is not only elitist to provide for gifted students but that it will discriminate even further against those with readily-perceived needs in society. There is little realization that giftedness is culturally based, developmental in nature, and intricately related to motivation, self-confidence, interest and sustained effort. Those concerned with gifted education in Australia and New Zealand must convince educational administrators and treasury officials of the true nature of giftedness within a multicultural framework if long-term gains are to be won. Only then will different provision be accepted within a legitimized range of options.

There is also a relationship between the political ideology espoused and the degree to which giftedness is specifically catered for within government schools in the various Australian states and territories. Political parties with social democratic traditions tend to favor policies aimed at equalizing social outcomes and overcoming social barriers. They avoid using such terminology as *gifted* and *talented*, referring instead to *special abilities* or *more able* children, and seek to provide for them within a mainstream setting, usually within the regular classroom itself. While resource teachers assist students with learning disabilities, no comparable provision may be made for those with special abilities. In short, the usual classroom setting and the regular teacher, with inservice or professional development assistance, are believed to afford the most appropriate education for gifted students and it is not accepted that the absence of special provision handicaps their development.

Political parties with a more conservative outlook, those geared more to a free-market economy, and

State and National Policies

Australia

those with anti-Labor attitudes are more likely to favor wider choice and diversity of school provision. These governments have been more receptive to the gifted and talented cause and have adopted policies that have led to special schools, special classes, and additional training of staff. Fiscal constraints over recent years have seen these developments occur within existing budgets and by the redistribution of resources rather than by the provision of additional capital.

It is difficult to convey the egalitarian sense that pervades Australasian society and it should not be considered to be a totally negative phenomenon. Social justice is a very real issue and, despite criticisms that have been leveled against governments in both countries, social attitudes have been modified, less advantaged groups have been assisted, and barriers to achievement have been removed. Those who succeed receive genuine applause and appreciation, particularly when they overcome obstacles on the way to their success. On the other hand, too much success may engender resentment and lead to the *tall poppy syndrome*: very tall poppies should be cut down. As Mitchell (1991) points out, there is a love/hate relationship with high achievers and continuing success is still a tainted term in the local vocabulary.

It is within this ethos that gifted and talented programs should be gauged within Australasia. There is an undoubted desire on both sides of the Tasman Ocean to widen the benefits of education, to promote high quality schooling within the regular classroom, and to provide inservice education for teachers in order to improve their effectiveness and allow them to cater for a wider range of abilities. This is generally conceived within a traditional lockstep method of organization, however, in which the majority of children cover similar work in groups and do not explore too far from the predetermined curriculum. As a consequence, some opposition is usually voiced when withdrawal groups, content or grade acceleration, special classes or differentiated programs are suggested. Some schools, regions, and entire systems have accepted society's egalitarian thrust and resisted demands for different forms of provision but others have forged ahead and introduced innovative and exciting programs that cater for individual needs.

In line with these advances, there is a feeling in some Australian states and in New Zealand that opposition to gifted programs is not as strong as it was ten years ago. Educational consultants who visit a number of schools report a deeper appreciation of the need to cater for a wider range of abilities, especially within the primary school, although teachers still favor such provision at the regular classroom level. There is some indication also that, when government (state) schools are involved, an increased level of teacher awareness is related to the existence of a publicized policy that has previously been released by the Minister or the State Department on the education of gifted and talented students.

Throughout the 1980s there was increasing pressure on State Departments and Ministries of Education to accept the challenge and to provide specific programs for gifted and talented children. All Australian states eventually issued policy statements which drew attention to the needs of such students, outlined the types of provision which might be made, and—in some cases—pledged resources for this purpose. As was to be expected, however, there was a wide diversity of approaches among the states and considerable differences in the extent of the commitments made.

Western Australia adopted the most radical of all policies based on a pyramid-type structure. Programs for the lower primary years (ages 5–8) were school based and designed to cater for approximately 5% of the age group; at the middle primary level (ages 8–10), 3% of children were selected for part-time withdrawal programs in strategically chosen schools with *special interest centers*; and, at the upper primary level (ages 10–12), classes were introduced for 2% of the children who were totally withdrawn for fast-paced scholastic courses but integrated with the rest of the school for expressive arts, physical education and other informal activities. At the secondary level, approximately 1½% were offered places in designated secondary schools where high calibre programs met their advanced intellectual needs while others attended secondary schools with specialities in such areas as music, dance/drama and languages (WA Policy, 1981).

This was claimed to be a total approach to gifted education because it provided enrichment, academic extension, and accelerated progression within the range of normal system options. An Academic Extension Branch was established within the state Department of Education, resources were committed, *talent searches* were conducted across the state each year, and inservice education was provided for teachers. Such innovative moves legitimized and embedded provision for gifted students within the mainstream of educational practice, a structure which enhanced planning, design, implementation and evaluation.

Most other states moved more slowly and developed less radical policies. They were more concerned with in-school provision and placed greater stress on enrichment within the school. Most were influenced by the Marland Report (1972) in which giftedness was conceived in a broadened form and by Renzulli's (1977) Enrichment Triad Model which was frequently used (and often misinterpreted) as the basis for in-class enrichment. An analysis of the policies developed by New South Wales, South Australia, Northern Territory, Queensland, Tasmania, and the Australian Capital Territory (ACT) reveals a spectrum of provisions ranging from special classes, regional consultants, and centralized mentor programs at one end of the continuum through to enrichment for

able students within the normal class at the other end. In those cases where schools were exhorted to provide for the gifted but were given no additional resources to do so, the results were patchy and it was not uncommon for platitudes to substitute for action.

In Victoria, no official policy was originally promulgated by the Department of Education but a Gifted Children Task Force was established, enrichment and extension programs were provided on a cluster group basis (often involving both state and private schools), a mentor register was developed for the state, and one high school in Melbourne introduced a radically differentiated acceleration program whereby students could complete six years of secondary education in four years. Victoria was an early leader in gifted education (GCTF, 1983).

Most states have modified their policies over time, sometimes reflecting changing attitudes to education. In South Australia, for example, there have been three policies which have reflected different educational ideals. The first was a *Policy on the Education of Intellectually Gifted Children* (SA Policy, 1979) but this was changed in 1983 to *Fostering Gifts and Talents among Children* (SA Policy, 1983), an egalitarian redirection which took the spotlight off gifted students and stressed the imperative of catering for a range of individual differences within the classroom. By late 1992 it was acknowledged that this policy lacked specific direction for the most able students (Minchin, 1992) and the Minister of Education announced the creation of six focus schools to assist "all teachers to identify students with high intellectual potential and to develop appropriate programs for them" (Crafter, 1992). At the same time it was revealed that a revised state policy would be issued, that some students would participate in accelerated learning schemes, that programs and support materials would be prepared and distributed, and that training programs in the area of gifted education would be devised for teachers.

In other instances, policies have been modified when new governments with different political ideologies have assumed power. When 27 years of Conservative government in Victoria came to an end in 1982, the new Labor Government changed the former policy of "equality of opportunity for all students" and stressed instead the *equality of outcomes*, based on the premise that differences among learners are quantitative, not qualitative, in nature (Victoria Ministerial Papers, 1983). The education spokesperson, who was to become the Premier of the state, claimed that gifted programs are a means by which "a ruling class stays dominant both in education and in the shaping of our political economy" (Kirner, 1984). As a consequence, programs for gifted students were de-emphasized and staff cuts were effected in this area of education but, with the defeat of the Labor Government late in 1992, the stage was set for a resurgence of interest in gifted provision.

At the commencement of 1993, all Australian states had policies relating to gifted and talented students,

some modified from earlier years. A few were relatively general and did not indicate a real commitment to gifted education while others reflected a system concern that led to quality program implementation. The main policy provisions, currently in effect, are outlined below.

- The strong thrust that earlier characterized Western Australia changed in some ways when responsibility for gifted education was transferred from the state's central office to the regional level. Overall, however, the specialized secondary school programs continue and are genuinely entrenched within mainstream provision; the part-time withdrawal programs for primary school children continue with strong support; and a range of school-based programs operate throughout the state. A new policy is currently being developed (WA Policy, 1984; Peters, 1992).

- Queensland maintains a supportive approach through a state coordinator of gifted and talented education and through regional consultants, who develop networks, organize cluster activities, provide inservice training, develop and distribute resources, organize specialist camps, and implement school programs and policies (Queensland Department of Education, 1991; Rankin, 1992).

- South Australia is re-asserting the needs of gifted students and developing new focus schools for those with high intellectual potential, an initiative to supplement the Special Interest Secondary Schools which provide for music, languages, agriculture and gymnastics at an advanced level (Minchin, 1992; Crafter, 1992).

- Northern Territory, in addition to a system-wide identification program, provides special classes, permits accelerated progression in a number of different forms, inservices teachers in enrichment strategies, provides state-sponsored camps, and emphasizes the special abilities of students from different ethnic groups, including the Aboriginal population (NT Policy, 1992).

- Tasmania and the ACT provide much less system direction and leave it to individual schools to develop their own programs (Tasmania Education Department, 1984; ACT, 1991). Tasmania has disbanded the special units which previously existed, moved consultants into other priority areas, and allowed the gifted and talented coordinator's position to lapse (Fish, 1991). The ACT has incorporated its consultancy service under the rubric of *special needs* (ACT, 1991).

- Since a Conservative government was elected in New South Wales in 1989, new measures have been introduced to cater for the gifted and talented population. The number of special schools is increasing, specially designated classes are being introduced in all regions, official Centers of Excellence are being named, early entry to school and accelerated progression are openly espoused in appropriate cases, and the retraining of staff is a priority (NSW Policy, 1991). Additionally, there are a number of selective schools and special classes, dating from an earlier period, which have been incorporated into the state's overall plan (NSW Government Strategy, 1991; Board of Studies NSW, 1991).

- In Victoria there is considerable activity at the school level where enrichment programs, extension schemes, excellence awards, and inter-school schemes operate. University High School, Melbourne, conducts a renowned academic acceleration program, while there are continuing ventures involving tertiary institutions and parent bodies (Matters, 1992; Nagorcka, 1992). It is evident, however, that gifted education has not enjoyed official publicity from the Ministry of Education in Victoria in recent years and that treasury-funded services have been reduced; but renewed interest is expected following a change of government late in 1992.

Even though education is a state concern, the Australian Government has also been pressed to develop a *national* policy on gifted and talented education. Indeed, a Senate Select Committee (1988) urged the Government to “make a clear statement that special educational strategies should be provided for gifted children throughout Australia.” The Labor Government declined to do so, however, and indicated its opposition to such a recommendation in 1992, a decision that should have minimal effect at state level where educational policies are decided.

New Zealand

No system policy has been issued in New Zealand. It has been claimed that of the 26 countries which were represented in Sydney at the *8th World Conference on the Gifted and Talented* in 1989, New Zealand was the only country which had not developed a system policy on school giftedness (McAlpine, 1991). Moreover, the NZ Ministry of Education has made a conscious decision not to develop a national policy and has left “the issue of actual provision for gifted and talented students to the local schools” which have “professional independence” (Burton, 1992).

As an alternative to a separate policy, the Ministry aims to influence the total curriculum development process and to raise the awareness of all teachers to provide for a wider range of abilities in the regular classroom. It is argued that this procedure is tantamount to a *policy* which is embedded in curriculum documents that are made available to all schools (Burton, 1992). Moreover, the new National Curriculum is designed to challenge “all students to fulfil their potential” (NZ Ministry of Education, 1991). The latest curriculum documents emphasize achievement objectives by *levels*, whereby the curriculum, which covers a 13-year span, is divided into seven or eight levels through which students may pass, dependent mainly on ability and performance and without regard to their age. While it is obvious that current New Zealand curricula stress higher order thinking skills, open-ended activities, and problem solving approaches to learning, one might question the willingness of many NZ teachers to accept accelerated content progression, given their present

reluctance to allow differential rates of progression for gifted students.

In line with its social justice orientation, the Ministry of Education does not regard the educational development of children with special abilities (such as *giftedness* or *specific talents*) as a policy goal in its own right but incorporates it within a broader policy of catering for all children with *special needs*. Gifted education has to vie with the equally important and competing needs of children with disabilities in order to attract funds from a fixed resource allocation. Moreover, within this wider framework of *Children with Special Needs (CWSN)*, gifted and talented children are not singled out by name.

In effect, there is greater concern with removing barriers to achievement, deleting cultural stereotypes, and raising teacher awareness of the need to provide for a wide spectrum of academic and social behaviors. This policy has been effective to date and should continue to have positive long-term effects. It does not highlight gifted and talented students as a target group, however, and does not make it mandatory to address their specific needs. New Zealand provision for special abilities is very patchy at present and many Boards of Trustees (school policy makers) have different educational priorities.

Overall, therefore, the force or strength of the policy statement in Australia and New Zealand usually reflects the attitude of the Ministry or Department of Education and indicates the commitment which it makes to gifted and talented students. The absence of a policy is reflected at the local level where schools may determine their own educational course. When the policy is general and does not specify responsibility, the commitment is likely to be relatively listless at the system level with schools being left to determine their own priorities. When the policy is specific and when responsibility is clearly assigned to particular people, it is more likely to result in action and increased zeal. This is best illustrated in New South Wales where the previous policy was couched in generalities: it indicated that “the talents of students should be identified as early as possible” by the schools but it did not specify whose responsibility it was or the mechanisms that might be invoked (NSW Policy, 1983). The present policy is more specific:

- Schools will develop methods for the identification of their gifted and talented students. These methods are to be made known to members of the school community.

- School principals have the final responsibility for deciding when *early entry* to school . . . is appropriate [and] . . . when any form of *accelerated progression* is appropriate for individual gifted and talented students.

- Teachers have a responsibility to identify the gifted and talented students in their classes.

- Each region will nominate a senior officer who will have responsibility for the education of gifted and talented students as part of a statement of duties.

- Schools should ensure that, by the end of 1993, all staff members will have had the opportunity to

participate in at least one professional development course in the education of gifted and talented students (NSW Policy, 1991; NSW Implementation Strategies, 1991).

When non-state schools are involved, it is not possible to generalize about gifted education policies because they are determined at the local school level or, in the case of catholic schools in Australia, within each diocese. Stemming from their social welfare orientation, diocesan catholic schools have been more concerned with issues of equity and with providing a sound general education rather than with singling out the gifted for specialized provision. This, however, is changing in some localities where programs are being developed, usually within the regular classroom. In other *independent* schools, the program is likely to reflect the aspirations of the fee-paying parents whose children are enrolled. While many provide an academically-oriented curriculum and rely on well-developed traditions to attract their clientele, there are other independent schools which are well-known for the innovative programs they offer for the gifted population.

Educational Provisions

There is a wide diversity of provisions made for gifted and talented students at school, regional and system levels throughout Australia and New Zealand. A team of curriculum consultants in Queensland, for example, collected information on 317 programs in its state schools in 1990/91: these were categorized under 117 cross-referenced descriptors that included subject discipline areas, cognitive processes and critical thinking, skill advancement, enrichment activities, extension education, independent studies, paraprofessional personnel and mentors, student self-esteem, social development and camp programs (Queensland Department of Education, 1991). The same programs could have been categorized quite differently, however, based on school organizational patterns, programs goals, parent involvement, and staff expertise. Hence, the present analysis which includes some thousands of Australasian programs necessitates a conceptualization that, while accurate, must be open to the charge of generality. The two countries are reported separately.

Australia

Seven major types of provision may be discerned across Australia, involving individual schools, small clusters of schools, wider regional initiatives, and overall system strategies.

ENRICHMENT

Virtually every school that provides for gifted students nominates *enrichment* as one of its procedures. Teachers

accept it because it may be integrated with regular classroom instruction and administrators are gratified that it causes less disruption to the normal school organization than some other approaches. It is obvious, however, that much confused thinking exists about the purposes of enrichment and the target group for whom it is actually intended. Some teachers confine enrichment activities to a small, select group of children who are considered to be gifted in some way, but the majority believe that enrichment is appropriate to the needs of all children and should not be restricted to predetermined groups. Few seem to realize that enrichment is a complex concept that may be implemented at different levels and for different purposes.

Level 1. At the first level, primary teaching is based on a general enrichment model within the regular classroom with little resource backup. Teachers seek to provide for the abilities of 25–30 children in the class, for example, and to cultivate their particular interests. This is done by grouping children on ability for reading and number work but reverting to representative or interest groups in other aspects of the curriculum; and by encouraging them to read widely and to explore other aspects of literacy. Learning centers are provided around the room, permitting the opportunity to work individually or in small groups on activities that are changed from time to time. Children are encouraged to read, to write their own stories, to conference them together, and to “publish” the products in some form. Work often follows a theme and allows youngsters to pursue enrichment activities that include small projects, extensive reading, spelling games, painting, ceramics, science kits, computer use, mathematics board games, graphs, categorization and collection of a range of materials/aids, small research activities, class concerts, group discussions, and problem solving tasks. The class is busy and is constantly introduced to new information, a wider range of teaching strategies, and to cooperative learning situations. Full use is made of local excursions, of parental assistance within the school, and of visitors and visiting troupes. The teachers themselves have access to a steady stream of new classroom ideas and have the chance to extend their knowledge of content and classroom strategies by attending professional development courses.

The above composite representation is typical of many primary classrooms in Australia and New Zealand and generally exemplifies *good teaching*. The children are relatively busy on relevant learning tasks, finding enjoyment in most aspects of their work, and the teacher is conscientious and receptive to new ideas, developing new approaches and referring to numerous books on *Classroom Enrichment Ideas*. It is a pleasure to work with such teachers and to observe the admirable results that they achieve but it is unfortunate that this form of good teaching, designed to provide stimulating experiences for all, has been confused with provision for gifted children.

Level 2. At this level, the school attempts to extend the expertise of those who have acquired a specialized

interest. Students who have developed knowledge and skills in such areas as electronics, writing, computers, photography or video production are provided with additional assistance in order to reach a higher level of understanding and application. They are withdrawn from the regular class on a part-time basis and community persons may assist in teaching small groups. Such enrichment classes are usually restricted to those whose learning is already advanced.

Level 3. Some Australian enrichment programs permit students to undertake the study of an additional subject if they are able to compact their other studies into a shorter time or if they are released from some lessons on a regular basis. While it may impose a penalty on those who are required to fulfill all their normal study obligations in addition to studying the extra subject, not all teachers require high performing students to make up for normal lessons missed.

Level 4. There are numerous enrichment activities that form part of the school's regular teaching program including well-devised excursions to illustrate some aspect of the curriculum (to observe, for example, a factory, a farm, or a particular landform); the pursuit of an individual or small group project that is related to the training of appropriate skills and research techniques; or the provision of extension, advanced, or honors classes within the school's normal curriculum. These are relatively traditional means of enriching the school's program and are widely found in Australian schools. One cannot guarantee, however, that project work is not more-of-the-same or that all students are trained to pursue independent research.

Level 5. Some students who are gifted and who can think in systems benefit from enrichment provisions that are based on an integrated curriculum. Often thematic in form and permitting rigorous interdisciplinary study, such enrichment programs may well suit the abilities of gifted thinkers, increase motivation, and extend skills and talents. When found in Australian schools at either primary or secondary level, they usually signify that the programs have an underlying conceptual basis and that teachers are aware of the needs of advanced students.

Level 6. At this level, the enrichment program is designed to provide for individual needs through differentiated study schedules, often in the form of individualized educational programs (IEPs). They may be found at any year level within the school from 5-18 years of age but they are particularly adapted to senior students who are comfortable with their own learning styles and can work in an independent fashion.

Australian enrichment programs vary widely and may be found at any of these 6 levels. While it is satisfying to see schools openly espousing level 1 as part of normal educational provision, it is unfortunate that it is confused with gifted programs. Relatively fewer programs are specifically targeted at levels 5 and 6. Of the 317 Queensland programs referred to above, for example, 236 were described as enrichment programs and most could be categorized as level 1 (enrichment

activities to broaden interests and cultural pursuits), level 2 (programs designed to extend specialized interests), or level 4 (those aspects relating to community excursions and/or project work). Most were designed for implementation within the regular class or for short-term withdrawal periods over a specified number of weeks on a part-time basis.

Two of the problems often associated with Australian enrichment programs is their unsystematic use, seemingly without regard to long-term goals, and their wrongful use at inappropriate levels (Braggett, 1992). It may be counter-productive, even dangerous, to provide low-level enrichment programs for a few hours each week over a six week period for gifted students whose needs demand systematic extension, content acceleration, and differentiated program provision. Many educators in Australia and New Zealand have yet to learn that level 1 enrichment should be automatically provided for all children and that other levels should be carefully matched to individual needs. When they are understood and used in a congruent fashion, enrichment programs fulfill a major role in the school's total program but when inappropriately used with gifted children they may even impair long-term development.

If there is any systematic basis for enrichment activities in Australian schools, it is likely to be based on a partial application of Renzulli's triad model and/or on Bloom's taxonomy of cognitive objectives. Professional development programs are introducing increasing numbers of teachers to the need to train research skills and independent study techniques, and to overview the higher cognitive levels of *application*, *analysis*, *synthesis* and *evaluation*. Rarely is a school's organization based on Renzulli's total model, however, and most of the activities are directed by the regular classroom teacher or by a small team of teachers working in concert.

CLUSTER GROUPS

Cluster groups allow a number of schools, which are in close geographic proximity, to plan and implement common educational programs for teachers or students. When gifted students are involved, they permit small numbers from two or more schools to combine for enrichment or extension activities on a part-time basis, the schools sharing the costs involved and having access to expertise that each could not provide individually. In the early 1980s, Victoria developed an extensive array of cluster group programs and involved students from state, catholic and other independent schools. As educational budgets were reduced after the mid-1980s, however, these projects were reduced in number as backup support was withdrawn.

Cluster groups exist in most states but are often developed on an informal basis among cooperating schools and are usually operated without system financial support. One group of 13 schools in South Australia developed 28 different programs which included such diverse fields as philosophy, computers, mathematics,

video-film production, poetry, literature, physiology, geology, biology and museum conservation. Programs were sometimes designed around practical situations so that a unit on *Science and criminology* was conducted at the Forensic Section of the Police Department; while those enrolled in *Who tells mankind's story* visited the museum and art gallery and took part in wilderness treks. Most current programs entail up to two hours each week for five to ten weeks, may entail a small cost if teaching materials are provided, and require families to organize transport. Only two to four schools are involved in most cluster groups and courses are typically confined to primary children aged 10–12 years and to secondary school students.

Considerable differences exist from state to state in the way the cluster groups are organized, reflecting the extent of the consultancy services provided and the availability of resource teachers for gifted and talented programs. In the ACT which has 10 senior secondary colleges, 19 high schools and 68 primary schools, there were 45 reported enrichment, extension and acceleration programs in 1991 but no cluster groups were in operation except when camps or competitions were organized on a wider basis. In Queensland state schools, however, there were 38 clusters in 1991 with programs that specialized in math, writing, computing, and science or, alternatively, provided a wider spread of cultural enrichment activities. While some of these programs were short, even one-off activities, others were 10 weeks in duration and some were targeted at highly gifted students or those with specialized talents (Queensland Department of Education, 1991).

Western Australia is one state that has perfected the cluster group concept and embedded it within normal mainstream provision. Developed from the original *pyramid-approach* to gifted education, the Primary Extension and Challenge (PEAC) program is a state-wide initiative that offers challenging experiences to gifted students in years 5–7 (ages 10–12) as part of their normal school program. Most children in state schools are tested in year 4 and, if they meet the relevant criteria, are placed in a pool of students who may attend courses in PEAC centers throughout the state over the ensuing three years. These courses are provided on a wide range of themes which vary from year to year depending on the self-expressed interests of local students. Examples of courses are outlined in Table 1.

There are 40 PEAC centers throughout Western Australia, 17 in metropolitan areas and 23 in country towns (Peters, 1992). They operate for the entire year providing withdrawal programs for children who are drawn from surrounding schools and who attend for half a day each week for 6–10 weeks or longer. Programs are designed to provide challenging content and to train research and independent study skills, as well as affording a chance for gifted and talented students to meet and support each other in their interests. Entry to the extension courses has been broadened so that children who are not in the selected pool are

TABLE 1
Examples of Programs Offered at PEAC Centres
in Western Australia

Statistics	What if . . . ?	Solar energy
Electronics	Aborigines	Man in flight
Japanese culture	Italian	French
Meteorology	Zoology	Theater
Anthropology	Logo	Propaganda
Magnetism	Astronomy	Chemistry
Extension math	Forestry	Paleontology
Left to write	Polyominoes	Algebra
Aviation	Propoganda	Esperanto
Microscopes	Poetry	Natural disasters

also permitted to attend an individual course if they demonstrate high ability in the specified area. A student who evidences talent in geometry, for instance, will be permitted to attend a course in this area even though he/she may be ineligible to attend courses in other areas of mathematics.

PEAC courses have proved popular with students and teachers because of the interest they provide, the motivation they generate, the enrichment and extension they impart, and the positive attitudes to learning which they foster. They have not only won the approbation of parents but have also been accepted by all major political parties in the state. This form of gifted education has now been accepted as normal mainstream provision, the only state in Australia where such continuing withdrawal programs for primary students have won this commendation.

When the WA Ministry decided to rationalize and refine its total state program for gifted and talented students in the late 1980s and to place greater responsibility on individual schools, the directors of the PEAC centers were alarmed that gifted programs would decline. Banding together, they formed PROAPT (Professional Association of PEAC Teachers) in which they now operate as a network, supporting each other, inducting new teachers into gifted education, and seeking liaison with secondary schools. They visit schools by invitation, explain the underlying bases of gifted programs, offer inservice courses, and conduct *Tournament of minds* for state and catholic schools across the state (Peters, 1992).

SPECIAL INTEREST CENTERS

In the present context, special interest centers are secondary schools for years 7–12 (ages 12–17), usually comprehensive in nature and serving all students in the neighborhood. Additionally, they have a specialized discipline area that attracts highly talented students from a wide geographic area because of the high quality instruction that is available. In South Australia there are four high schools with specialities in music, one in languages, one in agricultural studies, and one in gymnastics (Crafter, 1992).

In the music centers, students follow a normal high school course as well as specializing in the theoretical and performance strands of music. In one school, tuition is available in flute, piccolo, oboe, clarinet, saxophone, bassoon, trumpet, french horn, trombone, tuba, violin, viola, cello, classical guitar, untuned percussion (such as drums), tuned percussion (xylophone, etc.), piano, pipe organ and voice. It is not unusual for students to integrate their music with studies in the performing arts, to devote much of their free time to public performances, and to excel in many aspects of academic and social life. The staff are highly qualified and develop excellence that spreads to other teaching departments.

The special interest centers in South Australia have proved important in highlighting talent and in providing a model for other schools to emulate. It is intended to target other primary and secondary schools with special strengths in literacy, mathematics, and science and technology, and to develop them as centers of excellence. The announcement by the Minister to create six new focus schools at the *primary* level for students with high intellectual potential was inspired, in part, by the success of special interest centers in the state (Crafter, 1992).

Influenced to a degree by this South Australian concept, New South Wales created the Newtown High School of the Performing Arts in Sydney, a comprehensive school with specialties in the visual arts, dance, drama, and music. Students who concentrate on dance, for example, must study composition, appreciation and performance and may select from the following styles: traditional, modern, classical, jazz, African-derived modern, Aboriginal, ballroom, and Latin and American dance. Other students who do not specialize in the performing arts are still included in a wide array of related activities (set production, audio-backup, organizational activities, publicity, design, technology, etc.) and benefit from the excellence engendered within the school.

Twenty-five schools throughout New South Wales have been designated as Technology High Schools and fifteen as Languages High Schools, allowing them to develop speciality areas and to promote advanced teaching. An additional 70 secondary schools have been designated as Centers of Excellence in a wide range of discipline areas because of the quality of the programs they offer. The State Government has consciously set out to meet the needs of students with high abilities and/or outstanding talents, a policy that has raised community awareness and resulted in a range of diverse programs.

The special interest high schools with the longest history are found in Western Australia where the Department of Education has grafted specialist disciplines onto 11 existing comprehensive schools in the Perth metropolitan area. These schools, some with special programs dating from 1968, provide high level instruction in the areas of art, languages, music, dance and/or theater arts, and select students on the basis of

interview, performance, folio presentation, and standardized testing (if appropriate). In general, the cohort of 330 students who enter the 11 classes each year are expected to work at a sustained pace and to aspire to excellence. The programs have been widely acclaimed throughout the state because of their high quality and the outstanding levels of student performance that are attained.

SPECIAL CLASSES/SCHOOLS

During the first half of the twentieth-century when high school education was a privilege for an intellectual elite, selective high schools became an important segment of secondary education in most Australian states. Designed for students with university aspirations, they were often single-sex schools and were located mainly in metropolitan areas. When secondary education was extended and reformed in the 1960s and 70s, many of these academic schools were converted to comprehensive establishments and made co-educational in the process. A few, however, missed the reformers' zeal and have been preserved as selective schools with competitive academic entrance requirements. In the 1990s New South Wales is once again increasing the number of selective schools as part of government policy, ensuring that 15 of the existing 21 are co-educational and that three provide boarding facilities for students from country areas. Except for a few selective establishments in Victoria, however, virtually all similar high schools in Australia have been abolished. A Conservatorium High School exists in Sydney for talented musical students and is operated in conjunction with the NSW Conservatorium of Music.

When it was found in the mid-1970s that the replacement comprehensive secondary schools did not necessarily extend the most gifted, there were two important reactions. First, extension courses were introduced into the senior years of the high school curriculum so that subjects might be studied at different levels of difficulty, a decision which assisted academically capable students. Second, the organization of the high school itself came under closer scrutiny as alternatives within a comprehensive framework were canvassed.

One of the first states to react was Western Australia which introduced a *Talent search* for students with high intellectual potential in the final year of the primary school, a scheme that has continued to gain favor with the community. On the basis of this quest, 300 students are offered places at 10 comprehensive high schools, each school having a special academic class which provides advanced courses and permits accelerated learners to work at their own pace. Each of the schools has developed its own approach but most place the students in a separate class for academic subjects for the first two or three years of their studies but require them to join regular classes for elective and non-core studies.

One of the aims of these classes has been to stem the drift of students to private schools because of the

perception that independent schools might offer more academically rigorous programs. This drift has not only been arrested but the classes have also resulted in a diffusion effect, influencing other staff in the schools to individualize instruction and to permit more flexible progression through the grades. Moreover, at the prompting of the Ministry of Education, other metropolitan and country high schools have developed programs for academically advanced students and have achieved high community acceptance in doing so. The *Talent search* still operates each year for those who request, or are nominated, to take part in the testing session involved.

Other states are experimenting with schemes to increase the academic orientation of the secondary school. South Australia is focusing on literacy studies in 10 high schools (Crafter, 1992), New South Wales is emphasizing Technology High Schools and Centers of Excellence, and Lyneham High School in the ACT has a special class for highly-motivated academic students. As part of state school provision, Tasmania and the Australian Capital Territory provide separate Senior Colleges for students in the last two years of the high school, a form of organization which may enhance enrichment and specialization because of the larger numbers of students enrolled and the expertise of the staff. University High School, Melbourne, accepts an intake of 25 students in year 7 each year and permits them to accelerate their learning through the grades (Nagorcka, 1992).

Special classes have also been created at the *primary* school level, mainly for students in years 5 and 6, but sometimes for younger children when vertical grouping practices have been implemented. New South Wales introduced special classes for gifted students in the final years of the primary school in 1932, a concept which was gradually modified and expanded until the late 1960s when 42 classes existed. There was a subsequent fall in the number of these units until a Conservative government came to power in 1989, resulting in a recently-announced plan to treble the existing number of 32 classes (McGrath, 1992a). Regions are currently developing measures to identify gifted students, to train teachers for these new classes, and to develop curricula appropriate to the students' educational needs.

The Northern Territory is more sparsely populated than most other states and has a wide range of ethnic groups including a large Aboriginal population. When the NT Department of Education devised a *Gifted and talented policy* for a multicultural population, it created two full-time classes in Darwin and one in Alice Springs, selecting students on the basis of group screening and individual testing, and opting for vertically graded units for students from 9 to 12 years of age. Various models are used as the basis for curriculum modification including Bloom's taxonomy, Renzulli's triad model, various divergent thinking models, and Parnes' Creative Problem Solving Model, thereby allowing all students to follow individualized programs (NT Policy, 1983).

Provision for gifted students is now an accepted part of the Territory's provision and the Department's policy has won political and union support (NT Policy, 1983, 1992).

Full-time special classes for gifted students at the primary school level are not immune from controversy, however, as the Western Australian experience indicates. When the WA Department of Education commenced FUTEK (Full-time Extension Classes) for able students in years 6 and 7 (ages 11–12) in 1982, there was opposition on the grounds that early identification was undesirable and that full-time specialized provision should occur at a later age. This led to the discontinuation of FUTEK units after 1986 and a concentration on part-time PEAC classes in which identified gifted students are withdrawn for shorter programs in special interest centers in years 5–7.

While the above examples indicate a range of special class provisions, the majority of Australian schools have not introduced special identification procedures for gifted students and do not provide special classes for them. The most widely accepted approach is to grade children on academic performance but to retain whole-class instruction and to promote them on a lock-step basis. In this way, some provision is made for faster learners but most of the disadvantages of class learning are preserved. Many high schools are not committed to total grading, preferring to select only the highest performers in math and/or English, placing them in one or two classes in each grade, and leaving the rest of the students ungraded. The debate on the merits of *graded vs ungraded* classes is perennial.

ACCELERATION

Attitudes to acceleration vary widely from state to state. In the sense of grade skipping, acceleration is practiced in all states and in virtually all systems when the need is acute and when other forms of provision have been exhausted. In general, however, lock-step methods of promotion and adherence to the concept of age-cohorts still prevail in most schools, grade acceleration being viewed with suspicion or opposition. Nevertheless, there are notable exceptions and evidence of change in some states.

Western Australia was the first to espouse acceleration at system level when it encouraged the ten high schools with special classes for intellectually talented students to accelerate the progress of those whose learning was advanced. These students, identified by formal testing procedures, were sometimes permitted to jump a grade; alternatively, they were able to telescope three years of secondary education into two or to progress through six years of education at their own pace. Grade acceleration is a recognized form of provision in Western Australia but it is practiced with moderation.

The Ministry of Education in New South Wales formally accepted and publicized the benefits of accelerated progression in 1991, issuing a publication entitled

Guidelines for accelerated progression (Board of Studies, NSW, 1991) to all schools. School principals were subsequently granted the final responsibility for deciding cases of early entry to kindergarten or accelerated progression through the grades (NSW Policy, 1991). Because of some confusion within the schools, it was necessary to clarify the academic criterion on which acceleration is based: students whose learning is advanced and whose academic attainment has reached the level of the next grade may be progressed to that grade irrespective of their age. According to information supplied by the NSW Department of School Education, there were 60 students who were grade accelerated in all subjects in state schools during 1992 (McGrath, 1992b) with additional cases being reported in those private schools where accelerated progression is an accepted option.

Subject acceleration is more widespread than total grade skipping, although it is not widely favored throughout Australia. While there are official figures of NSW students who study in multiple grades because of subject acceleration, these do not include the more usual cases of content acceleration that occur naturally in vertically organized classes, in classrooms where teachers permit students to work at their own pace, or where individualized programs have been devised. Overall, there is an increasing trend to permit grade acceleration in individual subjects across Australia but opposition is still widespread, often because of the perceived restrictions of the ubiquitous high school lesson timetable.

In its widest sense, acceleration is multi-faceted as indicated in the current Northern Territory Policy (1992). Schools are informed that acceleration may take many forms but essentially means that a student will complete some or all of his/her formal schooling requirements in a faster time than average peers. Some ways this can be achieved include:

- early admission to preschool, primary school, junior high school, senior high school;
- curriculum presented above year level but with peer group;
- student accelerated into an older age group to work in one or more subjects;
- full-time classes of identified gifted students;
- family grouping in the primary school;
- vertical timetabling in the secondary school;
- curriculum presented at a faster rate in the mainstream classroom;
- student given credit for successful completion of a course at another institution (NT Policy, 1992).

The Northern Territory encourages schools to identify gifted students and to provide for them through a variety of strategies.

University High School, Melbourne, provides a striking example of an acceleration program that is combined with differentiated provision. Selected on the basis of high intellectual ability, academic aptitude, social and emotional adjustment, and high motivation during the last year of their primary schooling, 25 students

bypass the normal six year secondary program and are permitted to complete a unique course in five years or to vary the length of their program to their own requirements. For the first three years they are placed in a special class for 80% of their work and follow a course to develop and extend higher level thinking processes, promote problem solving strategies, encourage independent learning skills, and foster social and emotional growth. For the remaining time they combine with students in regular classes in years 7–9.

The year 7 program includes the following subjects:

Research skills (4 lessons a week): the location, understanding, interpretation, organization, analysis, presentation, evaluation and extension of information; application to problem solving.

Language (3 lessons a week): Latin as a linguistic and literary study.

English (4 lessons a week): literature studies (novels, plays, poetry), writing workshops, and drama.

Mathematics (4 lessons a week): the development of an information base in algebra, logic, geometry and number theory, and the elimination of repetitious learning procedures.

Science (4 lessons a week): knowledge and appreciation of the processes of science, the design of simple experiments, a critical examination of experimental design, analysis of evidence and drawing of conclusions, sufficient background for students to undertake Tertiary Entrance subjects in the 4th year.

Computer studies (3 lessons a week): machine architecture (hardware, software, memory, logic), problem solving using BASIC language, applications.

Art, music, physical education and sport (8 lessons a week): these subjects are studied with other students in regular year 7 classes (Nagorcka, 1992).

In year 8, geography, history, and French/German are added to the program while computer studies and research skills are omitted as separate subjects but incorporated into other work. In year 9, a study of economics/politics is introduced while geography and Latin become alternative options (Nagorcka, 1992; UHS, 1992). During years 10 and 11, the students attend normal senior classes and pursue the regular curriculum which includes a variety of academic subjects designed for those with university aspirations. For many years it was possible to graduate from this program in four years and there is some expectation that this option might be reintroduced (Nagorcka, 1992). Since its commencement in 1981, the acceleration program has won high acclaim in Australia.

SUPPLEMENTARY PROGRAMS

In addition to class-based programs, there are other initiatives which influence gifted education and frequently involve wider community input. Three particular ventures deserve mention. First, there are numerous mentor programs for individual students who exhibit outstanding performance or potential. The Ministry

of Education in Victoria has operated a state-wide mentor program since 1983, matching students who have specific needs in one of 100 subject areas with mentors who voluntarily offer their time and expertise on a continuing basis. While many students benefit in such traditional areas as painting, ceramics, electronics, computing, and creative writing, more esoteric fields include entomology, naval architecture, space/rocketry, and entrepreneurial ventures. The mentor does not provide coaching but seeks rather to inspire, guide, enhance and intensify each student's ability and performance (Victoria Ministry of Education, 1989). In other states such as Queensland, the ACT and Tasmania, programs are developed at the school or regional level and usually involve mentors who are local residents.

Second, there is enthusiastic support for camps that provide enriching programs in such talent areas as creative writing, art, drama, dance, music, math, science, languages, computers, and gymnastics. Resident camps may range from 2 to 7 days, permitting the development of skills in a more relaxed social atmosphere and in the company of intellectual peers. They may also involve community members who give their expertise, often on a voluntary basis. In most states the camps are organized by individual schools or on a regional basis but the Northern Territory Department of Education arranges vacation schools and provides funds for students to attend from all over the Territory. One camp, designed for 150 students aged 11 or 12, offers courses to supplement the normal school curriculum in such areas as video-film making, drama, music and environmental studies. The other camp allows 150 students, who are in the senior high school years and who wish to continue their studies at tertiary level, to meet for five days and gain an insight into university life and the courses and subjects that are available (Day, 1992).

Third, the *Tournament of minds* has achieved a high degree of popularity since it was introduced by the Victorian Association for Gifted and Talented Children in 1987. An extension of the American *Odyssey of minds*, the Tournament is conducted in divisions that allow primary and secondary schools to participate, each school presenting a team which competes against others in problem solving situations. The problems are drawn from the areas of math/engineering, language/literature and the humanities, and each team receives notification of the problems six weeks prior to Tournament Day; one additional question, however, requires a spontaneous solution on the day. The Tournament has now spread to every state in Australia and attracts widespread interest among the 20,000 state and independent school students who participate (Vision, 1992). Another venture, the *Future Problem Solving Program* (part of an international FPS venture), is a year-long program that promotes critical, creative and futuristic thinking among students at all levels of schooling and challenges them to apply advanced thinking strategies to significant issues. There are over 100 schools involved

from five Australian states and from New Zealand (Vision, 1992).

OTHER ORGANIZATIONS

In addition to the six forms of provision outlined above, there are two other groups which have a major input into gifted education and provide important services to the community. The first group comprises the State Associations which were established during the second half of the 1970s when the gifted movement was in its infancy. At that time the assistance of parents and community members was crucial because it broadened the base of the agitation for change and pressured governments to respond. Parents and professional educators banded together and established state associations, all of which have continued to have a significant input into the gifted cause. Because each association is responsive to the needs of its own state, there are differences among the associations, reflecting the size of the state, the needs of metropolitan and rural areas, and the effectiveness of state government initiatives for the education of gifted children. Generally the associations have similar purposes, however, ranging from educational functions to political activism.

An analysis of the Victorian Association for Gifted and Talented Children (VAGTC) illustrates the scope of the enterprise in which such associations become involved. *Programs for children* form the basis of much of its work: these programs include Tournament of minds for 3500 students in 130 Victorian schools, the Future Problem Solving Program, and Study Enrichment Days which are organized four times each year. In order to raise community awareness and to assist talented youngsters, the Association arranges an annual exhibition of children's work in art and writing. *Programs for parents* include discussion groups and workshops which are held on a needs basis, annual conferences with sessions for parents, and a telephone answering service for those who require advice or support. An additional Parent Interest Group operated from 1986 to 1991 arranging outings and social occasions as a form of network provision. Recent *programs for teachers* have included after-school workshops for six weeks in 1989-1990, a major conference for 300 teachers in 1991, and a collaborative venture with the Department of School Education, independent schools, and the Catholic Education Office for 300 teachers on the theme "Achieving excellence: a shared vision" (Clemons, 1992).

The VAGTC is a lobby group that promotes the interests of gifted and talented children in Victoria and, when necessary, at the national level. Its network is extensive and its contacts include influential persons in education, business, and politics. A special sub-committee has been formed to promote the association's objectives and to lobby at the political level. Like most associations around Australia, a highly prominent person is invited to be patron. A user-friendly journal, *Vision*, is issued four

times a year with units of work for teachers, information for parents, and activities for children, in addition to a diary of state and national events (Clements, 1992). It is obvious that this 56-page journal is also designed to raise awareness of gifted children and to promote the gifted movement.

In general, the associations operate in a professional manner and supply a valuable service for parents and teachers alike. In states such as Tasmania they have provided enrichment classes for children on a weekly basis over many years while in other states greater emphasis has been placed on parent support and teacher programs. Whatever the target group, however, their educational role has been a major factor in their success and has helped to develop strong support networks. All states are now moving closer to affiliation with the national association.

The Australian Association for the Education of the Gifted and Talented (AAEGT) was formed in 1985 and has assisted in developing awareness of giftedness across the country. It organizes conferences and workshops, publishes the *Australasian Journal of Gifted Education*, conducts national competitions for students, acts as a lobby group, and liaises with each of the state associations. Through its efforts, the *8th World Conference on the Gifted and Talented* was organized and held in Sydney in 1989 and the proceedings were published as *The challenge of excellence: a vision splendid* (Bailey et al., 1990).

The second major group includes academics who work in universities and colleges across Australia. They have been at the forefront of the movement in many states and at the national level, providing strong support in teaching, writing, and researching issues of giftedness. Whereas there were virtually no university courses on gifted education in 1975, it is now possible to specialize at undergraduate and graduate levels in a number of universities. Moreover, academics play a major role at the inservice level where they continually participate in professional development programs, and some are directly involved in programs for talented children. In a sense, they form a bridge between universities and State Departments of School Education on the one hand, and between theory and application on the other.

In summary, one may discern seven major strategies to provide for gifted and talented students in Australia, ranging from state-wide programs with Departmental imprimatur to in-school enrichment activities that reflect local-school initiatives. Despite the apparent range of these programs, it should be realized that gifted initiatives are not uniform across all states, that they are still confined to a minority (albeit a growing number) of Australian schools, and that those who promote giftedness with enthusiasm are not openly encouraged in some systems. There are many exciting developments and much has been accomplished but the problem of appropriate provision still remains in those schools/regions where an egalitarian philosophy attracts considerable credence. Nevertheless, there is a growing

sense of optimism in states where gifted programs now fall within the range of normal system options.

New Zealand

With a strong desire to remove barriers to achievement, the Ministry of Education in New Zealand has concentrated on issues of equity and sought to help teachers cope with a wider range of abilities within the regular classroom. It has been reluctant to target the specific needs of gifted students and has not believed it desirable to issue a system policy on *students with special abilities*. While new curriculum documents have indicated the desirability of flexible progression and the necessity to cater for those with higher abilities, the Ministry has not insisted on specific school provision except to advocate a cultural enrichment model. In the absence of an official policy and without central direction, schools have been asked to decide their own priorities.

When Havill (1990) surveyed 304 primary and secondary schools in the Tainui District to discover the types of provision made for gifted children in 1990, he concluded that only one-fifth of respondent schools had developed a policy statement on *Children with special abilities*. Moreover, there was an absence of formal policies in virtually all secondary schools and in 80% of primary schools. The figures were even more stark in that 50% of the schools did not respond to the survey in a geographical area of New Zealand where some importance had been attached to gifted and talented provision. The most commonly mentioned strategies were extension and enrichment but 35% did not mention any specific in-class techniques; cross-class grouping was used in 40% of schools; streaming was not favored at the primary level although it was accepted in some secondary schools; advanced placement was not practiced by many; and withdrawal or pull-out programs were employed in only 10% of schools.

In order to achieve a broader response, McAlpine (1992) conducted a national survey and, from the 927 replies received, concluded that fewer than 20% of respondent schools had formulated a separate policy on children with special needs. When questioned about actual program provision, half the schools declined to answer but, among those that did, it was obvious that 80% catered in regular mainstream classes and that three-quarters placed emphasis on enrichment type programs. The Ministry's refusal to formulate a specific policy is reflected at the school level and its emphasis on regular mainstream provision is widely accepted by local schools despite their independence to develop a unique approach. An overview of different approaches to gifted education is outlined below.

SECONDARY PROGRAMS

Some secondary schools have acquired an academic reputation because of the traditions they have developed and the socio-economic levels from which they

selectively enroll their students. Entrance is competitive, performance is stressed, and students are more likely to aspire to an academic curriculum; academically-oriented teachers, in turn, are attracted to the schools. They are located in such cities as Auckland, Hamilton, Wellington, Hutt Valley, Christchurch, and Dunedin, but the list is not exclusive. These colleges and high schools do not necessarily provide specially designed or differentiated programs for gifted youth but they generally expect students to follow an academic curriculum and many of them achieve well at the tertiary entrance examination.

Regardless of the secondary school attended, some New Zealand students who complete the Sixth Form Certificate at a high level may be accepted for university entrance at 16 or 17 years of age but many proceed further to the Seventh Form and sit for the Higher School Certificate with some presenting for the competitive University Bursary examination. Students who perform well attain a most commendable level of academic achievement. It is possible to attempt extra subjects which, in some cases, may be studied through the Ministry's Correspondence School (distance education) (NZ Ministry of Education, 1991).

Individual schools have developed programs for students with special abilities. Kirsten School in Auckland places emphasis on the *International Baccalaureate*, a two year senior high school course that is internationally accepted and is suited to students who intend to pursue university or college studies. Hamilton Girls' High School has developed extension programs for 13- to 15-year-old students who are introduced to problem solving and investigative skills and permitted to accelerate their learning in mathematics. Wainuiomata College permits a range of options that include advanced placement in math, extension programs, and early morning classes (one hour before normal starting time) for 3-6 weeks on such topics as logic and memory, research skills, archeology and antigens, and computing.

The *Achieve Program* at Queen Elizabeth College in Palmerston North is individualized and permits students to plan their own work with tutors, to enrol in correspondence programs, and to pursue independent learning at their own pace. Content acceleration is a natural outcome for motivated, gifted students and some sit for School Certificate subjects a year earlier than normal. When the venture was evaluated in 1991, 16 high ability students, who had been identified by the program, responded most positively to the learning autonomy encouraged, the individual assistance afforded by teachers, and the social network of friends developed (Poskitt et al., 1991).

The twin concepts of acceleration and enrichment are combined in a program at Wellington College where 13% of the school's intake in 1989 was selected on a test of scholastic abilities, a mathematics test, past academic results and a questionnaire adapted from Renzulli's *Interest-a-lyzer*. These students were permitted to sit for a range of School Certificate subjects after two

years, rather than the normal three years, and to proceed further through a spectrum of multi-level programs in Forms 5, 6 and 7. This flexible scheme permits accelerated progression and/or enrichment of subjects because teachers, students and parents plan together on a continuing basis (McLean, 1991).

Intermediate Schools, which are free from external examinations, possess an increased freedom to provide for students with special abilities. Some have responded by grading each age-cohort on ability or by introducing one or two classes for high-ability students; a few have devised acceleration programs based on a compacting model; others have established extension classes with enrichment programs; and one has encouraged acceleration in subjects that are particularly targeted at the Maori student population (Havill, 1990; Smith, 1992).

PRIMARY PROGRAMS

One of the most widely known gifted programs in New Zealand has been developed at Lincoln Heights Primary School in Auckland where 120 of the school's 700 students are identified as having special abilities, a group that includes 40 youngsters who are considered to be very gifted. Withdrawal programs are provided in a Special Abilities Unit on a *revolving door* model and youngsters are not required to make up for any time lost while away from the regular classroom. Part-time programs vary in length from a few weeks to an entire year, may sometimes include camp attendance, and may involve tutors who are not regular teachers at the school. Some of the numerous enrichment-extension programs include biochemistry, conversational French and German, drama, journalism, mathematics, music, research, and reading. A previous principal, E. Richardson, is an acknowledged expert in creative literacy and conducts classes within the Unit (Hope, 1992).

The Junior School of St. Margaret's College in Christchurch caters for students from 7 to 10 years of age in small classes, with children being identified on a continuing basis for inclusion in a variety of sound programs. A schoolwide enrichment model, adapted from Renzulli's work, emphasizes both self actualization and creative productivity. The staff is influenced by Renzulli's Type I, II and III Enrichment Program but this is overlaid by curriculum compacting and pull-out programs as well as by enrichment activities, grouping, and integrated teaching. The school's policy emphasizes children's different learning styles, the use of contracts, problem solving/thinking skills, mentor programs and personal support systems. It is apparent that the writings of Sternberg, Gardner and Renzulli have contributed to the school's overall approach (Atkinson, 1992).

Less selective but indicative of many New Zealand schools is the approach adopted at Te Kuiti Primary School where it is assumed that "every child has at least one special ability or area of strength." Teachers

develop monthly activities for groups of 12–20 children who are selected for each activity on PAT scores (tests measuring language, mathematics, and study skills), informal testing, and teacher observation. The children are involved in Writers in Schools Programs, a Science Fair, Science Badges, Art, New Zealand Biographical Dictionary, Research into Local Memorials, Outdoor Education, and Technical Lego. The school's program reflects a New Zealand approach because it seeks to involve as many students as possible (Havill, 1990).

Even more typical of New Zealand primary education is the school which does not use standardized testing to any great extent in the identification of special abilities among children. Teachers depend on the primary school program to broaden children's cultural experiences, to permit the identification of interests in a cooperative learning environment, and to extend learning through grouping practices, learning centers, and the provision of interesting and enriching activities within the regular classroom. The composite picture, presented earlier, of a typical Australian primary classroom is equally representative of New Zealand classrooms.

OTHER EDUCATIONAL ORGANIZATIONS

When New Zealand's educational system was restructured between 1990 and 1992, many consultancy services and formal networks were abolished. As a consequence, those who now wish to obtain advice on children with special abilities must approach colleges of education, universities, private consultants, a small number of resource centers, one of the New Zealand Associations for Gifted Children (NZAGC), or other schools for assistance. The only NZ Resource Center that specializes in gifted children's education is located at Upper Hutt in the Wellington area where the director provides advice for teachers, assists in the location

interest in giftedness, have begun to offer subjects relating to *children's special abilities*.

The New Zealand Council for Educational Research (NZCER) is the source of most standardized tests used to assist in the identification of students with abilities, either at the screening or verification levels. According to Reid (1992), the *Progressive Achievement Tests*, which measure reading vocabulary, reading comprehension, listening comprehension, mathematics, and study skills, are the most widely used tests that teachers administer to identify students with abilities. Reid, who is the Chief Research Officer with NZCER has authored many tests, has been a New Zealand delegate to the World Council for Gifted and Talented Children since 1979, and is a constant advocate for appropriate provision for gifted students. He has played a leading role in broadening research on disadvantaged groups in society and on minority conceptions of giftedness, including those of Polynesian people (Reid, 1990, 1992). With Professor McAlpine at Massey University, he has analyzed the New Zealand scene for international audiences (Reid & McAlpine, 1989).

Within the egalitarian ethos of New Zealand society, two associations assume a major role in promoting and meeting the needs of gifted and talented children. Formed in 1975, the New Zealand Association for Gifted Children embraces nine branches on the North Island while the independent Christchurch Association supports three other groups on the South Island. Each of the branches seeks to support parents and children through meetings, publications, discussion groups and advice on psychological and educational services; to provide opportunities for gifted children to contact each other socially and to take part in a range of initiatives such as camps, courses, holiday visits, and Explorer Club activities; and to support schools and teachers within each region (Twigden, 1991). A National Council acts

raises a number of issues which are discussed in the final section.

Future Issues

Despite the egalitarian nature of Australian and New Zealand societies, there have been major advances over the past two decades as the concept of giftedness has been debated and as implementation strategies have been devised. Teachers are more aware of the need to provide for a wider range of abilities and there is less opposition to system and school-based provision for gifted and talented students. The trend is not uniform, however, and there are major differences among the states. Five issues need to be addressed if advances are to occur and if gifted education is to be immune from redirections of policy consequent upon changes of government.

Policies: Those systems (or individual schools) which are most committed to gifted education develop policies that define the target group, delineate implementation strategies, appoint officers who have authority and are responsible for program development, and provide adequate resources—including training programs—to assist schools and their local communities. While it is true that all Australian states have developed policies on gifted and talented students, some are very guarded in their pronouncements and address only general issues. There is little doubt that, because provision for gifted students is a politically sensitive issue, some of the policy statements of the mid-1980s were released, in part, for political reasons: it was prudent to have a policy but specific directions were not included. Those states which have voluntarily rewritten their policies over the past few years generally indicate an educational commitment to implementing *appropriate* programs: they include Western Australia, New South Wales, Northern Territory and, lately, South Australia.

New Zealand has not developed a written policy, an ideological stance, it seems, to remove the spotlight from the most able. As an outcome, both professional educators and the general public have tended to downplay the special needs of the gifted or to pay only lip service to them (Williams, 1991). One is forced to conclude that the Ministry cannot cope with the anticipated charge of elitism that might emerge if it specifically targeted the needs of those with special abilities. Perhaps it cannot cope with the logical extension of its own equity policy. Within Australia, there are some states that, while having formal policies, adopt a similar position to that of New Zealand. They do not advocate strong measures and provide little system support or encouragement for differentiated provision. Tasmania and, to some extent, the Australian Capital Territory, fall into this category. This does not imply that individual schools or clusters of schools are not actively involved in innovative programs but it certainly indicates an egalitarian direction at the

central level. Other states are about to rewrite their policies. In short, those systems which target the needs of gifted students formulate policies that are clearly focused and provide specific encouragement to schools.

Definition: Gifted education would be accepted more widely if its advocates clearly defined *giftedness* as a life-span, developmental concept and *talent* as being amenable to educational influences. Many professional educators and the population generally conceive giftedness and talent as being basically innate, fixed in quantity, accurately measured by a single psychometric test, and divorced from environmental effects. Some students are gifted: the rest are not. They do not realize the importance of motivation, of self-esteem, of a sustaining mentor, of sympathetic teachers who nurture giftedness and who assist the development of talent. They have not considered that constellations of interacting factors lead to gifted behavior and that teachers, parents and the community can influence the development of school-house giftedness. More rapid progress will be made when the terms, *special abilities*, *gifted* and *talent* are operationally defined and the educational implications are deduced.

In-class provision: Emphasis is often placed on in-class programs and the necessity for regular teachers to provide for a wider range of abilities. In general, Australian and New Zealand teachers cater adequately for *above-average* students through cultural enrichment, elective studies, and the provision of senior high school subjects at different levels of difficulty. Class teaching still predominates, however, and teachers are limited in the extent to which they can provide for individual talents. Most primary teachers do not have the competence, time or resources to cater for a six year spread of abilities in all subject areas for 12 months each year in mixed ability classes. Moreover, the general enrichment model, described earlier at level 1, is not adequate for highly motivated students who require additional academic stimulation from like-ability peers and from teachers who have the time and competence to facilitate their specific development. There are times when regular, in-class provision is simply not adequate for students whose learning is accelerated and who require differentiated and accelerated programs. Some require advanced work, a different approach, a higher level of thinking, and the chance to work with intellectual peers on rigorous and sustained endeavors. In-class provision is only one strategy to meet the needs of gifted students; more profound curriculum changes are usually related to organizational changes as well.

Acceleration: Acceleration is an issue that generates heated debate in Australasia because it is almost invariably equated with grade-skipping. While there are a number of states that advocate grade acceleration as a matter of policy and while instances of accelerated progression are to be found in both countries, the majority of teachers do not espouse the concept and argue against its implementation. They can accept that many students are accelerated learners and that

provision should be made for them at the individual subject level but they find it offensive to contemplate total acceleration through the grades. If widespread changes are to occur, it is more likely through the broader concept of *flexible progression*, whereby a student is able to progress at an individual rate in specific subjects. Within those states that have accepted a range of accelerative practices, there is provision for compacting, for flexible progression, for individualized learning through individualized educational programs, and for early entry to kindergarten, to secondary school and to university.

A total approach: When gifted education is envisaged as an appendage to mainstream provision—sometimes under the rubric of special education—it is placed in a precarious position when governments change, when budgets are constricted, or when rationalization policies are implemented. Western Australia developed a total approach to gifted education in 1981, introducing classes for intellectually gifted students and embedding them within normal mainstream provision. Special purpose classes for students with talents in music, languages, theater arts, and dance were likewise considered to be an integral part of the state's program, as were special interest centers for students in grades 5, 6 and 7. These ventures have withstood the vagaries of educational change and the whims of politicians. In recent years, the Northern Territory and New South Wales have moved in the same direction, seeking to embed classes for gifted students within the mainstream of educational provision and providing a range of implementation strategies at school, cluster and system levels. It would appear that South Australia is also moving in the same direction. When the whole spectrum of education is viewed as a totality in which gifted students are part of the total school, and not seen as a separate group, the gifted movement will be increasingly accepted. There are signs that this is occurring in at least three Australian states.

Overall, therefore, the gifted movement has proved to be relatively resilient in Australia since it developed in the mid-1970s but has faced a more difficult task in New Zealand. While there are innovative practices at the local level in New Zealand, the lack of central direction restricts overall provision and places responsibility on individual schools which operate without strong system support. In Australia, provision varies from state to state and is, to a large extent, dependent on the ideology of the political party in government, but there are clear signs that permanent advances are occurring and that at least three systems are embedding a range of implementation strategies within normal practice. The signs are encouraging and the outlook is promising.

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Programs and Practices for Identifying and Nurturing Giftedness and Talent in Africa

CEDRIC A. TAYLOR

University of Port Elizabeth, South Africa

Introduction

Educational developments in Africa cannot be understood without a knowledge of traditional African culture and of political developments in sub-Saharan Africa during and after colonial rule. Therefore a brief historical background is given of political developments in that region. A number of issues which determine educational planning and priorities and also have implications for decisions regarding gifted education emanate from that complex set of historical, political and cultural factors. Those issues concern African culture, different and elitist conceptions of gifted education, different interpretations of equal educational rights, the goal of universal primary education, the priority of majority needs, economic conditions, the marginalization of education, and segregated and unequal education. A brief historical overview is given of gifted education in sub-Saharan Africa which illustrates the inequalities between First World and Third World education systems on the same continent. The same pattern is discernible from the description of present programs and practices for identifying and nurturing giftedness and talent. Future development of gifted education in African countries is seen as dependent on a restructuring of gifted education in the context of national developmental needs. Some aspects which need to be researched in this respect are outlined.

An Historical Perspective

Brief Historical Background of Political Developments in Africa

The colonial past of Africa and events subsequent to the attainment of independence by sub-Saharan African countries need to be taken into account to understand political, social, and economic issues that may directly influence policy decisions regarding formal provision for gifted children in the educational system. A brief overview is therefore given of the situation immediately preceding and after the granting of independence to African countries by colonial powers.

During the preindependence period most colonial powers unscrupulously exploited the human and natural resources of sub-Saharan African countries for their own purposes. The political, economic, social, and educational development of these countries and their peoples were considered of lesser or no concern. In some cases a minority of African elites were educated in Western education systems and allowed limited participation in government. Missionary schools provided basic training in reading and writing to a small percentage of the masses.

In the 1960s the winds of change began to sweep over the African continent, heralding the end of colonial rule and the dawn of *uhuru* ("freedom"). In a relatively short period of time, however, independence led to authoritarian regimes of one kind or another. In most cases, the demise of constitutional democracy began with a movement to one-party and ultimately one-man rule. This was due in some countries to the electoral supremacy of the ruling party and the high degree of elite cohesiveness before independence. In others, one-party regimes were established with extensive coercion and personalization of power (Diamond, 1988). A period of prolonged instability followed, characterized by successive power struggles, coups, and dictatorships, which in many cases led to civil war, and the destruction of the economy and poverty. An important contributing factor to this state of affairs may have been the fact that at independence most new African states were left in conditions of more or less acute economic dependence and not prepared politically and administratively for independence by the colonial powers. This may have led to a heightened sense of vulnerability felt by African leaders for their young countries which served to justify a concentration of power as a means of asserting control (Diamond, 1988).

In recent times some African countries have started to rebuild their economies and a move has become apparent towards a more democratic form of government. This observation is supported by the following events:

- in 1981 the African Charter on Human and Peoples' Rights was adopted in Nairobi, Kenya by the Organization of African Unity (Shiman, 1988);

- two sub-Saharan African states, Senegal and Ivory Coast, participated in the Second Strasbourg Conference on parliamentary democracy in 1987 (Council of Europe, 1987);

- Botswana continues to be one of the best examples of multiparty democracy in Africa. Moreover, in a decade and half, Botswana moved from being one of the poorest countries in Africa to one of the richest, with per capita GNP increasing from \$100 to over \$900 (Holm, 1988). Heavy and well-distributed investments were made, amongst others, in education (Diamond, 1988);

- Namibia has established a democracy and multiparty elections have taken place in Zambia; a democracy has persisted to a considerable degree in Zimbabwe, although for a shorter period of time and under considerably greater strain (Sithole, 1988);

- democratization is the common language of former combatants turned negotiators, from the African National Congress and the South African government to UNITA and the Angolan government;

- a Pan-African Conference on Democracy, organized by the Minister of State of Senegal in Dakar in 1992, was attended by 47 states.

Countries in Africa are entering a new phase of development, learning what democracy means in practice, for government and society. Democracy, however, means different things to different people. The form of democracy that will develop in the African context and its implications for education remains to be seen.

Events in South Africa followed a different course. Colonies formerly under British rule and granted self-government in 1905, formed the Union of South Africa in 1910 as an independent country. A multiparty democratic form of government was established with qualified franchise for coloreds, Indians and blacks which in effect limited representation in parliament to whites. The Nationalist Party which came into power in 1948 progressively consolidated social, residential, cultural, economic, and political apartheid constitutionally over the next four decades. While separate Houses of Parliament were created for coloureds and Indians in 1984, the blacks who form the majority of the population had and still have no vote and representation in Parliament. The speech by President F. W. de Klerk on February 2, 1990, however, heralded the beginning of the end of apartheid. On June 17, 1991 the legal foundation of the apartheid system was eliminated when Parliament scrapped the law classifying South Africans by race from birth. The Book of Apartheid has been closed and the Convention for a Democratic South Africa (CODESA) has started to negotiate a new constitution.

Issues Impacting on the Provision of Education for the Gifted

Certain issues which emanate from the historical and cultural context of a country may directly influence

policy decisions regarding gifted education. Issues which are relevant in the African context are discussed below.

African Culture

In the aftermath of independence, when African countries were struggling to escape from its colonial past and re-establish a traditional African way of life, leading thinkers such as Kwame Nkrumah, Julius Nyerere, Léopold Senghor, Koli Busia, and Kenneth Kaunda responded with a new philosophy: African socialism. African socialism, according to du Plessis (1992), professes to make sense of the traditional (African) way of life in a modern world. Its perception of society is said to be rooted in the idea of *ujamaa* (English: familyhood, togetherness) and both its foundation and objective is the extended family. Within this context the state is considered to be but an extended family, requiring an involved personal loyalty from its citizens. A multiparty system is seen as inherently divisive. Moreover *ujamaa* represents a call for communal coresponsibility towards the upliftment of those in society who, in some or other respect, have remained behind. African society's values are directed towards the maintenance of cohesiveness and solidarity, and one of the strongest social control agencies is the extended family, imbued with the principle of collective responsibility. In this context, children who have fallen behind or have been disadvantaged will receive priority educational treatment before those who are managing well, which in many cases may be the gifted.

African culture values and nurtures the attitude and behavior of identifying with others, understanding and responding to another person's needs and sharing emotions. Archbishop Desmond Tutu (1991) has referred to

... our sense of *ubuntu*—our humaneness, caring, hospitality, our sense of connectedness, our sense that my humanity is bound up in your humanity.

Traditionally, the African's concept of who he/she is, can be summed up in the words: "I am, because we are, and because we are, therefore I am" (Mbiti, 1969; Ray, 1976).

This value is expressed in African music. Traditional African musical performances are occasions not for passive listening but for participating and doing. Each person contributes only one note, a small part of the whole sound. For a Westerner this may appear very inefficient because one person could for instance produce the whole sound with one hand on a keyboard synthesizer. That, however, is irrelevant in this case. The music is a social thing, aimed at expressing cooperation (Tracey, 1990).

African drumming tradition requires that a good drummer restrains himself from emphasizing his own rhythm so that he may be heard better. He has to fill in

the other rhythms, and similarly create an emptiness in his own part which the others can fill. Every single beat in the music is not filled up with hectic noise—a common mistake with Westerners trying to play African music. So, it is a case of one “rhythm defines another” which is directly related to the African idea of “one person defines another” (Tracey, 1990).

From the above it may be hypothesized that African culture nurtures the affective development of children. Gifted programs which underemphasize or exclude the affective and social dimensions of child development may be seen as contrary to traditional culture and be rejected.

Different Conceptions of Giftedness

Giftedness has been defined in various ways. Some definitions refer to certain areas in which high performance needs to be demonstrated. If areas which are considered to be of major importance in a specific culture are excluded, such conceptions of giftedness may not be acceptable. Giftedness would appear to have meaning relative to a given cultural context. Modern technological societies value logical mathematical intelligence and certain forms of linguistic competence very high. On the other hand, African cultural tradition ascribes greater weight to social than technological facts of intelligence, views child-rearing goals primarily in terms of social skills and regards interactions with people as inherently more important than objects, thus fostering a more socially orientated set of cognitive skills.

Anim (1992) provides valuable insight into traditional African conceptions and manifestations of giftedness. He describes the custom whereby a young child addresses a visiting chief in drum language while another sings his praises in terms of traditional poems and then, to the rhythm of his companion's drumming, executes a beautiful and very intricate dance. This is repeated for other chiefs attending a festival. Each praise is sung spontaneously with no rehearsal and no prior knowledge except the name of a chief and where he came from. Anim points out that such a performance requires creativity and quick thinking. Another manifestation of giftedness is found in the role of the linguist who is the traditional mouthpiece of the Akan chief (Anim, 1992). As the traditional Akan chief is not allowed to talk directly with his people, the linguist becomes the intermediary. A linguist should have a great sense of humor, be a master of court language, be able to think fast and make quick rational decisions. In short, he should be an accomplished diplomat. A chief's drummer would be required to advise the chief during talks with rhythmic codes on the drum and would likewise have to be a very talented person (Anim, 1991). In traditional African culture the concept of giftedness acquires meaning in terms of performances such as those of the linguist and the drummer.

Elitist Conceptions of Gifted Education

For some, gifted education is associated with elitist education. For historical and cultural reasons this may be a view commonly held in present-day Africa. In colonial times and even thereafter educational opportunities in some instances were provided for the few at the expense of the many. African elites, i.e., those with social status and belonging to ruling families, were mostly assured of an education in Western-oriented systems. Members of such elites, according to Giri (1990), owed much of their personal success to their passage through such systems. It is therefore understandable that conceptions of giftedness which result in singling out for special treatment a selected group of children, say with high IQs, may be associated with earlier forms of elite education and seen as reinforcing existing inequalities and providing for a minority who are already perceived as privileged by virtue of their unique gifts. Thembela (1987), in rejecting special schools for the gifted, gives an indication of how deep-seated that feeling is by associating such an educational measure with “intellectual aristocracy” and “a perpetuation of class distinction.”

Different Interpretations of Equal Educational Rights

The most basic and widely accepted proposal about human rights is the Universal Declaration of Human Rights adopted by the United Nations in 1948. Article 26 of the declaration states that “Everyone has the right to education” (Human Rights, 1983). The document makes no mention of special provision for the gifted. Principle 7 of the Declaration of the Rights of the Child (1959) states inter alia that “The child . . . shall be given an education . . . on a basis of equal opportunity, to develop his abilities . . .” (Tarrow, 1987). Although this could be interpreted to include the gifted, educational rights for the gifted and talented are not directly mentioned in human rights documents. A society which does not provide for the gifted can therefore not be accused of not honoring the idea of equal educational rights.

Even if the idea of equal educational rights for the gifted is accepted, people may disagree about what is meant by equal educational rights (Thomas, 1987). For some, equal educational rights means equality of opportunity, i.e., the right to be treated differently according to one's particular abilities and one's particular needs. Equality of opportunity is interpreted to mean, not equal, but different offerings and treatment (Bishop, 1989). It may also be expressed in the words: “Help each child to become all that he or she is capable of being.” All children are not alike and should therefore not be treated the same. This implies inter alia special provision for the gifted. For others, equal implies equal access to educational opportunities and that everyone deserves a place in the regular educational system. This means that every child, of whatever ability, should have a chance to enter a typical classroom. All learners are

therefore admitted to school and all are treated equally, meaning that everyone is treated the same. Those who fail to progress under regular instruction will usually drop out of school or be forced to repeat their present grade level.

African countries which are struggling to provide greater educational access to its people will probably adhere to the latter interpretation of equal educational rights, i.e., give as many children as possible the opportunity to enter the regular educational system.

The Goal of Universal Primary Education

Article 4 of the Convention Against Discrimination in Education (1960) called for free and compulsory primary education. African countries which were signatories to the UNESCO Addis Ababa Conference of 1961 established universal primary education as a regional goal set to be accomplished within a decade (Ahmed & Coombs, 1975). This, however, has not been accomplished in spite of very good achievement in educational access and equity during the 1960s and 1970s. The problem is compounded by the fact that Africa, with the world's highest birth rate, will have doubled its population by the year 2000 (Poats, 1984). The population of Africa at present is about 550 million people of whom the majority are of low socioeconomic status.

In countries which are still some distance from achieving universal primary schooling, equalizing educational opportunities will remain a high priority. Equal educational opportunity will in these instances probably mean that everyone deserves the same chance to try the standard course of study offered in the schools.

The Priority of Majority Needs

It is to be expected that educational authorities will give first priority to providing education to the great mass of average learners. Only after facilities have been provided for the "average majority" can attention be given to special provisions, first the handicapped and then the gifted. In countries which are struggling at present to provide at least 6 years of primary education for all, special provision for the exceptional minority may be postponed indefinitely.

Other reasons for serving the nonexceptional majority before the exceptional also exist. First, the average majority of the population form a more powerful political body than do the exceptional. The nonexceptional are far larger in number and can exert more effective political pressure to have its educational needs fulfilled than can the exceptional minority. Second, the nonhandicapped majority compose the labor force needed for a developing country's economic growth, so that an investment in educating the majority is expected

to yield benefits in increased production. Third, as a developing nation desperately tries to enroll all of its growing population of children in school, its educators are hardly able to train enough teachers and print enough textbooks to serve the average majority, much less to finance the more expensive services needed by the exceptional (Thomas, 1987). Enrollment figures for sub-Saharan Africa are given in Table 1 and illiteracy rates in Table 2.

Economic Conditions

The more affluent a community, the more likely it is that a wide variety of special educational services will be provided. When resources for education are seriously limited, it becomes a difficult question to decide who should get how much. If resources are equally divided among everyone, an equal share may be too small to be of much practical significance. Training teachers in gifted education will place a further burden on scarce resources because of a longer training period and the need for additional trainers. This will be difficult to justify in the light of a World Bank report that states that in more than half of the countries in sub-Saharan Africa 50% or more of the teaching staff lack formal training and do not meet the standards the countries themselves require (Rideout, 1987).

TABLE 1
Enrollment Ratios in Sub-Saharan Africa, 1986-1988

Primary (%)	Secondary (%)	Combined primary and secondary (%)	Tertiary (%)
49	18	45	1.5

Source: United Nations Development Programme (1991). *Human Development Report*. New York: Oxford University Press.

TABLE 2
Illiteracy Rates (Estimates) of Populations Fifteen Years of Age and Over by Sex in some African Countries, 1990

Country	%		
	Male	Female	Total
Angola	44.4	71.5	58.3
Botswana	16.3	34.9	26.4
Cameroon	33.4	57.4	45.9
Ivory Coast	33.1	59.8	46.2
Kenya	20.2	41.5	31.0
Nigeria	37.7	60.5	49.3
Senegal	48.1	74.9	61.7
Sudan	57.3	88.3	72.9

Source: UNESCO. 1991. *Statistical Yearbook*. Paris: UNESCO

Marginalization of Education

Education systems in some sub-Saharan African states have been criticized for turning out too many graduates with doubtful qualifications of even more doubtful use and that they do so at a high cost that is beyond the means of the national economies (Giri, 1990). Scientists, technicians, economists, and others are in many instances trained for a Western-style economy geared to sustained development and high productivity. It appeared reasonable to think that the very existence of more and more professionals trained to cater for the needs of a modern society would help sustain economic growth.

The expected growth however seems not to have taken place. In the seventies, growth slowed in most countries and, in the eighties, the superficially modern societies of sub-Saharan Africa declined and in some cases collapsed altogether, according to Giri (1990). On the other hand, informal activity flourished in every sector—in trade, transport, and crafts and even in small industries and banking. There was a burgeoning of initiative outside the formal framework and of low-productivity activities in general. A stage has been reached where it is the informal sector which largely dominates employment in the townships of Africa.

Education is being perceived by some as having failed to lead African societies to economic growth and turning out young people whose only prospects are jobs in the informal sector which bear little relation to the training they have received. The result is that the aims of the education system have been questioned, that it has been seen as too expensive and unsuitable and in the process marginalized to some extent. Under these circumstances allocation of scarce resources to gifted education may be seen as a bad investment.

Segregated and Unequal Education

The issue of segregated and unequal education applies specifically to South Africa. For many years the majority population group was denied the benefits of a good education. In the allocation of resources alone the minority white population at state schools enjoyed extreme preference. The situation was exacerbated by the introduction of so-called Bantu Education for blacks in 1953 which incorporated the beliefs of Dr Verwoerd who later became Prime Minister. He stated that there was no place for blacks in the community above the level of certain forms of labor (Union of South Africa, Debates of Parliament, 1953). In 1978 the name of the Department of Bantu Education was changed to the Department of Education and Training. Amongst others, existing schools were improved, more schools and more funding provided and the same core syllabuses prescribed for white schools were implemented in black schools. Increasing unrest and disruption of black schools, however, led to an announcement by the

government in 1986 of a 10-year plan to create equal, if still segregated, schools. By 1991, however, the level of per capita expenditure for white students had been reduced only to about four times that for blacks.

Within a few years South Africa is likely to have a new constitution and a new government elected mainly by blacks. Such have been the injustices and indignities of apartheid that inequalities in education would probably be one of the first matters to be addressed. It is highly improbable, however, that a new government would have the funds, for one, to handle the problems of segregated Third World and First World schools merging in a unitary system of education. Some of the problems which will have to be addressed by a new government will include the provision of basic education for all black children, finding resources for millions of black school-age children who at present are not in primary school and providing facilities such as libraries and laboratories on a large scale. Making special provision for a small group of gifted pupils would probably be seen as a waste of resources. Unless private enterprise provides funds specifically for gifted education, the resources built up over years in this respect may dissipate or be utilized for basic educational purposes.

Historical Overview of Gifted Education in Sub-Saharan Africa

South Africa is the only sub-Saharan African country in which notable developments in the field of gifted education have taken place. After 1910 a sophisticated education system for whites was developed in South Africa. Education for the other ethnic groups, the coloreds, Indians, and blacks, was provided through separate but unequal and inferior systems of education. In spite of the well-developed education system for the whites, little was done to meet the needs of gifted children in that system. Prominent educationists pointed out from time to time that the country could not afford to neglect its gifted youth and that special provision should be made for their needs. In 1918 Dr W. T. Viljoen, Superintendent General of Education in the Cape Province, remarked on the rigid uniformity of teaching in the schools and in his annual report called for the introduction of differentiated courses which would provide for the slow and the gifted learner (Cape of Good Hope Department of Public Education, 1919). Much later, two Presidents of the influential *Suid-Afrikaanse Onderwysersunie* (English: South African Teachers' Union), G. J. Smit in 1954 and F. S. Robertson in 1963, devoted their presidential addresses to the theme of gifted education and expressed concern that gifted students were underachieving and that their full potential was not being developed in the schools (Smit, 1954; Robertson, 1963).

No significant research on the gifted child was undertaken before the 1940s. The first important work was done by Biesheuvel on African intelligence with special

reference to the extent that growth and measurement of intelligence can be determined by factors other than heredity such as cultural milieu, home environment, school environment, nutrition and temperament (Biesheuvel, 1943). Further studies by Biesheuvel on African ability focused on the intellectual potentialities of Africans and the identification and description of research problems in this field. These included the following: mental characteristics of African languages and the influence which they have on the process of thought and structure of the mind, musical ability (e.g., the ability to excel in the manipulation of auditory relations), a psychological study of the manual and perceptual skills involved in arts and crafts and their transferability outside their cultural context, and the high order perceptual and imaginal thinking processes required by traditional African games (Biesheuvel, 1952). Other pioneer researchers on gifted education were Venter (1955) who experimentally investigated different procedures whereby special provision could be made for gifted pupils and Duminy who defended his doctoral thesis on psychological and pedagogical aspects of giftedness in December 1959 at the Free University, Amsterdam in the Netherlands (Duminy, 1960).

From around 1969, Jock L. Omond, a retired headmaster and inspector of schools, started propagating the idea of gifted education. Over the next few years he put the case of the gifted to education authorities and the public at meetings all over the country, delivered papers at conferences, and gave interviews over the radio and TV. The educational authorities reacted negatively at first to Omond's pleas so he decided to proceed on his own. On June 14, 1976 he established the Office for the Gifted and Talented in Port Elizabeth with the aim of providing for the gifted on an extracurricular basis and in an out-of-school setting. Not long after, in 1979, the first National Conference on Gifted Education was organized by the University of Stellenbosch. Gradually a more positive attitude developed towards gifted education on the part of the education authorities and official recognition was gained with the appointment of the first education planner for the gifted, Dr J.S. Neethling, on October 1, 1980 by the Education Department of the Cape Province. At the end of 1980 the Transvaal Education Department followed suit and established extracurricular centers to provide for the needs of gifted children (Neethling, 1985). Shortly afterwards the province of Natal also established a system to provide for the gifted and similarly the Orange Free State in 1986.

During 1982 and 1983 various developments took place in the Cape Province. Twenty-five schools were selected and virtually given carte blanche to introduce and develop gifted education. One of the major tasks of these schools was to provide guidance and support to other schools starting out on gifted education. An editorial board was formed for the publication of *Creata*, the first bilingual journal on gifted education in the world and the first Problem-Solving Bowl, based on the Torrance model was held. In-service courses were

held for principals, teachers and school psychologists (Neethling, 1985).

It was also realized that apart from limited in-service courses for teachers formal training programs needed to be established at tertiary institutions. The first extensive training program for teachers of the gifted was established at the University of Port Elizabeth in 1983. Basic modules on gifted education were included in all preservice education courses and a Further Diploma and a Master's Degree in Gifted Education were offered.

In June 1980 the Human Sciences Research Council (HSRC) was requested by the Cabinet to investigate education in the Republic of South Africa. A Main Committee under the chairmanship of Professor J. P. de Lange was appointed to lead the investigation. Following a submission to the Minister of National Education by the Director-General of National Education the Main Committee in 1981 appointed a Work Committee: Education for highly gifted pupils, to research gifted education. The Committee published its report in 1986 (Human Sciences Research Council, 1986) in which it elucidated certain problem areas in the education of highly gifted pupils and suggested guidelines for the provision of such education.

During the 1980s the Education Department of the Cape Province and Dr J. S. Neethling played a leading role in the development and propagation of gifted education in South Africa. These developments, however, were limited to schools for white pupils. Further impetus was given to the idea of gifted education by the First International Conference on Giftedness (Ingenium 2000) which was held in Stellenbosch in 1984. Major inputs at the conference were made by speakers from the United States of America and their influence has been clearly visible in programs that were subsequently established in various parts of South Africa. In 1987 a Second International Conference with the theme, Children of Gold, was held in Johannesburg. Sponsorships were obtained to enable a large number of black teachers to attend. The impact on black schools, however, was limited due in part to boycotts and disruption of many of these schools especially in the Johannesburg area.

Outside of South Africa hardly any development of note has taken place in the field of gifted education. In Nigeria the National Policy on Education (1981) states that Ministries of Education will, in consultation with appropriate bodies provide special programs for gifted children (Gwany, 1989). It is not clear whether any further development took place before 1986 when a National Planning Committee of ten members from tertiary institutions was constituted by the Federal Minister of Education. A First Workshop on the Identification and Nurturing of the Gifted was held in 1986 at Kaduna (Adesokan, 1986). A blueprint was outlined and policy formulated on the identification and education of the gifted in Nigeria. According to Oladokun (1987) and Gwany (1989), however, the existing system has not been significantly adapted to accommodate the gifted child and nothing has been done to encourage

gifted education in Nigeria. Adesokan (1987) states that the Nigerian teacher is unlikely to assume the function of identifying and nurturing giftedness unless specific attention is given to gifted education in teacher training.

In some African countries with limited secondary school places pupils attending those schools are a highly select group. Secondary education may in those circumstances be regarded as a form of special education provision for a group of pupils which may resemble the highly able in some respects. In Tanzania a quota system exists for selection to secondary school. Such a scheme was necessary to prevent most of the places going to educationally rich areas in the country. The poorer areas can now send pupils for secondary education even though their academic achievement may be well below those of some pupils in the richer areas who are not selected. Furthermore, better-equipped primary schools tended to send a disproportionate number of pupils to the secondary schools. To achieve more equitable distribution of places to the secondary school, the top pupil from each primary school is selected to go on for further education. In this way children in every school in Tanzania have at least some chance of making it to secondary school (Bishop, 1989).

Yoder (1986) states that secondary education and certainly postsecondary education was, by definition, education of the gifted during the preindependence days of Botswana. Those few individuals who rose to the top and who were selected for further advancement of their education were typically those who displayed exceptional potential. Often, it was because of this potential that they received the educational opportunities which they did. It is true that social status and membership in the ruling family also affected educational opportunity, particularly in the very early days. In time, as the concept of education became more broadly accepted, however, access to schooling became more dependent on factors such as academic ability. Access to advanced schooling, particularly, was influenced by academic potential. Advanced education, therefore, was available primarily for the academically gifted.

According to Yoder (1986) Botswana has no programs which are identified as being specifically for the benefit of the gifted. The one possible exception to this is a private secondary school in the Gaborone area which offers a moderately accelerated program for pupils who demonstrate the required aptitude. Those pupils selected for this program may compress a 5-year secondary school program into 4 years. Additional mathematics was offered in some schools at one stage but this has been dropped. The training program of teachers' colleges in Botswana does not include gifted education.

Gifted education in Kenya seems to be in the embryonic stage. Interest is being generated at present among teachers, parents and the public by means of conferences. A first conference was held in 1991 and the Second Eastern African Conference on Gifted

and Talented Persons was held in August 1992 in Nairobi, Kenya on the theme of "Caring, educating and harnessing gifted and talented persons for national development". Objectives of the conference were the following:

- to develop and increase public awareness on the plight of gifted and talented persons;
- to encourage individual and/or collaborative research work in the area of giftedness and talent;
- to encourage efforts to establish and implement intervention programs;
- to identify in general terms the handicaps which gifted and talented people experience, and to suggest possible solutions; and
- to encourage the utilization of the gifted and talented in the society for national development.

Identification Procedures

Giftedness is culture-specific. What is recognized as gifted behavior in one culture or environment may be beside the point in another. An identification procedure for giftedness which does not attend to a specific sociocultural context would therefore fail to identify the gifted in that context. This is especially relevant in traditional African society.

Identification of the Gifted in Traditional African Culture

Certain characteristics are highly valued in traditional African society. These include a quick wit, wisdom, humor, an active, dynamic disposition, leadership, linguistic excellence, one who knows everything, and one who is good with his hands around the house (Anim, 1992). Children who are seen to reflect these characteristics may be given names accordingly. For example, parents may give their boy the name *Okabae* (English: he has returned) because their child showed exceptional intelligence that led them to believe that a wise and long dead member of the family had returned. Names can therefore be an indicator of giftedness (Anim, 1991).

In traditional African society gifted children were selected for very special roles and could be found at a very early age serving in the chiefs' court, learning the intricate life styles of a courtier. Certain roles, for example that of the linguist and drummer, cannot be inherited. It is something that a person becomes because of the qualities that he/she possesses. The linguist of the village who is the spokesman and adviser of the chief will be selected on the grounds of his wisdom, diplomacy and quick wit. Likewise the drummer who transmits messages in drum language to the chief during discussions will be selected on the grounds of possessing certain special qualities (Anim, 1991).

Identification Procedures Used by Education Departments

Gifted programs are practically nonexistent in most schools under the auspices of the Department of Education and Training (the separate department for black education) in South Africa. A general intelligence test based on the South African Individual Scale (1964) has been developed and standardized for nine African languages by the Institute for Psychological and Edumetric Research of the Human Sciences Research Council (HSRC), e.g., the Individual Scale for Xhosa-speaking pupils (1988). These tests could be described as culture-fair but are generally not accepted to be culture-free for various reasons. For example, these tests may be regarded as favoring an inner locus-of-control orientation which is typical of Western culture. Other tests developed by the HSRC that are currently applied in assessing black secondary school children's abilities in the Department of Education and Training are the Guidance Test Battery for Secondary Pupils (GBS) in grade 10, the Scholastic Aptitude Test Battery (SATB) for pupils in grades 4/5, 6/7 and 8/9 and the Academic Aptitude Test (AAT) for grade 12 pupils. The SATB 4/5 has been standardized for seven language groups, namely Northern Sotho, Southern Sotho, Tswana, Tsonga, Venda, Xhosa and Zulu. These tests are used for guidance purposes and not specifically to identify gifted pupils. Tlale (1990) is of the opinion that the above-mentioned tests are based on Western culture and therefore cannot reveal the full ability of black children.

A flexible approach to the identification of gifted pupils is followed by the Cape Province Education Department in South Africa. Instruments and procedures that are used include IQ tests, Torrance Creativity Tests, assessment of reading and spelling age, assessment of mathematical ability, and further teacher or parent assessment. Formal application of these, however, only continues if it is required to clear up doubts or to assess specific abilities. Where identification is obvious testing will not be completed. The teaching model which is used (see below) provides opportunities for all pupils to participate at the first level of the gifted program. Pupils are observed by teachers in the learning environment and their needs identified. It is then the responsibility of the teacher to provide for these needs by utilizing other components of the gifted program.

A more formal approach is followed by the Transvaal Education Department in South Africa. In the first phase of the identification procedure data are collected about academic achievement in school, characteristics of a child, and by means of teacher and peer evaluation, using checklists. Secondly, a panel of evaluators at a school identifies those who are considered gifted on the basis of the data available. In the third phase all particulars of the pupils identified in phase two are sent to the regional office of the Educational Support

Services for a final selection of pupils who would be included in the gifted program.

In most African countries the task of identifying the gifted presents a mammoth problem (Anim, 1992). An acute shortage of teachers and a near total absence of school psychologists or guidance counselors mean that identification procedures used in developed countries are largely nonexistent. The only means remaining for schools are the teacher's cumulative assessment of a child's achievement and, in most cases, the teacher's intuition. No specialized way is possible of identifying the gifted in the large classes in which over-extended teachers must function.

Recent Research on Identification

THE DEVELOPMENT OF PRINCIPLES FOR THE DESIGN OF AN INSTRUMENT TO IDENTIFY GIFTED BLACK CHILDREN

Tlale (1990) undertook an investigation in South Africa to determine principles for the design of a culturally relevant instrument to identify gifted black secondary school children. He identified six principles, namely that the instrument should

- measure cognitive and metacognitive functions;
- be divided into subtests, each measuring a specific ability;
- be culturally appropriate, i.e., based on the socio-cultural environment of black children;
- use appropriate language, i.e., be written in the first language of the child;
- effectively discriminate between children of different ages while taking into account language development in particular; and
- avoid biasing factors found in rural and urban cultures (Tlale, 1990).

These principles are applied to design an instrument to identify gifted Tswana secondary school students (ages 13–17 years). The instrument comprises six tests. The first five tests are verbal tests and similar to the first five tests of the Senior South African Individual Scale (SSAIS); the sixth test is similar to the eighth test of the SSAIS. The above-mentioned six tests of the SSAIS were used as a basis for the design of the instrument because they are primarily verbal or composed of pictures which can easily be adapted to African culture (Tlale, 1990). The tests are designed to be administered orally and individually.

The instrument was applied to 38 selected "possibly" gifted black secondary school students. The total number of students in the selected 10 schools was 3000 (to the nearest thousand). If it is assumed that 3% of these students are gifted a sample of 90 students is obtained. The top four students in each of the selected schools were selected on the basis of teacher nomination and performance in tests and examinations (Tlale, 1990).

A limited item analysis was done after the application of the instrument, using difficulty and discrimination indices. Indices were calculated by comparing the ten testees who obtained the highest scores to the ten who obtained the lowest scores ($n=38$). The criterion used for acceptance or rejection of items was a discrimination index lower than 0.20 but a difficulty index higher than 0.80 was not rejected on the grounds that the group comprised only high ability students. This led to the revision of certain items (Tlale, 1990).

The researcher concludes that it has been proved possible to design an instrument, written in Tswana and based on African culture, to identify gifted Tswana secondary school students. No reference, however, is made to the validity of the instrument as an indicator of giftedness. The researcher also concludes that, as black people in South Africa share a common culture with only a few variations, the instrument can be translated and adapted to other African languages. It is further recommended by the researcher that the instrument be administered to a larger group of representative Tswana-speaking secondary school students in order to standardize it (Tlale, 1990).

The study is limited and represents an initial stage in the development of an instrument to identify gifted black students. It should therefore be followed up by cross-validation of items with a new sample of subjects and further studies on the predictive validity of the instrument.

PREDICTORS OF PERFORMANCE OF DISADVANTAGED ADOLESCENTS

Skuy and his associates (Skuy, Gaydon, Hoffenberg, & Fridjhor, 1990) conducted a study at the University of the Witwatersrand, South Africa to determine which of Feuerstein's Learning Potential Assessment Device (LPAD), standardized ability tests and ratings of temperament, creativity and self-concept were significant predictors of performance. It was hoped that the study would provide the basis for developing an appropriate assessment battery for the identification of suitable candidates for a gifted program.

Of the 300 children participating in the Soweto Gifted Child Program, 100 were randomly selected for inclusion in the sample. Subjects were 13–18 years of age and of low socioeconomic status. Performance in the Soweto Gifted Child Program (SGCP) was the criterion against which the predictive value of the independent measures was determined. The stepwise regression analysis identified four significant variables that accounted for 50% of the variance in the criterion measure for the total sample. These were the LPAD Verbal Analogies Test (VAT), overall school performance, the Organizer transfer measure from the LPAD and the combined similarities subtest of the WISC-R/WAIS-R. The significant predictors of performance had in common their dependence upon an optimal amount of prior exposure

and learning (Skuy et al., 1990). The findings of this study corroborated those of Skuy, Kaniel, and Tzuriel (1988) in Israel by demonstrating the value of the LPAD and, in particular, the Organizer, for identifying giftedness among disadvantaged children.

In conclusion Skuy et al. (1990) state that the study suggests the usefulness of this battery of tests in identifying those students who would be successful in a particular type of gifted program similar to the SGCP in which English, mathematics and science are taught innovatively for 5 hours each Saturday and related to everyday life. Further research is needed to determine whether this or an alternative approach would be suitable for identifying children from disadvantaged communities for inclusion in programs of a different kind which would include racially integrated, mainstream programs, as well as programs of a less academic, more divergent nature.

Programs for Nurturing the Gifted

From the discussion of historical and current issues which impact on the provision of education in sub-Saharan African countries one may conclude that very little or no formal provision for the gifted will be made in most of these countries. As already indicated, South Africa is the exception in this respect that the gifted are at present well served by formal and nonformal programs. Outside of the well-developed and, for many years, well-funded Provincial Education Departments serving mostly the white sector of the population, universities, parent/community associations, and private sector groups also provide for the needs of the gifted in various ways. Programs which have been firmly established and appear to be successful are described below. The wide variety of organized opportunities for the gifted and talented of limited scope or shorter duration are not described. These include the following: olympiads (e.g., mathematics, accountancy), competitions (e.g., history, music, choir), art exhibitions, science expos, problem-solving bowls, futures' conferences, leadership seminars, writers' workshops, vacation schools, real world projects (e.g., groups identify and research a real problem in their school, suburb, town, or city), publication opportunities (e.g., *Wakening word; Voices from young Africa* (Mda & Van Wyk, no date)—a unique anthology of poetry and prose in which, uninhibited by political ideology or the constraints of the classroom essay, teenagers offer opinions about growing up, speak out against injustice, express their feelings, share their hopes for a new South Africa, and sometimes playfully stretch their imagination to their outer limits), youth orchestras and business/stock market games. In describing and analysing programs for the nurturing of giftedness two dimensions of educational provision will be utilized, namely setting (in- and out-of-school) and type (formal and nonformal). These two dimensions are

TABLE 3

Classification of Educational Provision for the Gifted

		setting	
		in-school	out-of-school
type of educational provision	formal		
	nonformal		

represented in the form of a matrix as shown in Table 3.

Formal In-School Programs

THE FOUR-AREA CURRICULUM ENRICHMENT AND EXTENSION MODEL

The Four-area Curriculum Enrichment and Extension Model of the Cape Education Department in South Africa is based on a wide, flexible interpretation of giftedness and makes provision for the gifted at four levels referred to as areas (Meintjies, 1988; Mentz, 1991). Area 1 provides for all pupils to receive training in thinking skills, problem-solving, research skills, creativity, and life skills (communication, interpersonal relationships). This area forms the basis of the gifted education program. Area 2 is aimed at the top 10–12% of pupils and represents a subject-directed approach. Enrichment and acceleration is provided in the regular classroom situation, in each subject and every grade. Area 3 is more child-directed and allows for a variety of withdrawal and grouping arrangements in- and out-of-class and school. A changing group of pupils is withdrawn for special and interschool activities, taking into account specific giftedness. Area 4 attempts to provide for the exceptionally brilliant pupils by means of individualization and mentors. These pupils may qualify for acceleration, i.e., skipping a grade when promotions are made at the end of a school year. Gifted underachievers receive specific attention in the Area 4 program.

Support for teachers is provided by coordinators appointed and paid by the Education Department and attached to regional Teachers' Centers, and also by the Psychological, Educational Guidance and Curriculum Services of the Education Department. The main task of the coordinators is to equip teachers with the skills, strategies and techniques which will enable them to integrate activities for the gifted with the normal teaching program in the school. Workshop, lectures, talks, consultations, personal interviews, advice, and information relating to any aspect of gifted education are some of the services provided, not only to teachers but also to parents, pupils, private, and tertiary institutions or any other interested organization. Schools are assisted to draw up a needs-based program which can be implemented in three phases: (1) the teaching

of basic skills and concepts; (2) multilevel teaching (the provision of learning experiences to match various ability levels); and (3) interschool activities and out-of-school programs (e.g., problem-solving sessions, future conferences, olympiads, leadership development courses, computer competitions) at local and regional level.

SPECIAL SCHOOLS

In some African countries special schools were established with the purpose of providing a model for other schools to follow. These schools were given various names such as Apex Institutions, Special, or International Schools. Schools in these categories include King's College at Yaba in Nigeria, Suleja Academy at Abuja in Nigeria, Prince of Wales College at Achimote in Ghana, Makerere College in Kampala, Uganda, and Waterford and St. Mark's in Swaziland. Although the establishment of these schools was to the advantage of gifted children many of them very soon became preparation grounds for university entrance examinations. Cognitive abilities were highlighted and in the process those gifted in other areas lost interest and became underachievers (Anim, 1992). Whether special schools get their fair share of gifted pupils is unknown. Those special schools which are privatized are very expensive and only the financially well-off can afford to send their children to these schools.

In Ghana, available places in secondary schools are so few that clusters of primary schools developed called Preparatory, International, or Experimental Schools. The primary purpose of these schools was to prepare pupils for the common entrance examination to the secondary school. These schools do not particularly provide for the gifted and talented.

SPECIAL SCHOOLS FOR THE ARTS, BALLET AND MUSIC

In the province of Transvaal in South Africa provision for specific talents in fine and performing arts, ballet and music is made by means of special schools which cater specifically for these areas of giftedness.

Formal Out-of-School Programs

EXTRACURRICULAR CENTERS

The Transvaal Education Department in South Africa makes provision for the gifted in out-of-school settings. The most prominent of these are the extracurricular centers which aim to provide enrichment in various fields not normally encountered by pupils in school. These centers are situated in the larger cities in the province. Only pupils who have been identified as gifted according to a three phase selection procedure may attend the centers. Classes are offered after school

hours, once or twice weekly for an hour at a time. Curricula are designed jointly by curriculum experts, universities, staff attached to the centers and the private sector. The program is divided into three phases and makes provision for various options which take into account individual interests and aptitude.

Phase 1: grades 4–6. Pupils attend classes in Thematic Studies for one hour per week after school. Themes include language, music, drama, science, art, history, and geography for the first 2 years and themes related to communication, the arts and the origin of man in the third year.

Phase 2: grades 7–9. After initial exploration of all fields of study, pupils choose one field from each of Sections A and B. Section A comprises constitutional and philosophical studies, language and literature studies, art, music, drama and communication. Section B includes informatics, astronomy, electronics, petrochemical and geological studies, money and banking, and materials. Pupils meet twice weekly for an hour at a time after school.

Phase 3: grades 10–12. Pupils choose one field of study from either Section A or B and meet twice weekly for an hour at a time after school.

ART AND MUSIC CENTERS

In some provinces in South Africa provision is made for the fostering of the creative arts at art centers, music centers which are attended after school and by means of publications such as *Woodspore* (English: Word Trails) and *Wakening word*.

Nonformal Out-of-School Programs

ACADEMIC VACATION SCHOOL

The Academic Vacation School established in 1984 by the University of Port Elizabeth in South Africa is a 2-week residential program which is attended by approximately 100 grade 9–12 gifted pupils every year from all over South Africa. The school is funded by the University Council and by sponsors from the private sector. Selection of pupils, for the Vacation School is based on IQ (where applicable), academic achievement in school, a personality profile filled in by the school and the creativity displayed by a pupil in making a statement about him/herself on a blank sheet of paper.

The objectives of the Academic Vacation School are the following:

- to provide intellectually challenging experiences for high ability pupils within the academic framework and environment which a university offers (Taylor, 1985);

- to promote good human relations between black and white pupils in South Africa; to help them to understand one another and in the process discover that they can move forward together in mutual trust and hope towards a better future for all;

- to create the opportunity for pupils from disadvantaged communities to learn and live together with their intellectual peers from more privileged communities and thus to facilitate their transition from school to university.

The program consists of the following activities:

Independent investigations. Pupils are assisted by experts to undertake an independent investigation on a problem of their own choice in a specific academic subject or on a social problem. Pupils spend the greater part of the two weeks on this and are encouraged to present their findings to a public audience of peers, parents, and other interested persons on the final day.

Seminars. Pupils participate in two three-day seminars on a topic of their choice which includes oceanography, medical research, philosophy, architecture, pharmacy, and the art of cross-examination.

Seminar on human relations. A special seminar on human relations is presented which aims to prepare pupils to deal with everyday conflict situations in a nonviolent way. Topics which are dealt with include human rights, conflict resolution, peacemaking, and mediation.

Social activities. The residential nature and two week duration of the Vacation School provide an unique and informal opportunity for the socialization of black and white pupils. Structured social activities are arranged for the evenings and weekends.

THE SCHMERENBECK EDUCATIONAL CENTER

In the late 1960s parents who were also professors at the University of the Witwatersrand in Johannesburg, South Africa, organized classes and facilities through their contacts at the university for small groups of gifted pupils. In 1971 they formed the Association for the Education of Gifted Children (AEGC) and began to organize classes on a regular basis for groups of children who were nominated by school principals from all the communities in the Johannesburg region. As a result of the good work of the Association and positive publicity a bequest was made in 1975 from the estate of a Namibian German family, Kurt and Ami Schmerenbeck, to the University for the education of gifted pupils. In 1980 the AEGC was dissolved and formally incorporated into the University as the Schmerenbeck Educational Center (Eriksson, 1988).

The Center caters for over 1000 gifted pupils of all races. Teachers are drawn from a list of interested persons (a resource of 300 has been identified) by networking with teacher groups and parents, from contacts within the University and from the community itself. The Center has a full-time director and full-time counselor. While the University covers costs relating only to the maintenance of the building itself, the Center has to generate funds to cover administrative and staff salaries, administrative costs, publications, teacher payments, course equipment, etc.

The Center provides access to high level personnel,

the most recent research developments in a broad range of disciplines and access to equipment, laboratories, and facilities not possible within a regular school. The Center aims, however, to communicate its methods for use in the regular school, and acts as consultant to many schools on teaching for creativity and skill development. The program offered by the Center includes the following: direct education of the gifted, teacher training workshops, adult education on giftedness and creativity, counseling for parents and pupils, a teachers' resource center, research into the nature and education of the gifted, and publications (Eriksson, 1988).

Education programs are directly related to identification. Hence, pupils do not fit the program, but the program is constantly modified to meet the needs of the pupils. The following are examples of programs which are offered in accordance with this approach: Microscapes (preschool, grades 1 and 2); Projects Plus which includes acceleration and enrichment opportunities and excursions (grades 3–9); creative arts (grades 3–9); and Youth University (grades 10–12) (Eriksson, 1988). Programs are presented daily, also on Saturdays and during holidays, throughout the year.

THE OFFICE FOR THE GIFTED AND TALENTED

Voluntary parent or community associations played a pioneering role in the 1970s in providing for the gifted in South Africa. During this decade the educational authorities were opposed to the idea of special provision for the gifted in schools. The parents and community responded by establishing parent/community associations in various big centers which provided extracurricular activities for the gifted. The pioneer in this respect was Jock Omond, a retired school inspector, who established the Office for the Gifted and Talented in Port Elizabeth, South Africa in 1976. The Office offers courses and lectures on a variety of topics and arranges visits to centers of interest. Periodicals, books, and newspapers from all over the world are scrutinized and a newsletter regularly published which summarizes articles from these sources which may be of interest to parents and teachers. A wide range of books, periodicals, and articles is on display and available on loan from the Office. A collection, possibly unique in the world, of 28 volumes of approximately 12 000 press cuttings on gifted education from all countries is regularly brought up to date. The collection is available for research and study by appointment. The death in 1990 of Omond who was the driving force behind the Office, has placed its future in jeopardy.

GROWTH OF CHILDREN'S POTENTIAL

In 1982 Stan Edkins, a retired headmaster, in liaison with the Department of Education and Training provided the impetus for a Saturday enrichment program in the sprawling black township of Soweto. It became known as the Soweto Saturday School. In 1983 a second

program was started in Alexandra, a overcrowded black ghetto, and a third in 1988 in Northern Soweto. These projects developed into what was called the Gifted Child Program. In 1992 the name was changed to Growth of Children's Potential (GCP).

The focus of the program is the disadvantaged gifted pupil from black township schools who because of the inadequate schooling system and deprived sociopolitical background would not reach full potential. The objectives of the program are the following:

- enrichment and acceleration enabling academic achievement within own communities and beyond;
- development of life skills and creative talents enabling achievement of potential;
- equipping the pupil to benefit community through leadership and career development; and
- encouraging meaningful cross-cultural relationships (Gifted Child Program, 1991).

The selection process consists of an initial screening by the school whereby the top 2–3 academic pupils from each school are invited for further assessment using a general intelligence test normed in South Africa and the Torrance Test of Creative Thinking. The top 25 pupils per area and per grade are selected.

The main components of the program are the following:

Saturday enrichment programs. The Saturday morning enrichment program is the foundation of the work of GCP and runs for 30 Saturdays a year. Pupils remain at the township schools during the week and attend enrichment classes on Saturdays. An integrated studies themes approach is used which dovetails with the syllabi of the state schools and covers English and communication, mathematics, physical and natural sciences, life skills, creativity and careers development.

Afternoon special interest groups. After the more formal lessons of the morning, pupils are invited to stay behind and after a light lunch take part in relaxing and creative enriching activities. Workshops are run by tutors, volunteer community people and experts and include current affairs seminars, drama, chess, dance, art, swimming, sport, and nature awareness.

Excursions. An excursion is designed to take the whole group of pupils out of the township environment and give them first hand exposure to places of educational value and interest leading to greater understanding and the contextualization of skills and knowledge.

Camps. Intensive enrichment and lifeskill development is provided by means of 4-day camps in an invigorating environment away from the city and township.

Cross-cultural activities. Opportunities are created where white and black pupils meet in an environment where they can come to an understanding of each other without feeling threatened.

Scholarship program. All grade 7 and 8 pupils on the program are tested annually using a battery of aptitude tests. Based on the test results and in consultation with GCP center directors, pupils are selected to write

the private school entrance tests. In 1991 thirty of these pupils were accepted and scholarships secured for twenty-one. Pupils who are selected for private schools attend a 4-day orientation program.

In the space of 10 years GCP has achieved measurable success and stability with over 600 pupils being accommodated in their programs per year and another 400 in programs run in other regions using the same model.

Non-Formal In-School Programs

THINKING ACTIVELY IN A SOCIAL CONTEXT (TASC)

A Curriculum Development Unit (CDU) under the codirectionship of Belle Wallace and Harvey B. Adams was established at the University of Natal, Pietermaritzburg, South Africa in 1985 with the overall aim of undertaking research, teaching and community-service activities to help teachers maximise the extent to which all pupils develop their potential. Under the broad aim of the CDU and in the light of the perceived needs of high school pupils an initial pilot project was launched in 1986 to develop a course to teach thinking skills to pupils in grade 10. The focus was on developing higher levels of thinking skills and problem-solving strategies amongst black pupils in Kwazulu/Natal schools (Adams & Wallace, 1991). The TASC program has since been revised and extended and aims to develop in the pupils:

- certain attitudes towards learning (in all contexts, not only in school);
- basic thinking skills necessary for making sense of experience;
- tools for effective thinking and problem-solving strategies; and
- *meta*-cognition—knowing how to and when to use strategies.

The extended TASC program also aims to improve the effectiveness of teachers as facilitators of children's "learning to learn". Short-term adaptation and long-term reconstruction of the curriculum is seen as part of the TASC program (Adams & Wallace, 1991, p. 104). According to the authors the program is based on the following: Vygotsky's work on the development of higher levels of thinking and its connection to social transaction; Feuerstein's theory of cognitive modifiability and the concept of mediated learning experiences; and Sternberg's theory of intelligence (Adams & Wallace, 1988).

Basic underlying principles of TASC are as follows:

- (1) Adopt a model of the problem-solving process and explicitly teach it.
- (2) Identify a set of specific skills and strategies and give training in these.
- (3) Develop a vocabulary.
- (4) Give ample practice in both the skills and the strategies using situations which are significant and relevant to the learners.

(5) Give attention to the motivational aspects of problem-solving.

(6) Progress in the teaching from modeling by the teacher, to guided activity by the learner, and eventually autonomous action by the learner.

(7) Assist the learner to transfer skills and strategies to new contexts.

(8) Emphasize cooperative learning in small groups.

(9) Encourage self-monitoring and self-education.

(10) Require learners to develop their *meta*-cognitive knowledge (Adams & Wallace, 1991).

Several courses based on these principles have been developed and tried out. Two courses, each spread over a 5-day (25-hour) period, were taught to high achieving white and black grade 10 pupils respectively. Adams and Wallace (1991) state that the outcomes were similar in each case, namely rapid learning, high motivation, improvements in self-image and lasting improvements in performance on specified cognitive tasks. No statistics are provided to substantiate these claims. It is, however, mentioned that an evaluation by members of the Schools Psychological Service, teachers, the pupils, and the researchers of the course taught to black pupils revealed certain difficulties. Firstly, it was felt that pupils not already achieving highly within the school system, for whatever reason (e.g., inadequate mastery of English), would need a foundation course in basic thinking, and assistance in achieving oral fluency in English. It was also felt that gains made during the course would be rapidly dissipated unless constant call was made upon the newly acquired skills and *meta*-cognitive knowledge during the pupils' subject lessons.

A major pilot course was subsequently run for a mixed ability grade 10 class of 40 black pupils. This extended over a 6-week period consisting of two 2-hour sessions after school each week. The researchers state that an evaluation of the course again revealed that the approach was highly successful for those pupils already achieving at a relatively high level and with a reasonable command of English language. The remainder progressed at a much slower rate. No statistics are given.

At present the work of the program is being expanded in two directions: the first 4 years of the 5-year secondary school curriculum will be included in the program of instruction; and secondly, the syllabi of all major school subjects will be examined to identify and develop opportunities for building the use of the newly acquired skills into regular subject lessons (Adams & Wallace, 1991).

The TASC program represents a systematic, multi-phase model of problem-solving, incorporating basic thinking skills and tools for effective thinking. The course is designed so that teachers and pupils can incorporate issues and problems which are identified by the pupils themselves. Every attempt is also made to establish transfer of skills to real-life situations. The researchers claim that there are good grounds for believing that the TASC approach has the possibility of achieving significant changes in the capacity of

pupils to benefit from their schooling, and the ability to meet problems in their day-to-day existence (Adams & Wallace 1991). No evidence, statistical or otherwise, is provided for these claims.

The social context within which thinking skills are to be acquired and applied, and which is specifically included in the name of the program, is not sufficiently developed. One of the basic principles merely states that cooperative learning should be emphasized without giving any indication which method or methods of cooperative learning are utilized in the TASC program. According to available accounts, it does seem as if the social dimension of the program has not yet been significantly integrated and developed in the model.

Research and Future Development

A number of issues have been described which emanate from the political, historical, and cultural context of Africa and which have a direct bearing on the provision of education for the gifted and talented. In general, those issues seem to imply that gifted education will probably not be a priority item on the education agenda of most African countries in the immediate future. A restructuring of gifted education on a broader base and contextualized for the needs and priorities of a developing country may be needed to establish legitimacy in future. Some aspects which need to be researched in this respect are briefly outlined below.

Linking Gifted Education Programs to National Development Needs and Traditional Culture

National Service Schemes which aim to relate education to practical service to the nation and to promote national unity have been established in Ghana, Nigeria and Sierra Leone (Anim, 1992). The restructuring of programs for the gifted within the wider context of national developmental needs may ensure the legitimacy of such provision in the education system. Likewise, gifted education may be linked to the traditional social structure of *ujamaa* and the improvement of the quality of life of the whole community.

Education in Democratic Citizenship and Leadership

African countries which have embarked on the road towards democracy will need to educate its people towards a tolerant political culture and a commitment to and understanding of democratic institutions and leadership. The two African states which attended the 1987 Strasbourg Conference on Democracy, Senegal and Ivory Coast, both indicated that educating young people in democratic citizenship was of the utmost importance (Council of Europe, 1987). In their written contributions to the conference, schools were specifically mentioned

as agents in this respect. The development of school programs in democratic citizenship and leadership can provide valuable enrichment opportunities for the gifted and talented and at the same time be seen as serving the future interests of the nation.

Building on the Strengths of African Culture

Competencies and attitudes which are highly valued in African culture and which can be utilized in the development of gifted programs are social-affective competence, interpersonal intelligence and orality (e.g., the *Mukama*—the tradition of oral history and poetry) (Bhola, 1990). Building on the strengths of African culture may increase the relevance of gifted programs. Traditional orality, for example, could be developed in the context of a modern democratic state in the form of public and political oratory. At the same time, programs should also augment those kinds of intelligence which are traditionally not favored in the African culture, e.g., technological competence.

The Integration of Gifted Programs in Regular Classroom Teaching

Gifted education should be seen to be affording all pupils the opportunity to participate in and gain from enrichment and extension and to discover and develop their potential. Therefore special programs should not be provided separately for a select few but be open to all who are interested in and able to benefit from such opportunities. Models need to be researched which integrate gifted programs in regular classroom teaching.

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Programs and Practices for Identifying and Nurturing Giftedness and Talent in Central and South America

EUNICE M. L. SORIANO DE ALENCAR

Universidade de Brasilia, Brasilia, Brazil

SHEYLA BLUMEN

Catholic University, Lima, Peru

Introduction

Considerable progress in locating and providing for gifted and talented students has been observed in different countries during the past two decades. This progress has been the result of several factors, such as:

(1) The growing recognition of the advantages for the countries that provide differential opportunities for their ablest and talented students to develop their potential.

(2) The promotion of national and worldwide communication, research and educational programs for the gifted and talented by several associations such as the World Council for the Gifted and Talented Children (WCGT), the European Council for High Ability (ECHA), Eurotalent and several regional and national associations for the gifted and talented.

(3) The emergence of a new concept of richness as a result of technological progress. According to this new concept, the value of natural resources has decreased and the resources originating in the new technology as well as the value of the human mind are considered to be of greater importance (Seidman, 1984).

However, when the provision of services for the gifted and talented and the conditions of the educational system are compared across countries, huge differences can be observed. While in some countries, such as the United States, Israel and Canada, a variety of programs for the gifted and talented are available and involving an increasing number of students, in other countries the interest for gifted education is just beginning, while in still others it does not exist at all.

Before discussing the educational programs for the gifted and talented children in Latin America we think it is appropriate to give an overview of the socio-economic context in which the educational activity is being developed.

The Education in Central and South America—An Overview

The region is currently passing through its most difficult crisis of the last 50 years. Besides the economic, social and political problems inherited from the previous decades and aggravated by the crisis, there are the effects of the foreign debts, the challenges of the technological revolution in progress in the industrial countries and the increasing demands of the people for better living conditions, impelled by the democratization processes (Cardó, 1990; Tedesco, 1991).

In addition to the problems due to the inflation which many Latin American countries are experiencing, there are the problems related to the foreign debt. This debt has resulted in the adoption of severe fixed policies, with a decrease of the social expenditures, recession, unemployment, enlargement of the urban areas and a decrease of real salaries. As a result of this situation, there is an increase in poverty.

While in the developed countries education is a priority in the discussions about development strategies, in Latin America the educational issues do not have such a high priority. This situation has been a severe setback in the educational development and achievement. However, the impact of this has not been similar in all the Central and South American countries (Hallak, 1990; Reimers, 1990).

In general, five phenomena (Tedesco, 1991) can be identified as the principal effects of the crisis in the educational sector:

(1) The increase of the repetition indexes and scholastic failure, especially in the first years of primary school. Latin America is currently the region with the highest class repetition rates in the world (Schiefelbeim, 1989), due to a shortage of material, cultural and educational facilities (Tedesco, 1991).

(2) The breakdown in the incorporation process to secondary and higher education of the children coming from poor socioeconomic sectors of the population.

(3) The increase of the internal differentiation of the educational system, due to the deterioration of the physical living conditions that affects not only the lower-class sectors, but also the medium-class sectors that had already achieved access to certain goods and services.

(4) The deterioration of educational quality due to:

(a) The reduction of the purchasing power of the teaching salaries, resulting in the desertion of the profession by the most qualified teachers, lengthy strikes, etc. At the same time, this has caused

(b) A great reduction of the educational budget intended for the development of infrastructure or staff training, since 90% of the educational budget is used simply to cover the teaching salary.

(5) The obligatory concentration of efforts and energy in the acute and immediate problems, thus ignoring the medium and long term issues where the principal educational decisions are.

The seriousness of this situation is increasing. If we consider the intense scientific-technological development in the world, then a lack of movement forward effectively involves a worsening of the situation.

Given this analysis, we can conclude that in the Latin American countries, especially those most affected by the foreign debt, the role of the state is the origin of the problem as well as being the beginning of the solution. Thus, due to the need to attend to mass needs, personalized attention is lower in the services intended for the lower-class sectors. Although there are non-governmental and voluntary organizations that work in this area, their capacity for solving problems is very limited and in some cases they still require state support for maintaining themselves.

In the following sections, programs and practices for identifying and nurturing giftedness and talent in some countries of Central and South America will be described. It was the authors' original intention to include information about promising practices that have been implemented in the education of gifted and talented students in all the Central and South American countries. All countries were contacted twice, by telephoning or by sending letters to the national delegates in the Interamerican Society of Psychology, as well as to all the Central and South American Institutes (both educational and psychological) who appear in the "World of Learning" reference book.

Unfortunately, this provided us with very little information. Even for those countries where institutes had been established to carry out research and to provide services for the gifted and talented, efforts to obtain information about their present activities did not always succeed. This was the case for Uruguay, where the "Latin American Center for the Development of Intelligence" was established years ago; for Argentina, where no information about public services for the gifted was available; and Cuba, where we know about the existence of the "Argos" program for gifted children in La Habana.

Furthermore, no material was available or found at the Cultural Departments of the Latin American countries' Embassies located in Brazil and Peru. This explains the limited number of countries whose programs for the gifted and talented students are described. As a further consequence, this chapter will emphasize a description of programs for the gifted and talented students in Brazil. This is the country that occupies the leadership position in this field in South America, with several teams of educators and psychologists involved in gifted and talented education.

Argentina

In Buenos Aires, the capital city of Argentina, the "*Fundacion para la Evolucion del Talento y la Creatividad*" (Foundation for the Evolution of Talents and Creativity) was established several years ago as a private institute whose main objective is to detect and encourage the abilities of the Argentinian children. The methodology this institute follows in the identification process includes interviews with parents, teachers and children, as well as a test-battery that considers the following areas: socio-emotional development, intellectual level, memory, interests, specific capabilities, originality, vocabulary and personality profile. The identified children work in groups and/or on an individual basis to develop their specific talents. An integrated development of their personality is always considered.

Brazil

Brazil is the largest country in South America (over eight and a half million square kilometers) and has a population of about 140 million inhabitants. The language of the country is Portuguese, differing from all other South and Central American countries, where Spanish is the official language. In Brazil a deeper concern for providing special education services for the gifted is relatively recent. Its origins are in 1971, when a national general law for elementary and secondary education was published. This law includes one article about special education, stating that "all students, with mental and physical deficiencies, those who are late in their schooling as well as the gifted, should receive a special treatment according to the policy at the state level policy."

In the same year, a team of American experts in gifted education came to Brazil to serve as consultants at the Brazilian Ministry of Education. This team suggested the following definition of giftedness:

Gifted and talented children are those capable of high performance and/or high potential ability in any of the following areas, singly or in combination: General intelligence ability; specific academic aptitude; creative or productive thinking; leadership ability; visual and performing arts; and/or psychomotor ability.

This suggestion was adopted. Furthermore, the Ministry of Education sponsored the First National Conference on Gifted Children. The First National Conference was particularly important because this was the first time that a group of psychologists and educators from different Brazilian states met to discuss giftedness. This was a very controversial topic. The concept of giftedness was not only associated with traditional myths and misconceptions deeply rooted in the popular thinking, there were also a wide variety of divergent values and attitudes prevailing among psychologists and teachers toward gifted education.

As described by Alencar (1986, 1989, 1991), one of the most serious obstacles to the implementation of programs for the gifted in Brazil were various misconceptions. One of them is the idea that the gifted should always show outstanding performance in all fields. This explains the hostility some teachers showed toward the students identified as gifted and who did not exhibit an excellent academic performance. These teachers typically refused to answer pupils' questions, arguing that the pupils themselves had the obligation to know all the answers and to do well in all their activities. Another common belief was that giftedness is a very rare phenomenon and that the gifted demonstrate extremely high levels of performance and achievement from very early in their lives and that the ability continues throughout life independently of the environmental conditions. The belief that giftedness occurs exclusively among middle-class students, predominantly among male students, is also common, as well as the idea that the most able do not need special attention, since they have enough resources to develop their abilities by themselves.

Teachers often ignore the fact that there is a variety of excellence in different areas and to be superior in one area does not necessarily imply superior performance in other areas. Most educators also ignore the fact that the gifted are a heterogeneous group in terms of traits, characteristics and abilities and that it is impossible to construct a single and perfect profile of the gifted which could be considered as a model for all individuals. There is also strong opposition to providing special programs for the gifted, explained by some characteristics of the country, such as the high rate of illiteracy and the high population of several millions of poor children, who cannot enrol in schools due to the lack of a sufficient number of educational institutions. It is pointed out that priority should be given to solving these problems and not to attending to the gifted and the talented.

These misconceptions, which still prevail among elementary and secondary teachers, were subjected to much discussion during the First National Conference. It was also proposed that a Brazilian Association for the Gifted be established, but this only occurred six years later, in 1977. In that year, the Second National Conference on Gifted Children was also organized. Since then a National Conference has been held every two years. The last one

was in Goiania, Goias, in 1991, with about 500 participants.

At the level of the Ministry of Education, a National Center of Special Education was founded in 1973. At present, this Center is a Department of the National Secretary of Basic Education and has the following tasks.

- To organize policies, guidelines and strategies related to Special Education, in order to assure the access and schooling of the students with special needs.
- To support the educational system in the organization and implementation of policies related to the qualification of teachers for the handicapped and the gifted students.
- To give technical assistance and to suggest criteria for the financial assistance to the public and private schools.
- To promote technical interchange and cooperation among those responsible for programs and projects in the field of special education.
- To coordinate all actions related to the analysis and elaboration of the legislation related to special education.
- To contribute to the production and dissemination of information related to special education.

A journal called *Integration* is also edited every three months by this Department and contains articles about the education of the handicapped and the gifted students, as well as news about conferences, schools and programs for the handicapped, the gifted and the talented students. Previously, in 1986, this Department edited the booklet *Guidelines for planning and implementing special educational services for the gifted* (CENESP, 1986). In 1990, this Department sponsored a course on gifted education for the directors of Special Education from all Brazilian states.

Programs for the Gifted and Talented in Brazil

Before describing the Brazilian programs for the gifted and talented, it is necessary to mention that Brazil is a country of many contrasts. Most of the population is poor and live in very bad conditions. Among the poor, it is common for the children to start their schooling later. Persistent experiences of failure and truancy are common among this group. In general, the poor children stay less than four hours a day in school, their teachers are less motivated and qualified to do their job and their schools are very poorly equipped.

On the other hand, among middle-class families, most children begin going to school earlier, commonly having three years of kindergarten before starting elementary school. Most children study in private schools, which are better equipped, requiring a longer school day. It is common for the middle class children to be enrolled in extracurricular courses, such as music, dancing (for girls only), a second language (usually English or French), in addition to sports classes. An awareness of the

importance of schooling prevails among these families, who hope that their children will be able to gain entrance to good public universities. To achieve this, students must pass a very competitive entrance examination and so preparation must begin very early.

We will now describe the most well known Brazilian programs for the gifted and talented. Some of them are for middle class students and others for the disadvantaged gifted.

PROJECT TO ORIENT AND IDENTIFY TALENTS: A PROGRAM FOR THE GIFTED MIDDLE CLASS STUDENTS

Among the programs for the gifted at the private school system, the most well-known is the one held in the Objetivo Educational Center. The Center is an educational complex ranging from kindergarten to college, with several schools in different states of the country, encompassing 170,000 students.

In 1973, the Objetivo Educational Center initiated a program for gifted students in one of its schools, in São Paulo. Initially, the program included separate classes for talented students followed by the organization of an advanced study program. More recently, in 1986, a series of extracurricular courses for the gifted and talented students was begun, with the general purpose of challenging the students' potential and to encourage them to use their own resources in a creative manner.

The courses comprised two areas: technology and humanities. The former aimed to help the gifted student become more familiar with technical advances and to find answers for different technological problems. Examples of these courses are: building things, electronic circuits, telecommunication, mechanics, microelectronics, robotics, etc. The purpose of the humanities course is the exploration of different experiences which in turn would lead to the development of creative and critical thinking, leadership abilities and communication abilities. The following courses, among others, are offered in the humanities area every semester: questioning news, humor, leadership, discovering feelings and legends and myths. A complete description of these courses is provided by Di Genio, Ancona-Lopez, and Brandão (1990).

Students from the first to the eight grade of elementary schools participate in these courses. The identification procedures are based on the results of intelligence tests (Raven's Progressive Matrices Test and Machover's Test of the Human Figure) and teachers' observations, who are requested to refer students who they consider have a high potential. Each year, before initiating the process of identification, teachers are invited to participate in a course on giftedness. They receive information about the characteristics of the gifted and talented students, about identification procedures, as well as about the role of the school and the family in the process of nurturing the giftedness and talent among children (Ancona-Lopez et al., 1988).

Evaluation studies of this program were undertaken by the team responsible for its implementation. In one of these studies, parents were interviewed and asked to describe the changes in children's behavior as a consequence of their participation in the program. The results indicated that participation in a special course had a positive effect on self-esteem, with a direct influence in the children's self image. A deeper self understanding was indicated, as well as a better use of their potential (Di Genio et al., 1990).

Besides this program, the Objetivo Educational Center has organized several seminars on giftedness and talent in São Paulo, attended by the most well known scholars in this field, such as Harry Passow, Erika Landau, Dorothy Sisk and Joan Freeman. These seminars were open to teachers and psychologists and provided an opportunity for the Brazilian teachers to learn more about identification procedures and programs for the gifted and talented students.

A PROGRAM FOR THE GIFTED AND TALENTED STUDENTS SPONSORED BY THE NATIONAL SERVICE OF INDUSTRY

In 1988, a new program for the gifted and talented was initiated at the national level, sponsored by the National Service of Industry. In that year, a national conference on giftedness and talent had been organized in Rio de Janeiro with two main purposes:

- (1) To call attention to the need of differential programs for the ablest students.

- (2) To provide general information on giftedness and talent to teachers and psychologists from some of the schools maintained by this service.

Immediately after this Conference, a Commission *Permanent Commission for the Identification of Gifted and Talented Students and for the Development of the Creative Potential* was established. Its purpose was to prepare a program which aimed to sensitize and prepare the teachers and the technical staff of the technical and elementary schools maintained by the National Service of Industry to participate in the education of those students with high creative and intellectual potential.

The following year, a project named PODESC, a national program for the identification of gifted students and for the development of talent and creative potential in industrial activities, was initiated in several schools in different Brazilian states. Members of the Technical Committee from the Brazilian Association for the Gifted served as consultants to this project, giving assistance in the process of identification, in the organization of programs and in the teacher's training process.

To identify the students for the program, teachers were invited to nominate their ablest students. The nominated students were observed by three independent teachers during three months, using a checklist which included characteristics and behaviors related to learning, motivation, creativity and leadership. The selected students were invited to participate in an enrichment

program which varied from school to school, depending on their resources and characteristics. In some schools, there are "interest clubs" for these students; in others, the gifted students participate in extra-curricular courses in electronics, computer sciences and creativity. Visits to laboratories and museums are also organized for these students. They are also encouraged to participate in competitions and in Science Fairs. At present, 318 students are participating in this program. The expansion of the program to encompass students from other states, not yet included in this project, is also planned (Leão, 1991).

ATTENDING THE GIFTED COLLEGE STUDENT: THE SPECIAL PROGRAM OF TRAINING

In 1979, the Department of Improvement of Graduate Personnel, of the Ministry of Education, initiated a program for gifted college students named "The Special Program of Training". This program has the following purposes:

(1) To provide an excellent academic preparation to those college students who demonstrate an outstanding performance in their academic activities.

(2) To supply those students with opportunities to further develop higher level thinking abilities and communication abilities.

(3) To stimulate new pedagogical experiences aiming at the improvement of the college education (Dessen, 1988).

Students were selected to this program during their second or third semester at the university, according to the following criteria: high academic achievement, nomination by university professors and high interest and motivation in carrying out their studies. Other factors taken into account in the students' selection were: general knowledge, domain of foreign language (particularly English), critical thinking and leadership characteristics.

The students interested in participating in the program were interviewed by two or three university professors and those who satisfied most of the criteria were selected. They received a scholarship and remained in the program through the end of their undergraduate program. However, if they did not continue to meet the program requirements, especially demonstrating accomplishments (including grades) in their undergraduate courses, they left the program and their place was taken by others.

At present, 41 Departments from 19 Brazilian universities offer this program to their students. University departments in the fields of Engineering, Biology, Psychology, Social Sciences, Pharmacy, Odontology, Agronomy, Economy, among others, are receiving support from the Ministry of Education to maintain the program. In each participating department, a professor is chosen to be the mentor of the students and is responsible for the organization of a program of activities and for the students' supervision. The mentors are selected

from among those professors at the university who demonstrate real interest in the program, high academic productivity, a good relationship with colleagues and students, competency and interest in learning. Every mentor is responsible for 12 students and has to evaluate each of them at the end of each semester.

The program organized by the mentors varies from department to department. However, there are some activities that are common to most of the groups, such as the following:

- organization of seminars and lectures by researchers and scholars from different fields;
- participation in conferences to get in contact with scholars from different fields;
- visits to laboratories to learn more about the research process and studies undertaken there;
- participation in research projects under the supervision of a professor.

A report with a description of all the activities developed by the program, as well as the evaluation of each student, is sent to the Department for Improvement of Graduate Personnel of the Ministry of Education every semester. This material is analyzed and a feedback report is given to the mentor, with suggestions for changes where necessary.

PROGRAMS FOR THE DISADVANTAGED GIFTED STUDENTS

In Brazil, there is a great deal of interest in the gifted children and youngsters from low socio-economic class and a number of programs have been initiated. One such program for underprivileged gifted students was begun at a technical high school in the state of Bahia, in the north-eastern part of the country. This has been a model for those in Brazil interested in starting programs for the disadvantaged gifted students. The program at this school was sponsored by the Jose Carvalho Foundation, a private organization established in 1975 to attend to the educational needs of the disadvantaged gifted.

At this school, a curriculum program was organized into four distinct dimensions:

- the first dimension covered all school subjects required by the Brazilian laws for the secondary technical educational level;
- the second dimension comprised a series of activities designed to promote personal development, including programs in physical education, sports and recreation, health education, oral expression and communication, and community education;
- the third dimension was occupational training, preparing the student in three occupational areas: mining techniques, computer sciences and language translation;
- the fourth dimension stimulated and developed individual talents, interests and aptitudes (Gunther).

The students had the best conditions to learn in a personalized system, according to their own style of learning and at their own pace. The school is very well

equipped, with an audiovisual laboratory, a computer center, a bio-ecological laboratory, an English club and a well equipped library. A team of teachers was specially trained by the Foundation to help the students develop their potential.

To identify the students for the school, teachers from different towns in the north-eastern part of the country were asked to observe their students' behavior, indicating those with characteristics of leadership, interest and attraction for studies, capacity for independent study, critical thinking responsibility, production of ideas and originality. A second stage of the identification procedure occurred in the residential school where the students indicated as the ablest stayed for about two weeks and were observed in different activities by teachers and psychologists. Those selected received a three year scholarship to study at the technical school.

Even after completing their programs, these students continued receiving assistance by means of several projects, such as Project Eagle, which provided financial support to those newly graduated students in the technical school who wished to continue their studies at the college level. The school also facilitates the job placements of its graduate students, promoting contacts between the students and professionals from various corporations.

The school maintained this program for the ablest lower-class students for a period of ten years. Unfortunately, a few years ago this program was discontinued, as the technical school lost interest in selecting and attending to underprivileged gifted students.

A second program for disadvantaged gifted children was initiated in 1972 by Helena Antipoff. She was a Russian teacher who came to Brazil in 1929, after having studied in France and Switzerland and where she published several studies on intelligence and testing in the journals *Archives de Psychologie* and *Revue Pédagogique*. Since her arrival in Brazil, she has called attention to the need of special education for the gifted disadvantaged and is the author of several studies, such as *Ways to help the gifted* (1942), *The gifted child* (1946) and *The supernormals* (1983). These and other studies have been collected into a book to commemorate the centennial of her birth (Antipoff, 1992).

Helena Antipoff was especially interested in attending to the needs of the talented and the gifted from the lower class families. Her project known as Project CIRCULA (Rural Civilization, Culture and Leisure) was based on the educational philosophy that each child has different abilities, aptitudes and interests which should be identified and developed. This project has been supported by the Milton Campos Association for the Development and Nurturing of the Gifted, founded by Antipoff in 1972.

Her program for the gifted and talented was initiated that year on a farm in the state of Minas Gerais, where disadvantaged gifted students participated in an enrichment program. To identify these students, the public school teachers from several towns near the farm

are asked to complete a questionnaire which includes such questions as: "Who is the student most motivated to learn?", "Who are the leaders in class?", "Who are the students more appreciated by their colleagues?", "Which student has the most original ideas?", "Which student exhibits outstanding performance in the arts?" (Antipoff, 1988). The nominated students completed general intelligence tests (Stanford-Binet or WISC) and the best of them were invited to participate in the program.

As described elsewhere (Alencar, 1989, 1991), the invited students participated in an enrichment program during their summer vacations. They developed projects in one of the several laboratories on the farm, studied the plants and animals and looked for solutions to ecological problems. Depending on their interests, they developed projects in the fields of arts, folklore and handicrafts, participated in sports and problem solving activities and also visited museums, churches and the historical cities of Minas Gerais. All of these activities were organized in small groups in order to give each participant an opportunity to discover their interests and to reveal their personality, characteristics and abilities.

During the school year, groups of gifted children were also invited to participate in enrichment programs held on weekends. On these occasions, the parents were invited to participate in the meetings, where they had an opportunity to learn more about the gifted and to discuss ways for developing their talents. Recently, an Association of Parents and Friends of Gifted Children was founded to implement better gifted education in their cities.

Although Helena Antipoff died in 1974, two years after the beginning of the program, her project was continued by her son. Every year and during the week of her mother's birthday, he also organizes a program on gifted and talented education for elementary and secondary teachers, preparing them to meet the needs of the gifted and to develop educational strategies better suited to them. It is common to observe the participation of college students from different schools of education who seek information about giftedness and talent. This program is especially important because there is no course on giftedness at the college level in most Brazilian universities.

To commemorate the centennial of Antipoff's birth, a conference was organized, attended by teachers who worked with her, by former students and by teachers and psychologists involved in gifted education. On this occasion, her main studies and contributions were recalled and senior scholars gave talks on a variety of topics related to education, talent and giftedness. This event also provided the opportunity to call attention to the serious difficulties faced by the Milton Campos Association in maintaining their educational activities, due to a lack of sufficient financial support by the government. Although the association also receives private donations, this has not been sufficient to continue the enrichment program in the way it was originally conducted, nor to

expand the number of disadvantaged gifted children who can attend.

A third program was initiated in 1983 in the state of São Paulo by the AVIBRAS foundation to help gifted students without the financial resources to pursue secondary education. This program consists in providing scholarships to study in a technical school with courses in mechanics, electronics and computer sciences.

The students are selected from the best ones enrolling in the last grade of elementary school (8th grade) by the school teachers from more than one hundred cities in the state of São Paulo, on the basis of the students' academic achievement, motivation to pursue their studies, ability to solve new problems and leadership qualities. Their families' income is also checked, to insure the need for a scholarship. The selected students are invited to enroll in an extension course to better prepare them for the entrance examination held by the technical school. Those who succeed in this exam receive a four-year scholarship. One hundred and twenty students were supported in 1988 by the Foundation. Each of the students who resides in the technical school has a godfather chosen from among those who work in one of the factories of this foundation. It is the duty of the godfather to give support to each student and to help him in his difficulties.

After completing the technical school, the students are invited to work in one of the industries maintained by the Foundation or to go to the university. If the student decides to continue pursuing his studies at the University level, the foundation supplies the financial support necessary for him until his graduation (Benitez, 1987).

PUBLIC SCHOOL PROGRAMS FOR THE GIFTED AND TALENTED

Programs for the gifted and talented have been implemented in the public school system of several states. At present, eight states besides the Federal District support programs for the gifted. However, in most of these programs, the number of children who attend is very limited and the administrative arrangements for the students consist of enrichment activities in a learning center that belong to their own school or a special course in another educational institution.

This is the case of Rio Grand do Sul, in the southern part of the country, where a program was started in 1985 for children with high intellectual potential as well as high potential ability in visual and performing arts. The students are selected on the basis of intelligence tests, artistic performance, interviews to discuss their interests, family background and motivation to attend a special program. Those with high intellectual ability participate in a computer science course at the local university, while a special program in a school of arts is offered for those students with an outstanding performance in arts (Fundação Riograndense de Atendimento ao Excepcional, 1987).

One of the oldest public school programs for the gifted was initiated in 1975 in Brasilia, the Federal District. This program has been visited by educators from other states interested in starting arrangements for the gifted and talented. This program aims to offer the gifted student opportunities to optimally develop their potential and talents; to promote their personal, social and school adjustment; to expose the students to experiences, materials and information which is outside the bounds of the regular curriculum; and to expose them to more difficult or more in-depth material.

As described elsewhere (Alencar, 1991), the nomination of the students for this program is made by the teachers who are invited to refer the students who have demonstrated high intellectual ability, leadership, creativity, academic achievement or high capability in the performing and visual arts. The teacher then observes the nominated students for one month, using a check-list to guide these observations. This check-list includes several traits, such as initiative, originality, curiosity, independence of thinking and persistence—a questionnaire about the behavior characteristics of their children is also completed by the parents. They are asked to evaluate independence, responsibility, imagination, facility to learn and to memorize and ability to concentrate. The nominated students complete a questionnaire about their own interests, hobbies, preferred sports, preference for working individually or in groups, among other topics. Psychological tests are also administered (Wechsler Intelligence Scale For Children, Raven's Coloured and Progressive Matrices and HTP).

The identification of the talented student in music or arts is done by the art teachers. An assessment checklist is also completed by these teachers for each of the nominated students after one month of observation. The students are interviewed by a team of educators and psychologists of the Educational Foundation responsible for the implementation of the administrative arrangements for the gifted and talented.

Administrative provisions for the gifted students occur in Resource Centers at their own schools and at the Park School. In the former, the gifted are exposed to in-depth material on the typical curriculum subjects. Teachers stay in these centers and encourage the students to develop projects in their areas of interest. At the Park School, students study music, visual arts, ceramics and theater once a week. According to their interests, the students also participate in one of several clubs (science, flute, photography, foreign language, folklore and others). The Park School has some learning centers where different enrichment programs are offered especially for the gifted. One of the main purposes of these programs is to develop the student's intellectual autonomy and to cultivate independence and creativity. The students decide which activity they would prefer to follow under the supervision of the teacher. They may work individually or in groups, according to their interests. When the school does not have the equipment or the resources needed to develop projects, the students

are sent to the museums, to the local university or to the city libraries (Souza & Sant'Ana, 1987; Fonseca et al., 1990).

For the students who have an outstanding ability in the performing, visual arts or music, the program is not in the Resource Center but in one of the art or music schools in the city. There is a very good public music school as well as an art school maintained by the Educational Foundation of the Federal District. Here, the talented students attend classes once a week for two to four hours.

In order to work effectively with gifted students, a special in-service program is provided to the teachers. This program includes workshops about definitions, identifying characteristics, nurturing the gifted individual, instructional strategies for the gifted and ways to foster creativity. Experts from the Brazilian Association for the Gifted have contributed to this in-service training, offering short-term workshops and lectures for the teachers who attend to the gifted and talented students.

THE ROLE OF THE BRAZILIAN ASSOCIATION FOR THE GIFTED IN THE EDUCATION OF THE GIFTED AND THE TALENTED STUDENTS

In 1977, the Brazilian Association for the Gifted was founded in Rio de Janeiro. In the following years, several branches of the association were founded in several states of Brazil, including Bahia, São Paulo, Goiás, Espírito Santo and the Federal District. Each branch is responsible for the development of a program, such as organization of a state conference, seminars, workshops, research and orientation to parents and teachers.

In the Federal District, a program was organized in 1987 with two main purposes: (1) To sensitize the community to the need for providing more adequate conditions for the recognition and development of talent, intelligence and creativity; and (2) To contribute to the preparation and improvement of human resources for research, identification and education of the gifted.

Several activities have been organized over the past four years to attain these goals, such as:

- lectures: each month a lecture is organized on a topic related to giftedness, such as programs for the gifted in different countries, the role of the family in developing talents, current trends in gifted identification and qualifications for teaching the gifted;
- courses/workshops: courses and workshops are offered to teachers and parents. Because the Brazilian educational system emphasizes the reproduction of knowledge, with little attention given to the production of ideas and the development of creativity, several courses and workshops related to creativity and how to nurture it have been offered. There are also courses on the education of the gifted and talented students;
- conferences: two local conferences have been organized. In both of them, scholars from different fields

were invited to speak about topics related to education, such as "The challenges to promote excellence in the Brazilian educational system", "Nurturing artistic talent in Brazil", "Mechanisms to identify the gifted and the talented", "Favorable conditions to the expression of creativity in science and arts", "Facilitating the development of the scientific talent" and "The importance of the preschool years for the development of talent and intelligence";

- creativity workshops for children: several workshops were organized in association with the Institute of Psychology, University of Brasilia, to provide exercises and opportunities for the children's creative expression in arts and problem solving.

A newsletter is also edited every year, providing information about giftedness and talent and news about national and international conferences and other events related to gifted education. A folder "Gifted Education: Guidelines for Teachers and Parents" was also published, to disseminate information on giftedness (Alencar, 1990).

The Technical Committee of the Brazilian Association for the Gifted serves as a consultant team at the state and Federal level, suggesting guidelines, policies and procedures in relation to gifted education as well as giving assistance to those interested in helping the most talented students to realize their potential.

ACCOMPLISHMENTS AND DIRECTIONS FOR THE FUTURE

More than twenty years have passed since the first initiatives were taken to introduce programs for the gifted and talented students in Brazil. However, the change process in education is slow and much effort is still needed to implement quality programs for the gifted and talented.

Although several recommendations had been made to the Ministry of Education during the First National Conference on Gifted and Talented Children, including the need for early identification of the gifted, special programs for the gifted and talented and appropriate preparation of elementary school teachers to enable them to attend the needs of this group, few efforts have been made in this direction and very limited resources are available for the programs. There is also a paucity of research on giftedness and talent. Finally, there is a lack of interest in the universities to become actively involved in teacher training for gifted and talented students.

Despite these facts, conferences about giftedness and talent are frequent in Brazil. Also, more and more parents and teachers are becoming aware of the need to identify and attend to these students, especially as a consequence of the program held by the several sections of the Brazilian Association for the Gifted. Several books related to this field have been published in the last few years. A special interest in creativity and how to nurture the students' creative potential has also developed.

A large number of schools for the talented in music, ballet and arts are functioning in many cities, at least one in every state. There are also several competitions at the local, state and national level in Mathematics, Chess and Science. The oldest and most famous is a project known as "Scientists for the Future", described by Alencar (1989), which is a nationwide competition that aims to discover new talent in the field of Science and to help those students to continue their studies until the university level.

What is urgently needed is the maintenance of the current programs for the gifted and talented in Brazil. As indicated previously, some of the programs are facing enormous financial problems. It is also necessary to expand the number of gifted and talented students attending special programs. In a country with a population of more than 55 million people under the age of 14, much more must be done to decrease the waste of human potential. It is also necessary for the Brazilian universities to devote more attention to the field of giftedness and talent. Also, those in leadership positions in the education of the gifted should become more actively involved in the political and public policy procedures on gifted education. All of these are big challenges for the Brazilian researchers, who are aware that a better future for the country depends directly on appropriate educational conditions for all students, including the gifted and talented.

Chile

Chile is located in the south-western part of South America and has a population of 12 million inhabitants. In 1964 the "Chilean Institute for the Gifted" was founded, an institution specialized in nurturing giftedness in all children. Its founder, Dr Mario Julio Gamba, is also the author of the recently published book *Scientific methods to make a child gifted* (Gamba, 1991). In this book, Dr Gamba describes activities, exercises and games intended to stimulate children in the first years of their life to develop their potential. These exercises are used with children who study in the Chilean Institute for the Gifted.

In 1979 the "Andes-Chile National Association for the Development of the Gifted Education" as well as the "Latin American Association for the Integral Development of the Gifted" were founded. The following year, "Supraxia Universal", an Institute for gifted youngsters and adults from all countries, was founded.

In 1985 a new method for inducing gifted behavior from the first days of a child's life was put in practice by Dr Gamba who, at present, is disseminating this method in the other countries of Latin America.

Colombia

Colombia is located in the northern part of South America and has a population of 28 million inhabitants.

In its capital, Bogota, the Alberto Merani Foundation for the Development of Intelligence was established in 1986, with the following purposes:

- to develop studies on intelligence and education;
- to provide a meeting point for researchers and teachers interested in the production and implementation of strategies for promoting a better education;
- to help teachers interested in the development of the students' creative abilities and higher levels of thinking;
- to be an enrichment center for gifted children of 12 years old or more;
- to be a consultant center for teachers, school principals, researchers, university students and parents interested in education and giftedness.

One of the reasons which led to the organization of this foundation were the results obtained in a study of the cognitive abilities of 14- to 15-year-old high school students. These results indicated a delay in the students' intellectual development due to the adverse living and schooling conditions.

The Foundation's organizers were aware that changes were necessary in the Colombian educational system, which was blocking the students' intellectual and creative abilities and inhibiting the development of self-confident individuals. They were also concerned about the large number of Colombian children with high intelligence, creativity and talent who were being ignored, due to the lack of special programs for the gifted and talented.

As a starting point, a Research Institute on Intelligence was created at the Foundation, with the purpose of conducting studies on intelligence and its development. A journal entitled *Perspectives in Psychology and Education* was initiated in 1987 and a book *The superior intelligence* (Samper, 1987) was published. This was the first book in the country to call attention to the characteristics of the intellectually gifted and to the need for identifying them and for promoting appropriate educational programs for them.

In 1987, the Alberto Merani Foundation for the Development of Intelligence organized the First International Conference on Intelligence, attended by several scholars from the different countries of Latin America and from other continents. Several topics related to intelligence and gifted education were discussed, as well as the different strategies to attend to the needs of the intellectually gifted. The first author attended and spoke about gifted education and the development of creative thinking abilities.

This conference was the starting point for the creation of the Institute for the Gifted Children in Bogota, which started its activities in February, 1988. Administrative arrangements for the gifted at this Institute included an enrichment program for kindergarten and elementary school children in different areas of learning not commonly found in the curriculum. The following courses were planned: Introduction to Symbolic Logic, Electricity, Conceptual Reading, Mathematical Reasoning, Electronic Circuits and Chess. A special concern to

nurture the students' creative thinking abilities was a characteristic of all courses. An emphasis on exposing the students to experiences and materials which were outside the bounds of the regular curriculum was another characteristic of the program. Eligibility for participating in these courses was based on information about linguistic development, motivation and level of reasoning as well as results in general intelligence tests. The activities of this Foundation are continuing. One of their goals has been to establish the scientific validity of their pedagogical proposals. Therefore, between 1990 and 1991, they have carried out a research project to validate their philosophy (Zubiria et al., 1992). Furthermore, several agreements between the Alberto Merani Institute and Colombian Universities have been established. The most important of them regarded the beginning of a master's degree program in cognitive development, in order to improve the post-graduate students' knowledge about gifted and talented.

Guatemala

Although experimental research on highly capable children has not been carried out in Guatemala, supporting programs for highly capable students have been established in this country. The *Asociacion Pro Alumno Talentoso y Superdotado* (Association in Favor of the Talented and Highly Capable Student) is one of the institutes interested in the identification and educational promotion of highly capable children. The Universidad del Valle de Guatemala, through its *Programa de Orientacion y Becas para Estudios Superiores—POES* (Orientation and Scholarship Program for Superior Studies) applies batteries of Aptitude Tests to all the interested students. Scholarships for university studies are available for the highly capable students identified through the Aptitude Tests results. In addition to this, in 1992 the *Fundacion Herculano Aguirre* (Herculano Aguirre Foundation) sought to identify the highly capable students at the Universidad del Valle, in order to give them scholarships and other economic support for continuing university studies.

Mexico

The following programs to support highly capable children are being carried out in Mexico.

In 1982 the first public school for Mexican highly capable children was established in the city of Puebla, located 100 km south of Mexico City. This school began with 143 children who came from 23 public, 10 federal and 13 private schools. All of the children possessed an IQ higher than 120. Later, the *Centro de Desarrollo del Intelecto* (Center for the Development of the Intellect), a private organization that aids children of middle-high socioeconomic levels, was established in the same city.

Its objective was to create a favorable environment for highly capable children, in order to develop their superior potential and to provide psychological and pedagogical support for abilities that were not attended to in the traditional school (Arroyo, 1989).

In Mexico city, there has been a proposal that attempts to meet the conditions of the public primary schools as well as the educational philosophy followed by the Head Office of Special Education. The main objective of the proposal was to identify and promote the creative and productive potential of children and to encourage their academic performance. This proposal includes the following basic conditions:

- (1) The development of sensitivity toward the members of the educational community and its environment.
- (2) Identification programs involving the regular school population as well as the special groups.
- (3) Enrichment activities for the regular school population and mainly for the special education groups.
- (4) Research and task commitment activities for all the students.
- (5) The identification process based on a wide-range criteria of human performance, as well as clinical observation of the students.

During the 1987–1988 school year, a program for gifted and talented children was begun in 38 primary schools in Mexico City. A wide variety of identification and enrichment programs were developed. One of the initial results was that 5430 children in regular schools and 993 children in special education schools benefited from this program. In June 1988, the work of 45 children were exhibited to the public.

Some of the problems faced by Mexican researchers (Cortes and Schwanke, 1988), such as administrative difficulties and a lack of physical conditions, are very common in Latin American countries.

Peru

Peru is located on the mid-western part of South America (Morales, 1992). Peru is a multicultural and multilingual country and is currently facing very serious social and political problems. Drug dealing in all its forms disturbs the social structures and terrorism threatens the stability of the country.

In this crisis period, educational development has involved changes in the following four areas:

- (1) Coverage of the educational services. This includes:
 - (a) The expansion of elementary education with strong participation of the state.
 - (b) Increasing the indicators of scholastic failure in primary education.
 - (c) The incongruence between enrollment in secondary and higher education and opportunities in the labor market.
- (2) The quality of the educational services. Faced with the rapid increase of knowledge in the developed

countries. the obsolete curriculum (aggravated by the lack of innovating resources) is being criticized.

(3) The process of budget assignments. A global decrease in educational expenses is observed along with a significant increase in the budget percentage for the salaries payment.

(4) The management capability of the Ministry of Education affected by the bureaucracy goes along with the loss of negotiation power in the places where financial decisions are taken.

The quantitative analysis of the changes in the educational services in the past decades permits us to appreciate that the goal of universal basic education has not yet been achieved, whereas secondary and higher educational levels have become massive, beyond the real absorption possibilities of the labor market. This imbalance is aggravated by the centralist dynamics of the national development. Education achieves its best coverage and quality on the coast and in the urban sector, especially in the capital city, Lima, while the greatest shortcomings of the system is found among the feminine, non-coastal and rural population.

In the last two decades changes in plans and educational programs, global reform and pedagogical and organizational innovations have been made within the framework of three general Laws of Education.

Research on Gifted and Talented Children in Peru

Since the educational reforms of 1972, instructional methodology and educational programs were developed in an attempt to achieve the integral education of the student. With this goal in mind research on creativity, expressed through artistic tasks, was begun. In the first half of the 1970s theoretical and methodological proposals were submitted and the Ministry of Education, in agreement with the then Federal Republic of Germany, carried out a project on Education for the Arts.

From 1978 the research carried out in Peru has mostly been experimental and comparative. The relationships between variables such as the demographic and socio-economic level variables and creativity were examined. Reategui's CCAP Test (Test of Creative Capabilities in Visual Arts) was used as an instrument for evaluating creativity and for developing programs in order to encourage the children's creativity.

In the 1980s, various mediating and conditioning processes were incorporated into the research. In this period, creativity was defined as a measurable rational function, which developed through constant and voluntary practice. In the middle of the decade the first research with talented children was carried out. In general, the purpose of these studies was to detect very able children in order to help them become productive members of society. Theoretical and methodological proposals aimed at achieving a complete use of the human resources to improve the development of the country.

At the beginning of the 1990s research focused on those specific areas that contribute to creative ability. Proposals and methodological suggestions have been made regarding how creativity can be oriented and expressed in different ways. A more practical tendency in the research has also emerged. Attempts have been undertaken to detect talented and creative students in order to help them in their adaptation, socialization and development, as well as to orient them towards improving the living conditions in their society, community and country.

DETECTION OF GIFTED AND TALENTED CHILDREN IN PERU

In 1972 the National Council of the Peruvian University issued Resolution No. 776 which stated that the two students from every public school or every commercial, farming, or industrial institute of the State, who had obtained the highest grade average in secondary studies could apply for admission to the public or private university of his choice, in the region corresponding to his school, without needing to take the admission exam. At present, the University Law No. 23733, in force since 1983, includes in this provision the top two students from private schools.

A regulation was established by which the universities could determine a maximum number of vacancies to be covered by this procedure, in the event that the number of eligible students was too high. This situation led to the need for carrying out a selection process of the applicants, according to criteria that every university deemed convenient. Pereyra (1987) has carried out research which examined the convenience of this system in the Universidad Nacional de Ingenieria (National University of Engineering).

On January 15, 1983, the Supreme Decree No. 02.83-ED was given inside the Rules of Special Education, in which there are two articles that benefit highly capable children: The exceptional child due to outstanding abilities, that surpasses significantly the average of normal intelligence, needs special programs in different modalities (D.S. 02.83-ED).

A student subject to special education has the right to:

(1) Be accepted in a Center or Program of Special Education without any discrimination or in the Centers or Programs of the different levels and modalities of the Educational System, according to the achieved development.

(2) Receive an integral education in the different levels and modalities which permit him/her effective incorporation in the society, especially in the labor field.

(3) Be treated with dignity and fondness, respecting his individual differences.

(4) Receive freely the educational services in the Public Educational Centers and Programs.

Under the protection of this law, the following programs for detection and nurturing the Peruvian highly capable children were developed. Although

limited in number, these programs represent the first attempts to detect and attend to the needs of the very able children of Peru. Some of the research got bogged down due to the lack of economic resources and others were not even concluded.

In 1989, the National Council of Science and Technology (CONCYTEC), proposed the need for a talented detection program, in order to secure the good advantage of the scholarships granted to students of low financial resources. The creatively talented child was defined as:

... the person with high levels of creativity, good tolerance to frustration, highly intelligent, autonomous, with a high level of self-esteem, good sense of humour and a steady structure of personality (CONCYTEC, 1989).

A battery of tests was developed to evaluate the intellectual, creative, socioemotional and personality aspects of these children. Initially, the following diagnostic criteria were considered: IQ higher than 127 (WISC-R), high scores in the creativity test (CCAP) and a stable personality structure (Eysenck Inventory of Personality).

There was a nationwide request for parents, who thought they might have a gifted child, to bring the child to CONCYTEC for an evaluation. However, few parents responded and none of the children who were evaluated fulfilled the diagnostic criteria. Therefore, it was decided to take into account only the intellectual criterion (IQ > 127). But, the identified children (28 in number) never followed a special program, due to difficulties within CONCYTEC.

Gonzalez (1991) carried out an identification study of highly capable children in the southern city of Tacna, in order to develop an historical, social, ecological and future-oriented awareness, as a way of improving the living conditions of their community. A total of 2049 students from 27 public and private schools participated in the selection process. Once the identification process was finished, recommendations for the educators, parents, educational and political authorities of the town and even for the CONCYTEC were suggested. The study was based on the need to use the human resources for improving the development of the region and, later, the country. Due to the lack of financial resources, only the first goal of detection could be achieved.

Ruiz (1991) carried out a descriptive study to identify the personality profile of the highly capable children of Lima, as a basis for further research. This author and colleagues proposed in 1986 to the Ministry of Education a program for attending to the educational needs of talented children. The definition of talented children referred only to those children that had an IQ greater than 130 (Wechsler Scales). The sample were children from the middle-low socio-economic class of the city of Lima. During the summer vacations of 1987 a program which consisted in enrichment activities in the cognitive and affective areas was applied to the selected children.

In 1988, the *Unidad de Servicios Educativos-USE 15* (Unit of Educational Services) that is in charge of two districts of the middle-low socioeconomic class in Lima, took charge of the program's supervision and the research was continued with 16 children. The project was carried out on a weekly basis in a school of the USE 15 jurisdiction. During the years 1989 and 1990, the process of detection was continued and succeeded in selecting 40 children. Towards 1991, the program included 100 children, but for political and economical reasons, the number of participants was reduced to 50 and the selection process was suspended. At that time, the timetable was modified to daily basis, as an extracurricular activity, including Saturday mornings.

In 1992, the detection process was started again, using the criteria of 1986. This program is aimed at gifted and talented children ranging from 5- to 12-years-old who belong to the public schools of the jurisdiction. The objectives of the program are:

- to extend and improve the coverage of the educational services for very able children;
- to extend the curriculum according to the individual characteristics of the students;
- to develop training programs for psychologists and teachers in order to improve the quality and efficiency of the educational services;
- to carry out detection programs in all schools of Lima City and its jurisdictions.

There are several stages in the execution of the program:

- (1) The USE 15 public school teachers refer two or three children from their classroom that fulfil the characteristics on an observation scale.
- (2) Two tests (PPVT and CPQ-Catell) are given to the referred children and those that exhibit rapid learning ability are placed in the superior category. Afterwards, the WISC-R is administered and only those who obtain an IQ higher than 130 are selected.
- (3) Finally, a complete psychodiagnostic battery is administered to all the participants, using a matrix criterion, according to the children's age and IQ, for the placement process.

(4) The children participate in the enrichment programs on group and/or individual basis according to their cognitive and emotional needs. All the programs are led by psychologists.

An evaluation of the program is carried out as follows:

- (1) Pre- and post-test evaluation processes are carried out at the beginning and at the end of each year.
- (2) A bimonthly evaluation is controlled in a qualification notebook in which the achievement of the specific objectives are evaluated with a nominal rating system.
- (3) After the program had been running for two years, a follow-up study was carried out to evaluate the goals of the students in the program. The results showed that, in general, the children were good students in their regular school classes, although were not the best achievers academically.

The main problems that affect the success of the program are related to the financing of both the physical conditions and the testing material. At present, a private school of the USE 15 jurisdiction is lending its physical environment for the development of the program. Unfortunately, the space is very limited and so the program cannot be extended to more children. There are also no economic resources to renew the psychological tests used in the identification process and this may interfere with the suitable administration of the tests.

This has been the first Peruvian attempt to nurture gifted and talented children and has been affected by the deficiencies in the educational conditions in Peru and the rest of Latin America.

Venezuela

In Venezuela there are two programs supervised by governmental organizations which serve highly capable children. The first is a branch of the Ministry of Education and is responsible for the whole areas of special education. The second is the Galileo Program of the Gran Mariscal of Ayacucho Foundation. We will describe this program in detail.

The Galileo Program

The main objective of the Galileo Program is to select and prepare secondary students with outstanding academic performance for continuing advanced studies in foreign universities. Other objectives of the program are:

- to create the suitable conditions in order to give outstanding students the opportunity to receive the best higher education available;
- to organize meetings and exchanges with students from other countries that share education programs in order to extend the basis of international relations;
- to propose different instructional methodologies to the Venezuelan educational system, that could influence and improve it;
- to integrate the contributions coming from university authorities, educational institutes and service enterprises, into programs for the very able supported by FUNDAYACUCHO;
- to promote students' sense of commitment and guide them to act in a way which takes account of the problems, opportunities and possibilities of the country.

Stages of the Galileo Program

PRESELECTION

This stage consists in the administering of a battery of four sub-tests: reading ability, logical reasoning, situational analysis and space relationships.

SELECTION COURSE

This is an intensive four week course carried out in the month of August, through forty weekly hours of academic, cultural and recreational activities. FUNDAYACUCHO grants scholarships for participation in this course. Once completed, the students who have obtained satisfactory results may apply for the financing programs of FUNDAYACUCHO, in order to follow the pre-grade studies in Venezuela.

REINFORCEMENT AND PREPARATION PROGRAM

This program is carried out in the last year of secondary studies. It includes four days of meetings in which the students are assembled to carry out study workshops, visits to industrial complexes and activities related to previously assigned work.

The *Premio al Talento* (Award for the Talent) program has been created in order to encourage excellence and to promote the students' abilities through grants and scholarships for finishing secondary studies in Venezuela. This program is available to secondary school students who exhibited satisfactory performance in the Galileo Test of Pre-Selection.

Results

In August 1990, the first Selecting Course of the Galileo Program was carried out with the participation of 247 first and second year secondary school students from all regions of the country.

The students who finished school were placed by FUNDAYACUCHO into universities in several countries: 53 students in the U.S.A., 13 students in Germany and 22 students in France. At the present time, these students are completing preparatory and foreign language courses prior to their acceptance in the universities where FUNDAYACUCHO had made admission applications.

The students of the first year of Secondary School that took the Selection Course in August 1990 and obtained satisfactory results have continued their studies in their respective schools and have received simultaneously the support of the Reinforcement and Preparation Program corresponding to the third Stage of the Galileo Program. These students have begun work on themes of national interest such as, education, health, food, technological cultures.

American Sponsored Schools in South America

American Sponsored Schools in South America (ASSSA) serve a multilingual and multicultural population comprised of the American overseas community and the upper-class Latin American population. Seven years ago the U.S. State Department Office of Overseas Education contacted the Johns Hopkins University Center

for Talented Youth to implement the Optimal Match in South American Schools. The philosophy of this project is that a child should be allowed to move through the curriculum at his/her own speed regardless of age. Communication between teachers, administrators and grade level coordinators in the schools make it possible to meet the needs of individual students at the appropriate content level.

The U.S. Office of Overseas Education established a grant for a specialist in gifted/talented education to be in South America to act as consultant for programs in the schools. This person is a resource for in-service in the areas of program development and teacher training in the area of gifted and talented.

Identification of students in these schools is very difficult, because there are students who are learning in a second and, not infrequently, a third language. Existing tests have not been normed to this kind of population so finding an appropriate test is difficult. If a student has testing results from the last school he has attended, those scores are often considered as indicators.

Teacher recommendations and more general measures of ability, such as the Otis-Lennon Test of Mental Abilities or other standardized tests provide additional information about a child recommended for identification in most of the schools. These scores are also used as indicators of achievement and ability. Students who score above the 90th percentile are usually selected.

Each school establishes its own criteria for identification and chooses whatever test(s) or part of a test they find useful. After students have been identified, each school then looks for a way to serve the children. Acceleration, usually in one content area, is a frequent mode of service. Enrichment activities after school such as forensics, dramatics, knowledge bowl, chess club and science related clubs are available at schools. The students can then compete or get together on an international basis. In a few instances these activities are followed in the classroom. Model U.N., debate, drama and various music classes are electives in some of the schools. The students also participate in the various talent searches sponsored by universities in the United States.

Another feasible concept, especially for grades 1-5, is "clustering". When students have been identified they are grouped in the same classroom. The teacher for this class is given special training which deals with the characteristics of the children, problems that are often found in a gifted population and an introduction to methods that have been successful with highly capable students. The highly-capable coordinator, is a resource to all the schools for training teachers, trouble shooting advice and helping find materials to meet the needs of these students. Clustering provides opportunities for the students to be grouped together on some occasions as well as having opportunities to work with non-gifted peers. This is not cooperative learning although cooperative learning is used in some of the classrooms some of the time.

There are two factors which make special services more difficult in South America. One is that communication is very slow and expensive. It is often not possible to fax large amounts of information between schools and delivery of letters or packages can take a long time. The second factor that affects these services is the transitory nature of the American faculty. These teachers may stay four or more years, but many are on two year contracts which they do not renew. This means that new teachers must constantly be trained and that continuity and program development is an ongoing difficulty. The ideal would be to have foreign and local teachers trained in all the areas of need.

Despite these problems students are served and served well. Since the calibre of the students is above the norm to begin with, content is much more challenging and moves at a fast rate. Teachers and those who work with highly capable students are constantly on the look out for new things to do and new materials to use.

Junior Great Books and the Great Books program are frequently found in these schools. Many offer juniors and seniors with opportunities to try to receive a diploma from the International Baccalaureate program. This program is academically demanding and highly structured. There is a version of it that is appropriate for grades 6 through 10. Although this is not being used in many places, at least one South American school is giving the Pre-IC program careful consideration.

Several of the schools group their special services under one administrative unit. This simplifies student identification, placement and services. There is also a standing committee involved in the placement of these students. This consists of teachers, administrators and specialists who know the child and can discuss the best available options.

In summary—each school recognizes the need for services for these students. Many of the schools have looked at these needs and found ways to deal with them. Most often, the services for gifted students are given in the classroom and as extra-curricular activities. Acceleration by content of grade level is also used often to meet needs. The acceleration is usually not radical, but this is always a possibility. Because these schools are not bound by many regulations, they have the flexibility required to make their programs work.

Summary

As was stated at the beginning of the chapter, the governments played an important role in the priorities given to education in their countries. Therefore, it is important to sensitize political and educational leaders of Latin America to the need for improving the conditions for developing the ablest children, who are the best human resources for the developing countries to improve their living conditions.

Very big differences can be seen when comparing the services available for nurturing the gifted and talented in

Latin America. This is related to the development of the psychological and educational sciences in the countries, as well as with the laws given by the governments to improve the conditions of the special educational services. Brazil, the leading country in this area, is ten or twenty years in advance of other countries where only the first programs are being initiated as experimental proposals.

It is necessary to disseminate information about giftedness and highly capable children and youngsters among school staff, teachers and parents, in order to make them more aware of the cognitive, social and emotional needs of these children.

More research needs to be carried out in this area, to gain better knowledge about the personality profiles of the gifted and talented children that belong to different socio-economic levels in Central and South American countries. The socio-economic level should be taken into account in future studies, because it is very probable that more similarities would be found between children belonging to similar socio-economic levels among the Latin American countries, than between different socio-economic levels in the same country.

It is also important to make colleges and universities aware of the need to include gifted and talented education in their curricula, in order to train teachers to have the knowledge to identify and nurture the gifted and talented children.

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Advocacy as a Force in the Education of the Gifted and Talented

NORAH MAIER

University of Toronto, Toronto, Ontario, Canada

Introduction

This volume presents a view of the breadth and depth which the field of gifted education has reached in the last few decades. The variety of perspectives are ample tribute to the significance of the power of advocacy. The struggles of implementing change in public attitudes and educational priorities is nowhere more aptly reflected than in the development of the field of gifted and talented research and education.

Advocacy has assumed a key unifying factor between theory and practice, national and international interest groups, private stakeholders, and public policy. Parents, students, educators, researchers, societal agencies have often joined together on behalf of a neglected population of learners, sometimes singularly, sometimes in concert, but always in the belief that outstanding human resources need equal attention and nurturing.

Advocacy on behalf of giftedness and talent, has taken different forms over the years. The last quarter of this century evidences the role which advocacy groups wield in bringing about major changes in all areas of human endeavor. The force of committed individuals united in a common purpose is undeniable.

This chapter underlines the fact that advocacy, far from being a haphazard, emotional preoccupation of vested interests, has become the agency to champion the right to learn, the right to pursue one's ability, the right to be different. The meaning, the process, the outcomes and future directions of advocacy are discussed.

The present state of the field shows new partnerships evolving between education and industry, business, government, and labor—all standing to benefit from the development of individual talent. If gifted education is to move beyond the sporadic and cyclical development to which it was subjected in the pre and post Sputnik era (Passow, 1979) and the pre and post cold war world, it must become more reflective about its purpose and general relevance. Above all, it must be accountable to all the constituencies which support and believe in it. Gifted education cannot escape the re-examination which many fields in the sciences and humanities are presently undergoing.

The Meaning of Advocacy: Purpose, Role, Scope, Process

Need and opposition are latent in the term advocacy. It presumes that there is a cause which needs support; further, it signals the existence of controversial issues which may be represented by adversarial groups. To be an advocate for the gifted and talented entails the awareness of historical, societal and ideological attitudes which have surrounded the field with debate. The purpose of advocacy is fourfold:

(1) To correct mistaken assumptions about the nature of the subject.

(2) To improve the conditions which nurture the subject.

(3) To broaden the scientific knowledge base which informs identification procedures.

(4) To deepen specialized instructional and curricular provisions.

The role of advocacy is to draw attention to a need. Tannenbaum (1980) defines it as organized persuasion of the highest order. The target audiences are legislators, trustees, administrators, policy makers, educational practitioners, parents, and the gifted themselves. Within a decade, media strategies (Alvino, 1991) and public relations have become recognized handmaidens to secure funds for academic research and curricular provisions. Educational partnerships have extended to include universities, corporations, governments, and industry (Maier, 1991; Shaklee, Padak, Barton, & Johnson, 1991).

The scope of advocacy has likewise grown with the emergence of general concern about educational practice in the public and private sector. The early academic preoccupation with the search for theories of general intelligence and individual psychology has expanded to a societal interest in the development of a vast array of human potential. New theories emerged which broadened and contextualized the understanding of intelligence (Snow, 1980; Sternberg, 1977; Gardner, 1983). The concern for developing the talents and competencies of all children (Raven, 1987) forced reflection

tion and inquiry about traditional identification of and provision for the gifted.

Recently the nature and nurturance of abilities in the individual child has become linked to the exploration of excellence in society as a whole. Even the initiation of a General Unified Plan for Gifted Education has been proposed as a platform from which gifted programs can effectively be built.

Public awareness of the importance of gifted education has risen dramatically, resulting in the formation of a number of support organizations and advocacy groups at the local, state, regional and national levels. In short, gifted education has come of age (Sanders & Sanders, 1992).

A review of approaches, methods and experiences in achieving systematic public advocacy will lead to an examination of future directions.

Local, National, International Advocacy

Advocacy has evolved into a science in its own right, with its own history and its own problem solving process. Firstly, a problem emerges; secondly, like-minded people congregate to address the problem; thirdly, they present the issues to raise awareness; fourthly, a multiplication of concern builds to form power forces; fifthly, strategic intervention ends in action.

Tannenbaum (1980) was an early proponent of reaching out through advocacy on behalf of the gifted and talented. He argues that each advocate organization, has its own history and development, depending on the people who support it. The *American Association for Gifted Children*, the first voluntary organization devoted exclusively to the gifted in the U.S.A., was founded in 1946 by two women. A group of their friends from various fields and professions were concerned about the neglect and abuse of gifted children. Since then the *National Association for Gifted Children* (NAGC) has grown into a powerful force in American education. Its membership is now predominantly practitioners, academics and researchers in education. After the first initiative, the effectiveness of such a group depends on continuous vigilance.

An independent advocacy organization can serve as a deterrent to the diminution of programs at higher levels of administration. It can provide community support for teachers and program directors in their struggle to maintain quality. So many other urgent and reasonable pressures are being brought to bear on school systems by a variety of advocacy groups that gifted education requires continuous support (Tannenbaum, 1980).

Advocacy groups can close the gap between mandated programs and their implementation. Coleman and Gallagher (1992) reported that state policies were not preventing services to special populations but rather it was the implementation process which created obstacles. They proposed specific strategies such as conducting

a formal community awareness campaign to recruit support and resources for talent development.

Other countries appear to follow the same pattern in organized advocacy. A group of parents formed the *National Association for Gifted Children* (NAGC) in Great Britain. It now has about 4000 members in approximately 50 branches across the country. A similar parent group in Canada designates itself as the *Association for Bright Children* (ABC). As an advocacy group, it was largely responsible for the introduction of special legislation which guarantees differentiated programming for the gifted in the province of Ontario.

Teacher organizations can be both a positive and a negative power group. On the positive side, the *National Association for Curriculum Enrichment and Extension* (NACE) was founded in the United Kingdom for and by teachers. NACE arranges for extended provisions and services for the highly able in regular schools (George, 1992). On the negative side, Gagné (1993) described the special case of advocacy for special educational services for gifted and talented children in the Canadian province of Quebec. He noted the crucial role which the largest provincial teachers union played through its systematic and forceful opposition to the development of such services in primary and secondary schools. Berthelot (1987) was commissioned by the union to prepare a literature search of gifted education for evidence against differentiated programming. The arguments and actions of the union leadership to win a majority of the almost 70,000 members to its position led Gagné to reflect on the limits of advocacy, on the role of ideology as a major obstacle to mutual understanding, and on the frequently difficult task of bringing together regular classroom teachers and the teachers of the gifted.

Larger and larger units of influence develop from such grassroots levels to undertake more and more ambitious tasks. The Council of the Australian Association for the Education of the Gifted and Talented publishes the *Australasian Journal of Gifted Education* "to share research and good practice from our part of the world" (Bailey, 1992).

The *European Council for High Ability* was founded in 1987 to provide a forum for an exchange of research activity in Europe. It increasingly grew beyond this scope to influence good educational practice as well. In addition to holding three European-wide conferences since then, Freeman (1992) lists teacher training activities, the creation of an advanced teaching Diploma in the Education of the Highly Able, an emergent ECHA European Jazz Orchestra and the ECHA Schools Division as its emergent accomplishments. In addition to many national associations, some other examples of leadership provided by European groups are: EUROTALENT, *Association Nationale Pour Les Enfants Intellectuellement Precoces* (ANPEIP); *Asociacion Para El Desarrollo De La Creatividad Y Talento* (CREDEYTA); *Association Nationale Pour Les Enfants Surdoués*.

Eastern Europe provides a special case. The political

and ideological changes taking place in what were formerly designated states of the U.S.S.R. or affiliated nation states, resulted in a momentary upheaval. Problems in Poland are identified by Sekowski (1992). Dockal, Laznibatova, and Kovac (1992) hope for progress in Slovakia through the agency of the World Council for Gifted and Talented Children. Nevertheless, some examples show visible development in planning for the gifted and talented. In Hungary (Herskovitz, 1991) teachers, psychologists and curriculum specialists founded the *Hungarian Association on Giftedness* in 1989. The objectives of this group include the dissemination of information on research and development and the provision of support systems to teachers and gifted children. An interdisciplinary team composed of sociologists, philosophers, teachers and psychologists, led by József Zsolnai, founded the Zsolnai method of identifying and developing talents. Currently 15,000 students are participating in 50 areas of talent development through this program.

In Azerbaijan (Alikperov, 1992) an association, ISTEDAD, founded by three Ministries, the Academy of Sciences and four large social organizations created "a new democratic model of education on the national level. This model should provide the necessary conditions for the education and development of individual abilities." The association undertook the following projects:

- foundation of the Scientific Research Centre to examine the problems of the development of gifted children;
- opening of nine-month courses for the training of school psychologists, mostly for rural areas (80% of children in Azerbaijan live in the rural area);
- setting up a computer data bank in which the names of all children who were somehow distinguished in different scientific competitions and contests are included;
- foundation of Summer Creative Camps and the Creative School Centre, "Samshit".

Clearly, associations of groups interested in seeing that this special population of learners is adequately provided for as the massive political change process are on the increase.

Global and Regional Advocacy

Hany and Hany (1992) identified the inadequacies of data bases for effective literature searches on giftedness. Nevertheless, published strategies for advocacy, advocacy plans, advocacy at all levels, from within the home to national and international levels, continue to offer a broad base of experience and knowledge (Gallagher, Kaplan, & Sato, 1983; Dettmer, 1991).

One of the leading forces in the global development of gifted education is the *World Council for Gifted and Talented Children*. Founded in 1975 at the First World Conference on the Gifted and Talented organized by

Henry Collis, its major mission is to promote world-wide communication, research and educational programs, and a transnational consultant service (Sisk, 1986). Among its objectives, the following distinguish it from local, national and regional associations;

- to focus world attention on gifted children and their valuable contribution to the benefit of mankind;
- to create a climate of acceptance of gifted children, not as a privileged elite, but as a valuable global asset;
- to assemble people interested in the gifted and talented from all over the world;
- to persuade the governments of the world to recognize gifted children as a category for special attention in officially maintained educational programs.

As an advocacy organization, the WCGT works mainly through the organization of World Conferences held under its auspices. Countries wishing to place a bid for such an event must demonstrate financial support, programmatic and thematic ingenuity and a dependable infrastructure. The World Council Executive Committee sets the criteria for selection. Considerations of a demonstrated need to develop activity in the field of gifted education within a region weigh heavily in determining the venue of such congresses.

World conference organizers and participants have attested to the powerful influence of such gatherings in drawing attention to the gifted as well as setting new directions in research and curriculum development.

The thematic swing in emphasis from one World Conference to the next has mirrored the changing emphasis of the association (*Victorian Association for Gifted and Talented Children*). The First World Conference dealt with the manner in which the gifted were perceived. The Conferences of the early eighties treated the emotional and social concerns of the gifted. More recent Conferences have placed stress on the idea of the gifted as a national resource, causing the very definition of the giftedness to spring from a broader base in its relentless pursuit of excellence (Cahill, 1992).

A systematic analysis of world conferences held by the World Council for Gifted and Talented Children (WCGT) from 1975 to 1989 shows both the priorities and the complexity of the field of gifted education in various stages of its development. Table 1 demonstrates the wide spectrum of subjects and topics of interest.

An examination of the frequency with which issues are addressed (Table 2) indicates the trends throughout this 14-year period. The analysis can be read, not only as the current state of gifted education, but as the outcome of the work of ongoing support, be it of an individual or a group.

The data also suggest future directions and needs. For example, the paucity of pure research leads to the following recommendations:

The WCGT conferences could indirectly support these other research-related activities by inviting a number of selected pure researchers and by involving

TABLE 1
Main subjects (percentages) according to categorizing II in the WCGT Conference Proceedings 1975-1989
(Heller & Menacher, 1992)

Numbers of proceedings	33	26	33	32	30	55	108	51
Subjects	1975	1977	1979	1981	1983	1985	1987	1989
	%	%	%	%	%	%	%	%
<i>Definitions and Concepts of Giftedness and Talent</i>	7.5	10.4	15.1	14.4	17.5	20.8	10.5	12.5
cognitive processes and structures								
curriculum and program development								
giftedness								
holistic approach								
intelligence								
intercultural programs								
longitudinal studies								
<i>Identification of Giftedness and Talent</i>	10.7	6.5	7.9	2.9	11.4	11.8	6.4	5.4
identification								
interest, leisure activities								
test evaluation								
<i>Programs and Practices for Nurturing the Gifted</i>	26.9	42.8	39.7	37.5	42.0	42.7	49.6	45.5
creativity								
development								
educational policy and reforms								
instructional systems								
leadership, entrepreneurs								
learning processes and strategies								
memory								
problem solving								
emotional response and development								
moral development								
personality traits								
social attributes								
special education, special programs								
special schools								
talent								
– multiple								
– special								
art, dance, music, sports								
mathematics, science techniques, computers								
language, reading								
others								
<i>Other Components of Nurturing Giftedness and Talents</i>	14.0	24.7	20.6	27.9	9.2	16.9	10.2	21.0
family and peer influence								
gifted disabled								
gifted disadvantaged								
gifted underachievers								
needs								
sex differences								
physical disabilities								
physical and mental constitutions								
social problems								
student/teacher behaviour and interaction								
teacher training								
<i>Examples of Country Efforts to Identify and Nurture</i>								
Giftedness and Talents	35.5	10.4	8.8	9.6	13.0	3.9	17.3	12.0
reports of national programs								

TABLE 1 Continued

Numbers of proceedings	33	26	33	32	30	55	108	51
Subjects	1975	1977	1979	1981	1983	1985	1987	1989
	%	%	%	%	%	%	%	%
<i>Present and Future of Education of the Gifted/Talented</i>	5.4	5.2	7.9	7.7	6.9	3.9	6.0	3.6
educational philosophy								
educational trends (future images)								
Total number	100	100	100	100	100	100	100	100

TABLE 2

Main subjects (frequency) according to categorizing II in the WCGT Conference Proceedings 1975-1989 (Heller & Menacher, 1992)

Numbers of proceedings	33	26	33	32	30	55	108	51
Subjects	1975	1977	1979	1981	1983	1985	1987	1989
	N	N	N	N	N	N	N	N
<i>Definitions and Concepts of Giftedness and Talent</i>	7	8	19	15	23	37	28	21
cognitive processes and structures	1	3		1		8	2	3
curriculum and program development	3	2	7	5	9	10	17	5
giftedness	2	2	5	3	7	7	3	3
holistic approach	1		4		1	4	5	2
intelligence			2	2		5		3
intercultural programs		1	1	3	6		1	3
longitudinal studies				1		3		2
<i>Identification of Giftedness and Talent</i>	10	5	10	3	15	21	17	9
identification	9	4	9	3	11	15	12	6
interest, leisure activities					3		2	2
test evaluation	1	1			1	6	3	1
<i>Programs and Practices for Nurturing the Gifted</i>	25	33	50	39	55	76	132	76
creativity	2	3	4	3	1	6	17	3
development	6	6	8	5	13	7	19	9
educational policy and reforms		3	3	7	5	4	11	8
instructional systems	5	4	4	5	3	13	10	5
leadership, entrepreneurs		2	1	1	2	4	8	2
learning processes and strategies		2	2	1		4	3	1
memory						1		
problem solving		1	3			3		2
emotional response and development	1	4	1	2	1	2	2	4
moral development	1		1				1	
personality traits	3		4	1	5	7	5	9
social attributes		1	3	4	3	3	3	4
special education, special programs	3	5	9	7	15	7	11	19
special schools			4	2	4	3	3	1
talent							4	
- multiple							4	
- special						1	4	
art, dance, music, sports	3	1	1		1	5	6	6
mathematics, science techniques, computers	1	1	3	1		6	12	2
language, reading					2		5	1
others							8	

TABLE 2 Continued

Numbers of proceedings	33	26	33	32	30	55	108	51
Subjects	1975	1977	1979	1981	1983	1985	1987	1989
	<i>N</i>	<i>N</i>	<i>N</i>	<i>N</i>	<i>N</i>	<i>N</i>	<i>N</i>	<i>N</i>
<i>Other Components of Nurturing</i>								
<i>Giftedness and Talents</i>	13	19	26	29	12	30	27	35
family and peer influence	2	7	8	7	2	8	6	5
gifted disabled				1		1		4
gifted disadvantaged			3	4	2	1		1
gifted underachievers	1	1		2	1	1	1	5
needs	2	6	8	4	3	5	6	6
sex differences		2	2		1	5	3	5
physical disabilities			1			1		
physical and mental constitutions			2			2		
social problems		1	1	8	1	1	2	3
student/teacher behaviour and interaction	2	2	2			2	6	3
teacher training	3		2		2	4	3	3
<i>Examples of Country Efforts to Identify and Nurture Giftedness and Talents</i>								
reports of national programs	33	8	11	10	17	7	46	20
	33	8	11	10	17	7	46	20
<i>Present and Future of Education of the Gifted/Talented</i>								
educational philosophy	5	4	10	8	9	7	16	6
educational trends (future images)	4	2	5	4	6	3	9	4
Total number	1	2	5	4	3	4	7	2
	93	77	126	104	131	178	266	167

them in symposia with applied researchers in order to increase the exchange of information and the contact between disciplines (Heller & Menacher, 1992).

The Tenth World Congress on Gifted Education addresses this problem. Members of a collaborative researchers' network in North America, the National Research Center on the Gifted and Talented, present 39 research papers clustered into the following topics: gender and developmental differences, identification, research issues, program development and evaluation, secondary school issues, curriculum, and special populations. Members of the *National Association for Gifted Children* cooperated with personnel from the research center to review and rate the contributions under the directorship of J. S. Renzulli. International participants at the congress have an opportunity for input. A collaborative process such as this can have far reaching consequences in giving direction and support to advocacy efforts worldwide.

Cupertino and Ancona-Lopez (1992) of Brazil credit the Eighth World Conference held in Sydney in 1989 with new research directions as well as collaborative linkages. In Brazil provision for the gifted was legislated in 1971, and financial and technical aid provided by a National Center of Special Education.

Significant advancement in actual provisions for the gifted, however, is attributed to the establishment of a National Association for the Gifted in 1977. Alencar (1989) credits this association with the development of the "Spiralprogramm", a special program of training, mentoring opportunities and after school, weekend, and holiday enrichment, projects for children from disadvantaged backgrounds. Additional programs, compensatory and enrichment provisions are funded by the government. These appear in the form of integration within regular programs, withdrawal to the Escola Parque on a weekly basis in Brasilia, and special learning centers for the gifted with specialized interests.

The creation of the Projeto Objetivo de Incentivo ao Talento (POIT) is directly attributable to a paper presented by Dr Nava Butler-Por of Israel's Haifa University at the World Conference. The results of her international study examined the view of talented children concerning their leadership responsibilities in the future. The participating countries included South Africa, the United States and Israel. The study was replicated in Brazil. POIT, in association with the President's Office for Research and Postgraduate Studies of Paulista University and with Objetivo's Research and Technological Centre (CPT), undertook to examine related aspects in students under the supervision of POIT. The authors reported their results at the Ninth

World Conference on Gifted and Talented Children held in The Hague in 1991.

Regional associations representing large geographic areas and a wide cultural diversity are forming within the World Council (Maier, 1992). Two such federations are the *Asia Pacific Federation of the World Council for Gifted and Talented Children* and the *Ibero-American Federation of the World Council for Gifted and Talented Children*.

Inaugurated at the Second Asian Conference on Giftedness held in Taipei in 1992, the Asia-Pacific Federation is an innovative model for regional cooperation. The 12 participating countries Australia, Hong Kong, India, Indonesia, Japan, Korea, Malaysia, Philippines, New Zealand, Singapore, Taiwan (R.O.C.) and Thailand comprise a unique combination of national, racial and cultural heritages. Closely affiliated with the WCGT the goals of this organization are:

- collaborative research on topics such as identification procedures, city groups, family, school and community involvement;
- comparative effectiveness of teacher training;
- cross-cultural studies with an emphasis on parental roles;
- exchange of information on funding, interdisciplinary support systems, case studies reflecting national differences.

Roldan (1992), emphasized this new challenge for advocacy groups:

An additional task which we face . . . is to explore possibilities for providing educational programming for the gifted which is relevant, effective, and meaningful within our respective Asian cultures. Such a task does not, however, preclude learning from those Western countries who are admittedly decades ahead of us in gifted education efforts, as we draw on the unique richness of our own cultures.

Other paradigms of networking break with traditional allegiances and territorial interests. A bridge between Europe and South America was formed with the creation of the *Federacion Iberoamericana del Consejo Mundial del Nino Dotado Y Talentoso*. Still to be ratified by the World Council, the Ibero-American Federation is not drawn up along regional or geopolitical lines. Linguistic and cultural criteria guide this initiative to unite efforts in establishing future directions for the education of the gifted and talented. The result is an unusual combination of national entities which spans hemispheric and continental boundaries as well as traditional geo-political alliances to include: Spain, Portugal, Mexico, Guatemala, Belize, El Salvador, Honduras, Nicaragua, Costa Rica, Panama, Cuba, Jamaica, Republica Dominicana, Puerto Rico, Colombia, Venezuela, Ecuador, Brazil, Peru, Bolivia, Paraguay, Uruguay, Chile and Argentina.

Some of the aims of the Federation reflect the special characteristics of regional priorities and needs:

- to assemble criteria in the Iberoamerican countries for the education of the gifted at all levels;

- to activate public opinion and governments of these countries to the need for an effective attack on the problem of this kind of education;

- to create and adapt effective means (instruments) to identify, select, and diagnose the gifted and talented Iberoamerican;

- to encourage the interchange of contemporaneous psychopedagogical trends developed in each country about the exceptionally gifted and talented;

- to stimulate research and the scientific and technical study of the problems of the gifted and talented in the environment of family and education as well as in their society and country.

These recent developments indicate the increasing networks which regional cooperation and world-wide collaboration can build. Support systems of such magnitude achieve a conservation of resources and energy. They avoid unnecessary duplication of research. They permit a planned development of services and a sharing of material resources. In a time of fiscal restraint, such intelligent systems work for educational change. They use the possibilities of technology and communication networks. Such ambitious paradigms of cooperation continue to surprise the pioneer advocates in the field.

Rethinking, Redirecting and Restructuring Advocacy

Advocacy takes on very different tasks and forms in the setting of developing countries. In many cases it is premature even to consider a concern for differentiated education. UNESCO works to assure an education for all in non-industrialized countries. At the same time, there is concern that reality will show this to mean the same education for all, regardless of ability and motivational differences. The new, and long overdue, acknowledgement of the wealth of Aboriginal cultures should result in an attention to different types of talents and abilities. In attempting educational reform, each nation should include those characteristics which are unique to its history and cultural heritage, as well as the skills required by a technological and information age. Clearly it is premature to sketch out the work for advocacy groups in the non-industrialized regions. However, there is current recognition of the need to address intelligence, talent and giftedness in the context of diverse cultures.

The development of provisions for the gifted in Nigeria (Adesokan, 1986) confirms the observation that centralized leadership is one model to follow in developing countries. A National Committee for Gifted and Talented Children published guidelines delineating psychological, behavioral and learning characteristics of the gifted. These are not significantly distinguishable from those identified in industrially developed countries. Oladokun (1986) identified the factors militating against gifted education in Nigeria. This is the first step in reform.

In the African context it is especially significant to redefine the manifestation of giftedness. As Anim (1992) disclosed at the Ninth World Conference of the World Council for Gifted and Talented Children, a bridge between giftedness both outside and in the school context is necessary.

Different change forces work in the three major areas of Africa: Arab Africa, Euro-Africa, and traditional Africa. Educational development in Africa is said to have certain common features which led to the establishment of special institutions such as Apex, special, or international schools. Anim describes this form of provision for giftedness as the "pulling effect" of tertiary institutions such as the universities. Cognitive abilities is the only domain which the special schools highlighted. Even after independence, the "indiscriminate expansion with a view to accommodating as many pupils as possible" followed the forms of an imported culture. Educational reform did not adapt to the needs of the traditional culture. With this, special types of gifts manifesting themselves in a whole culture outside the artificial environment of the school room were devalued.

Proponents aiming to secure the development of gifts and talents within the context of a cultural and historical heritage have a dual role to play. First, they must recognize and follow educational practices which prepare children of high ability to realize their talent in a global arena. Second, they must reflect upon the effect of culture, family, environment on the individual learning style and unique propensities manifested in an African setting.

King's College at Yaba in Nigeria, Prince of Wales College at Achimota in Ghana, Makerere College in Kampala Uganda, Waterford and St. Mark's in Swaziland were established along European models of university preparatory schools. The knowledge domains in language, mathematics, science and the arts reflected the traditions of European education, not the traditions of an African culture. The definition and identification of giftedness consequently ignored the characteristics of giftedness unique to and evolving from a local or regional history.

Vygotsky (1962, 1978) found cultural and historic processes to be important in the development of human intelligence. Information processing studies of cognition corroborate the theoretic base of the Zone of Potential Development (ZPD). He suggested that the individual's internalization of external social relationships brings into focus topics such as culture and its historical roots in the mind of a thinker. So intrinsic is the complexity that "to understand another's speech, it is not sufficient to understand his words—we must understand his thought. But even that is not enough—we must also know its motivation" (Vygotsky, 1962).

For the teacher of the gifted this provides a special challenge. If development takes place as much from outside in as inside out, the point of entry (i.e., the medium) of any attempts at instructional intervention is of crucial importance. He/she must determine the "Zone

of Potential Development." The cultural influences on intellectual strategies must then be acknowledged. Symbols and representations in the mind are consequently recognized as influenced by the culture which produced them. Instructional planning is then obliged to take these influences into consideration.

The variety of cognitive and affective imprints on an individual can be observed most interestingly in a context in which several cultures merge. Umezina (1983) presents the different cognitive symbol systems in the white and black culture.

It is a matter of a semiotic study of the vectorial line drawn by the mountain, the hillside, the horizon, the sun, the moon, the village, the road . . . the hillside, like the horizon, the sun or the moon, the fertile soil, the village, are the possession of the whites in the Africa of the novelist.

The cognitive and affective structures of the child inheriting such symbol systems should be of consequence to all efforts of educational intervention.

Further evidence of the new challenges to local advocates appears in a study of Polynesian conceptions of giftedness. Reid (1983) of the New Zealand Council for Educational Research, concludes that "giftedness" for Pacific Island parents would have to be compatible with the cultural values of the community. In that particular community, however, "giftedness" as a state or trait that sets one apart from the community is unlikely to be valued highly. The Maori conception of giftedness, on the other hand, is likely to value some of those intelligences Gardner (1983) designates as personal or interpersonal intelligence. A special gift for empathy, *aroha*, is valued highly, as is the cleverness of speech making, oratory and politicking on tribal councils.

By contrast, European conceptions of giftedness in New Zealand value the intelligence necessary to a technological society. Specific gifts and talents are furthered if they can be utilized in the service of technological progress and economic advancement. A utilitarian view of giftedness happens to be the cultural and social context into which children are set by a particular criteria of identification.

The point of these examples is to illustrate that the teacher is the most important advocate for differentiated instruction. What should he/she "see" before he can (a) identify the gifted child and (b) design a curriculum for the individual child? The first task of the teacher is to recognize the extant interior landscape of the child, or student, before him. Then he can proceed to undertake those modifications which arise out of the dictates of the analysis. As in the process of observing spontaneous action in drama and discovering ritualising elements in the actions of children, the teacher becomes merely a "catalyst or administrator" in the initial stages (Courtney, 1985).

In the developing countries, the gap between this kind of professional knowledge and practice and societal, economic and political needs is for the moment insur-

mountable. At the same time, it would be advisable that the same pressures which effected educational change and reform in other countries be brought to bear early in the evolution of educational policy in the developing nations.

Unfortunately, economic realities immobilize the very groups which advocated gifted education in the industrialized countries: parents, private citizens, teachers, researchers. This is a great loss to the developing world. Nurture of high abilities at an early stage could provide that leadership which could take responsibility and accelerate change. The alternative is a planned provision in formal and official policy to compensate for the networks of informal support systems which exist in the developed world. For the moment the issues of hunger, disease, and general education are so large that giftedness so far has remained purely academic. The gifted child remains "one of Africa's cases of gross underdevelopment" (Anim, 1992).

Advanced Principles and Practices of Advocacy

An analysis of the proceedings of WCGT conferences (Heller & Menacher, 1992) shows a breakdown of participation by country (Tables 3 and 4).

The authors caution with the proviso that the country in which the conference was held influenced the number of contributions to the proceedings, e.g., Australia and New Zealand in 1989. Nevertheless, percentages shown suggest that the quantifiable advances in the field lie in North America.

Political, economic and social reasons account for the headstart in advocacy activity and systematic development of the field of gifted education in North America. It is no surprise then that a higher level of organizational structure and a diversity of approaches have emerged. The change process has in itself become a science as educational priorities shift and the need to create a learning society grows.

Current methods of building advocacy follow the principles of program integration. Program design and student productivity in themselves are seen to lead to sustained efforts to support programs for high ability students. Economic cutbacks naturally affect programs which are considered to be extended enrichment beyond the regular curriculum. Renzulli and Reis (1991) argue that continued advocacy for special programs should develop more flexible and more inclusive identification procedures, resulting in serious attention to underrepresented groups and individuals. A wider range of students than has been traditionally identified in the past and an extended teacher development program which informs the general teaching staff are seen to promote more integration between the regular and the special programs. This, in turn, produces positive attention in teachers, parents, and administrators.

The active engagement of public relations strategies aids in starting and maintaining gifted programs.

Vigorous public awareness activities are often not initiated until there is a threat to the program's existence. We believe that public relations must be an ongoing activity and that special program activities should be undertaken with a view to the public relations benefits that might result (Renzulli & Reis, 1991).

They cite the example of the Talents Unlimited (Schlichter, 1986) program. Its successful implementation greatly expanded the advocacy base in a New England district by pointing out ways in which the program benefited all students.

In the U.S.A., the *National Association for Gifted Children* is preparing a public relations packet and position papers for use by state organizations, businesses, and parents. It will include a history of gifted education as a field, a history and explanation of the association, samples of gifted education programs, a selected bibliography on research, and reprints of positive research and articles in the field. Novel in this development is the outreach to the business community.

TABLE 3
Countries of origin (authors) of the contributions to the WCGT Conference Proceedings since 1975: Frequency

Countries of Origin (Authors)	1975	1977	1979	1981	1983	1985	1987	1989
Africa				2	3	3	4	2
Arabian Countries and Israel	3	2	7	2	2	3	3	3
Asia and Philippines		1			7	2	1	
Australia and New Zealand			3	1	3	5	4	15
China and Japan			1		1	3	3	
Canada	1		2	8	3	6	7	6
Eastern Europe			2			5	2	
South America		1			1		5	2
U.S.A.	8	16	15	9	9	18	74	18
Western Europe	11	4	5	10	1	10	5	5
Numbers of proceedings	23	26	33	32	30	55	108	51

TABLE 4

Countries of origin (authors) of the contributions to the WCGT Conference Proceedings since 1975: Percentages

Countries of Origin (Authors)	1975	1977	1979	1981	1983	1985	1987	1989
Africa				6.3	10.0	5.5	3.7	3.9
Arabian Countries and Israel	13.0	7.7	21.2	6.3	6.7	5.5	2.8	5.9
Asia and Philippines		3.8			23.4	3.6	0.9	
Australia and New Zealand			9.1	3.1	10.0	9.1	3.7	29.4
China and Japan			3.0		3.3	5.5	2.8	
Canada	4.4		6.1	25.0	10.0	10.9	6.5	11.8
Eastern Europe		7.7				9.1	1.9	
South America		3.8			3.3		4.6	3.9
U.S.A.	34.8	61.6	45.4	28.1	30.0	32.7	68.5	35.3
Western Europe	47.8	15.4	15.2	31.2	3.3	18.1	4.6	9.8
Numbers of proceedings	100	100	100	100	100	100	100	100

The business community is very important in advocating for gifted education. Business leaders in many communities are responding to the need for gifted education by developing internships, mentor programs, competitions, funds and teachers where needed. This cooperation must continue to be encouraged and expanded. Business leaders usually have influence and contacts that are helpful to gifted program advocates (Rosenstein & Dettmer, 1991).

Such recommendations can be implemented worldwide. In Europe, the Vereinigung Österreichischer Industrieller (VOI) (Federation of Austrian Industrialists) published a position paper on the occasion of the Vienna Summit held by the World Council for Gifted and Talented Children (Maier, 1991). The intent was to influence educational policy makers. Secretary General, Krejci, prefaced the report:

By submitting some ideas and propositions on the development of talent, the Federation of Austrian Industrialists would like to draw the attention of educational policy makers to this important subject. In doing so, it hopes to contribute towards the creation of a climate conducive to the recognition and development of talents and to help provide the appropriate prerequisites within the Austrian educational system (VOI, 1990).

The programme presented was intended to provide a new impetus to improve conditions for the development of talent in Austria. The outcome, however, surpassed this goal. Within three years, it resulted in ministerial funding for a European Bureau of the *World Council for Gifted and Talented Children* as well as the founding of its carrier organization, the *Austrian Association on Human Talent*.

Gifted education has great need for advocacy of this type. It lends power to the mission of conventional interest groups by extending the relevance of talent development to public constituencies outside the conventional interest groups composed of parents, educators and researchers.

The ultimate consequence of such extended commitment is the creation of legislation providing for the learners of high ability such as that in Austria, Bill 82 in Canada, and the Jacob J. Javits Gifted and Talented Students Education Act in the U.S.A. Advocacy and legislation go hand in hand at the advanced stages of development. Irvine (1991) emphasizes the importance of vigorous advocacy when a state has no mandate to require differential instruction for gifted services. Reis (1992) prepares a regular column to assist parents and other advocates who are attempting to retain programs and advanced classes and/or attempting to have their classes and programs expanded. Countries at the primary stage of building advocacy structures and those disheartened by the paucity of results, despite the quantity of time and effort expended, can take courage from the special measures which can follow governmental commitment:

Over a decade ago, the question was raised: Will the gifted child movement be alive and well in 1990 (Renzulli, 1980)? The movement does, indeed, survive and the Jacob K. Javits Gifted and Talented Students Education Act has resulted in an infusion of federal funds for model programs, curriculum writing, a new national report, the recreation of a federal office of gifted and talented and the establishment of a National Research Center on the gifted and Talented (NRC/GT) (Renzulli, 1991).

If the gifted child movement is to survive economic setbacks and the effects of the reform movements to the year 2000, efforts must be doubled to identify young people with potential from all economic classes, all races, and all backgrounds.

Current advocacy practices adopt similar directives to address special populations of gifted learners and to use experience gained in gifted education to inform general practice and regular education. The forces of change appear to be especially critical when it comes to providing for specialized groups or populations of gifted children. VanTassel-Baska (1989, 1992, 1993) identified

the need to develop program prototypes for use with atypical learners. Foremost among these are individualized services such as tutoring, mentoring and counseling for at-risk gifted learners. Such personalized service can be delivered by caring individuals who understand the nature of the child's culture and socio-economic status.

The volunteer assistance can be composed of two groups: (1) highly skilled retirees and women who are not in the work force, and (2) college or even high school students who can make this part of their community service contribution. Building on such approaches, a local board/council of education and even a nation can develop projects which address the special needs of at-risk learners. Project Mandela at the College of William and Mary in the U.S.A., for example, serves 130 at risk students and families by tailoring the curriculum and instructional process to their needs. Special consideration for criteria which are responsive to cultural groups, multicultural issues and diverse abilities inform the identification and curricular provisions of modules of learning and the overall program development.

Policy can often develop after a need has been identified. Attention to a neglected population followed after studies indicated that the majority of gifted learners in the U.S.A. and Canada came from higher socio-economic backgrounds (Sears & Sears, 1980; VanTassel-Baska & Willis, 1988; Maier, 1992). A less articulate, less empowered group of parents with fewer financial and temporal resources were not strong enough to be the initiators of action. However, once engaged by the findings of research and the follow-up of professional practice, such groups can feel empowered to shift educational policy decisions to new priorities, which will then serve the economically and culturally disadvantaged children of a nation.

It is critical for advocates of gifted education to join forces with general education to ensure that the needs of disadvantaged gifted learners are met in regular schooling. Attention and support of these promising learners must be drawn at all levels of concern. The private, individualized intervention of parents supports the work of social agencies. This in turn feeds into public institutions which must adopt a systematic nurturance through flexible and imaginative identification procedures and programming approaches.

The fact that gifted education is beginning to provide program services responsive to the needs of at risk learners in the context of overall program development (Pallas, Natriello, & McDill, 1989) parallels developments in alternate programming for the gifted learning disabled population.

Vaughr (1989) discusses the identification procedures and instructional techniques regular education teachers can use to provide for the individual characteristics of the learning disabled children with gifted potential. These recommendations are based on a review of the literature in the field. Here, too, support groups were instrumental in directing attention to special needs. For very obvious

reasons it was the existence of parent support groups which prepared the ground for advancement in educational intervention (Adams, 1986).

Gifted learning disabled children cannot and will not be treated differently from other disabled populations by teachers who have not had training in the full range of abilities. This range exists, not only within the regular population of learners, but within the special population. Yet, gifted learning disabled children continue to be excluded from gifted programs (Minner, 1990). However, new assessment models which include parent and teacher information and incorporate formal and informal assessment procedures are beginning to be used to identify gifted learning disabled children (Lupart, 1990).

There is a strong argument that the incorporation of gifted education within special education can accommodate the needs of gifted learning disabled children (Yewchuck, 1992). In terms of program design, this is an advance toward providing for both the strengths and the weaknesses inherent within each individual's potential. A teacher can develop compensatory strategies from an awareness of the possibilities and limitations within the learning process of a pupil. Too often in the past, the disabilities outweighed, and even negated, the high abilities which were present. A European association founded in Liechtenstein devotes its work to advocacy for the gifted disabled. Jan-Elizabeth James (1993) proposes that the gifted handicapped are a metaphor for humanity. This area of gifted education is expected to be significantly influenced by the priority it is being given at the Tenth World Congress of the World Council for Gifted and Talented Children.

The New Meaning of Advocacy

Advocacy is about change. As Fullan (1993) indicates: "productive change is very much a process of mobilization and positive contagion." The final goal of an advocacy for the gifted and talented is to bring about educational change. Its objectives are equity in learning opportunity and differentiation in instruction. Its process results in the congregation of a group toward change agency.

A larger social agenda emerges in the current focus to assure the proper development of human potential. To varying degrees, the wealth of a nation is increasingly linked to the intelligence and creativity of its citizens. For this reason, politicians, economists, social scientists and the general public are examining education and the total educative process in a new light. Goodlad (1992), Stevenson and Stigler (1992), Murphy (1991) and the Holmes Group (1990, in press) clearly link the future of society to the future of the schools and educational reform. An active restructuring process is the final measure of the success of advocacy.

The reform movement in education is rapidly becoming the priority of the decade, not only in North America, but worldwide. The cause, tenor, and impetus

differs significantly from country to country and is culturally and contextually distinctive. Nevertheless, this effort to provide a better education for all is universal in its effect on gifted education. It can be seen as an opportunity and a problem (Dettmer, 1991; Tomlinson & Callahan, 1992).

Tomlinson (1993) rightly argues that the problems which have provoked the reform movement affect highly able learners as well as others and that, some elements of reform have the potential to impact gifted students adversely because of their status as atypical students. At the same time, the rich experience, exemplary practice and instructional strategies of gifted education provide an opportunity and an obligation for the field to contribute positively to reform initiatives. Such an interface between gifted and general education provides potent arguments for both public and private proponents. This is the positive side of the budget pressures and reform movements which force the integration of special education students. It also leads some specialists to advocate change. The unique elements of gifted education, they say, should be redefined within new and possibly narrower boundaries (Clark & Shore, 1993).

It may be that the hidden opportunity here is to reexamine the historical context of gifted education which placed it within, or linked it closely to, special education. The solution to a provision for the population of highly able learners and talented youth was an expedience which produced positive benefits in the short term, but detrimental linkage in the long term. It begged the comparison of needs between disability and ability, the handicapped and the enabled, the learning limited and the learning unbounded. In a time of financial constraints ideological and humane considerations continue to tip the balance against the gifted and talented, raising the question as to whether two learner groups should ever have been placed in the same arena to compete against each other under the umbrella of special education. The research investigating the cognitive and affective development of the gifted is beginning to differentiate itself clearly from the research which explores the many dimensions of learning exceptionalities. Studies show how the needs of gifted students often go unrecognized in regular classroom settings (Reis, 1993; Rogers, 1993). Yet the structures of educational systems are too slow to adapt to an inclusion of the most recent studies.

The problem and the potential of educational change is examined by Fullan (1993) in a societal context:

Especially in times of paradigm or mindset shifts we cannot expect existing institutions to lead the way. More fundamentally, in any society of the future, productive educational change will mean productive individuals who do not fully trust the institutions that surround them. Systems do not change themselves, people change them. . . We must ingrain in society the kind of capacity for educational change that inevitably generates its own checks and balances

and lines of solution in situations that will always be somewhat out of control, even if we do everything right.

Fullan emphasizes that, because the change process is non-linear, every initiative, whether taken by an individual or a group, is important. Systems change when enough kindred spirits coalesce in the same change direction. This is why top-down structural change does not work. You can't mandate what matters because there are no shortcuts to changes in systems' cultures. But like-minded people, pushing for change do add up. Unfortunately, what also adds up are like minded people resisting change in opposing directions as discussed earlier (Gagné, 1993).

It is important to distinguish between the pursuit of individual purpose and collective commitment. The former is often motivated by a singular personal need, for example, Bonnard's (1993) search for an appropriate education commensurate with the high abilities of her son. She came to understand the conservative and paradoxical nature of the French educational system through the difficulties she encountered; she was not prepared for the resistance and alienation she discovered within the teaching profession itself. Terrassier (1992) reports little advance despite a decade of advocacy efforts in France.

Collective purpose develops when a transformation occurs. The first step in such a transformation takes place when a singular need joins other voices to articulate a common distress, hence the development of group forces. When personal and collective purpose merge, a shared vision develops. This is essential to the efficacy of organized change. It reinforces the third challenge set at the World Council's Vienna Summit:

A planned system of global communication and dissemination of information is the foundation of a world organization. It permits a unified development of positive attitudes and change toward the gifted and talented. Shared innovations reduce the waste of duplication and move the field forward (Maier, 1991.)

Senge (1990) theorizes that a shared vision is one vision that many people are truly committed to because it reflects their own personal visions. It is at this point that leadership toward directed action takes place and can ultimately engage in a transformation of single institutions, complex systems and even public policy. "Collective vision-building is a deepening, reinforcing process of increasing clarity, enthusiasm, communication and commitment."

It would do well for leaders in the field of gifted education to become cognizant of the rather large body of literature which has developed in the last decade dealing with the problem and process of educational and corporate change. Knowledge of how educational leadership can be transformational (Leithwood, 1992) is a requisite to influencing and even controlling adminis-

trative structures. The response to the alternating and often erratic interest in the gifted and talented too often followed the pattern of passive acceptance, or at best, reactive adaptation. Advocacy groups have provided an invaluable service to the field. Currently, however, such efforts must be supported and integrated into the general process of educational and societal change.

"The goal of greater change capacity must become explicit and its pursuit must become all out and sustained" (Fullan, 1993). A common global, national and local policy for the development of human potential can activate economic and political support. New partnerships can help to create a climate of global excellence which nurtures individual ability within and among diverse groups. The recommendations made in the fifth challenge of the World Council Vienna Summit stand as a summary of the advocacy trends discussed above and as a guideline for future action (Maier, 1991):

- publicize the existence and the need for human resources in society;
- create a World Council policy statement to guide governments and institutions around the world;
- broaden the support base by involving business, industry politics;
- include private enterprise in financial partnerships;
- direct awareness of philanthropists and foundations to the need of investing in human potential, ability and talent;
- assure governmental support to appropriate financial resources to meet the special needs of educating those with high ability;
- forge links with the UN, UNESCO, UNICEF and complementary international associations.

Antiquated patterns of thinking which are competitive, rather than collaborative, which harbour hate and destructive memory, will never lead to new visions and worthwhile missions. A world moving toward the fulfillment of the promise of a gifted globe is very much in need of new dimensions of advocacy.

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Suggested Further Reading

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PART VII

Present and Future of Education of the Gifted and Talented

Research and Education of the Gifted in the Year 2000 and Beyond

A. HARRY PASSOW

Teachers College, Columbia University, U.S.A.

FRANZ J. MÖNKS

University of Nijmegen, The Netherlands

KURT A. HELLER

University of Munich, Germany

Introduction

As the Year 2000 approaches, people and groups concerned with the nature and nurture of giftedness and talent—educators, policy-makers, researchers, the public—find that, despite a large and growing knowledge base, issues concerning the education and development of the gifted continue to be discussed and debated. It might even be said that, as in other fields, the more that is known, the more issues are raised and controversies are fueled. Issues concerning the gifted field have never been confined to a small group of children and youth identified as “gifted or talented” but have an impact on the whole of education. For example, the issues surrounding questions of *excellence and equity* affect all educational decisions, not just provisions made for the gifted. Despite a century of programming for the gifted, such efforts are still debated as to whether or not they are elitist, undemocratic and even necessary. In the 1990s, “tracking,” one kind of ability grouping, had once again become the focus of policy debates with research cited to support both sides of the controversy. These are just a few examples of the perennial issues which are unresolved despite the accumulation of research, theory and experience over the past century. In fact, it is likely that they will never be fully resolved; supporters of gifted education will only find more solid basis for their positions with the growing base of research and theory.

In the first report on his longitudinal study, Terman (1925) suggested that, as more is learned about giftedness and how gifted children should be educated, we will learn more about increasing the talent reservoir:

When the sources of our intellectual talent have been determined, it is conceivable that means may be found which would increase our supply. When the physical, mental and character traits of gifted children are better understood it will be possible to set about their education with better hope of success. . . . In the gifted child, Nature has moved far back the usual limits of educability, but the realms thus thrown open to the educator are still *terra incognita*. It is time to move forward, explore and consolidate (pp. 16–17).

The German psychologist Stern emphasized in 1916:

It is strange that until now there exist thorough diagnostic processes only for the children for whom we have concern because of some handicap but not for the children of hope (p. 114). For 2% of the highly gifted and another 10% of the gifted elementary school children we need provisions for appropriate nurturing (p. 109).

The novelist, John Hersey (1958) once wrote: Our uncertainty about exactly how to develop talent is only a part of the greatest unresolved problem in American education—the problem of how to help every child realize his maximum potential (p. 5). Recognition of the education of the talented as an integral part of a nation’s total educational challenge and an understanding of the multiple dimensions of the problems of nurturing talent potential are important first steps. It has long been understood that the future of gifted education will be affected by developments regarding education and schooling in general. The history of gifted education is inextricably a part of the drive for quality education for

all and this has become even more so in the past two decades.

As the twentieth century nears its end, the consensus seems to be that, in many ways and in many contexts, education of the gifted is in a stronger position than it has ever been but that there is no millennium yet in its future. To reflect on research and education of the gifted in the year 2000 and beyond requires a look at the issues and problems in the field—many of which are perennial—which will shape the future of talent development.

The Beginnings of Study of the Gifted

Modern giftedness research has a long past but a short history. Confucius in China and Plato in Greece (in *politeia*, VI) discussed “heavenly” (gifted) children. They attempted not only to explain giftedness or high ability theoretically, but also made practical suggestions for the identification and selection of the gifted and for nurturing them in society. In this way giftedness or talent was considered as a national resource, to be encouraged and multiplied for the good of the community. It is interesting to note that both East Asian and Classical European traditions adopted largely identical interpretations of giftedness and talent, which were considered to be gifts from nature, in the form of exceptional cognitive abilities (perception, thinking, learning and memory).

The close relationship of giftedness to the concept of intelligence is shown etymologically not only in the Chinese attributes “Tsun” and “Ming” (exceptional sight and hearing) but also both in the Latin meaning of “intellect” in the philosophy of Aristotle and in the writings of the later English Sensualists (e.g., John Locke, 1632–1704). This European attitude or hypothesis was expressed in the assumption: *Nihil est in intellectu, quod non prius fuerit in sensu* (the intellect contains nothing that did not come to it through the senses). This intellectual conception of giftedness or talent was probably first broadened to include motivational components (cf. Renzulli’s definition of giftedness). In the New Testament parable (Matthew 25, p. 15) Jesus spoke of the talents entrusted to mankind. The term “talent” (*talanton* in Greek, *talentum* in Latin) was derived originally from an ancient unit of weight or token. In Vulgate Latin (fourth century) *talentum* adopted, possibly for the first time, the meaning “mental aptitude”. In the Middle Ages the term “talent” took on the meaning of giftedness in the sense of inborn ability; this meaning persisted into the first half of this century (e.g., Révész as late as 1952). The concept of genius, long native to psychiatry (cf. Anastasi, 1958), can also be traced back to its classical roots (Heller, 1993). For further information see Chapter 1 in this handbook.

In a more narrow sense, research on the nature and nurture of the gifted began at the turn of the century but has intensified and become increasingly

more sophisticated, focused and informative in the last few decades. Americans tend to mark the beginning of serious research on the gifted with the 1922 initiation of Terman’s so-called *Genetic Studies of Genius* when a life-span longitudinal study “was designed to discover what physical, mental and personality traits are characteristic of gifted children as a class and what sort of adult the typical gifted child becomes” (Terman & Oden, 1951, p. 21). Europeans sometimes cite William Stern’s 1916 publication *Psychologische Begabungsforschung und Begabungsdiagnose* (*Psychological research and detection of the gifted*) as having preceded the Terman study and a better benchmark.

There were, of course, earlier studies about the nature of “genius,” the training and exploits of *Wunderkinder* and other prodigies and the provisions made for rapid learners and academic achievers (see Chapters 10 and 25). The editor of a 1924 yearbook of the National Society for the Study of Education (NSSE) observed that:

Lombroso’s *Man of genius* (1891), Galton’s *English men of science* (1874), Galton’s *Hereditary genius* (1869), Constable’s *Poverty and hereditary genius* (1905), Cattell’s *A statistical study of American men of science* (1906–1910) are characteristic studies that have helped define the problem of the origin of superior achievement, especially to raise the issue as to the relative contribution of inherited constitution and educational training in the production of greatness (Whipple, 1924, p. 2).

The 1924 NSSE yearbook titled *The education of gifted children* contains an annotated bibliography of 453 entries—mostly American although several German citations are included. The sheer volume provides clear evidence that there was considerable interest in the nature and education of the gifted in the early part of the century. The content of the articles as reflected in the titles and annotations suggests that many of the topics discussed or reported were not unlike those one finds in more recent literature. There were articles on intelligence testing as a means of identification, descriptions of “superior groups,” comparisons of “bright and dull pupils,” honors plans, studies of precocious and “super-normal” children, outcomes of ability grouping, the nature of genius and even a 1906 article by Terman titled “Genius and stupidity”. (This was a report on his doctoral dissertation which he finished in 1905. In June 1905 he received his doctoral diploma from the hands of President Theodore Roosevelt.)

In his Editor’s Preface to the 1924 NSSE yearbook, Whipple noted that the “Committee has not found itself in agreement upon some fundamental principles involved in the education of gifted children” (p. iv) including the various means “for the selection of gifted pupils or the administration of their training” (p. 24). These same two classes of issues persist (see Chapter 2).

Themes and Issues from Earlier Research

In 1960, in connection with legislation being considered by the State of Illinois, Gallagher prepared a report whose purpose was "to review and summarize all of the information now available relating to the education of gifted children" (p. 3). Gallagher summarized his findings under the following headings: identification, cultural background, intellectual patterns, academic achievement, social popularity, emotional adjustment, elementary programs and program evaluation. He concluded that a clear generalization that can be drawn from the review of research was that "special programming for gifted children requires additional personnel and services" (p. 131).

In 1961 Mönks published a review article entitled *Contributions to the study of giftedness in childhood and adolescence*. In this article a survey was made of the then existing trends in the study of gifted children and adolescents. Six theoretical approaches were identified and summarized as follows: (1) clinical approach or the theory of disharmony, (2) socio-cultural/psychosocial approach, (3) psychoanalytical approach, (4) hereditary theory, (5) theory of differentiation and (6) theory of harmony (after Terman's correlation of giftedness with psychological and physical health). The same article proposed a longitudinal study to develop an empirical basis for the improvement of psychological educational as well as instructional guidance of gifted students (see Mönks, 1992).

About 40 years before the 1963 Mönks' article there already existed in the Netherlands scientific interest in the gifted child. The contribution of the Dutch psychologist Révész (Hungarian by origin, residing in Amsterdam after 1921) about a musical prodigy in 1925 is well known. Other psychologists like Waterink and De Groot contribute to the study of giftedness theoretically and empirically. But at that time (1938, 1956) policy makers were more interested in "equal opportunities for all" and this meant for the children with handicaps. Concern for the appropriate education of the gifted and interest in theoretical conceptualizations of giftedness have a long history in Europe but a minimal impact on research and practice.

In a 1965 publication titled *Research on the talented*, Goldberg compared "some recent research findings with those from past research," examined "the extent to which current projects are seeking solutions to perennial problems which have remained unsolved" and reported on "efforts to study unchartered ground" (p. 1). Goldberg organized the review of research under the following categories:

- Social and personal characteristics: Are the personal and social characteristics attributed to gifted youngsters of the past descriptive of the gifted youngsters of today?
- Identification of the talented: How adequate are the commonly used identification procedures? What are some new directions in identification with respect to intellectual factors? Motivational factors?

- Discrepancy between prediction and achievement: What are the characteristics of underachievers? What can schools do to reverse patterns of underachievement?

- Administrative provisions: Ability grouping, acceleration and other adaptive provisions.

- Guidance provisions: What are the special needs of the gifted? Are the problems faced by gifted individuals sufficiently different from those of average persons to warrant special attention or new approaches?

- Course content and method: How should the actual course content and teaching method be differentiated for gifted students?

Commenting on research on the gifted in terms of what was known and was not known about programming for the gifted and talented, Renzulli (1980) wrote:

In spite of vast amounts of research on every conceivable aspect of the learning process, we still have difficulty pinpointing the reasons for the remarkable differences in learning efficiency and creativity among persons with similar genetic backgrounds and environmental experiences. We simply don't know what factors cause only a minuscule number of Thomas Edisons or Langston Hugheses or Isadora Duncans to emerge while millions with equal "equipment" and educational advantages (or disadvantages) never rise above mediocrity. Why do some people who have not enjoyed the advantages of special educational opportunities achieve eminence while others who have gone through programs for the gifted fade into obscurity? The answer is, we simply don't know (p. 601).

Renzulli's query raises a number of related questions. For example, do we really know whether there are many "persons with similar genetic backgrounds and environmental experiences" or "millions with equal 'equipment' and educational advantages (or disadvantages)?" We have not yet pinpointed the factors which result in talent potential becoming talented performance, particularly with respect to extremely rare giftedness.

There is, as yet, no comprehensive theory that would explain what factors contribute to the emergence of superior/outstanding/unusual performance in a socially valuable area, let alone a variety of areas. In part, Tannenbaum has observed, theory building and research regarding the gifted has concentrated mostly on what is giftedness rather than what (and who) *makes* giftedness.

McClelland et al. (1958) have suggested that one major problem has been the focus of efforts on designing instruments to identify talent without an understanding of the phenomenon itself. He conjectured that even if an instrument were constructed which inevitably identified promising young persons, if we had "no idea as to why or how it worked, or what the problem of talent development really involved—in other words, if we had no theory," we would still not know what should be done with the "gifted students" the instrument had identified (p. 24). McClelland argued that an orientation which

emphasized talent potential as a fixed attribute of a very few people was problematic and speculated that:

Talent potential may be fairly widespread, a characteristic which can be transformed into actually talented performance of various sorts by the right kinds of education. If so, the emphasis should shift from identifying talent potential to *studying the process by which talent becomes actual*, by which it develops. Such a focus requires above all a knowledge of theory—an understanding of what we are measuring, how it develops under different circumstances and how it is related to the ultimate criteria of talented performance which we want to predict. Until we achieve these goals, our ignorance of the process by which talented performance develops will remain an outstanding gap in current talent research (p. 25).

A quarter of a century after McClelland and his colleagues reported to the Social Science Research Council, a second SSRC group, its Committee on Development, Giftedness and the Learning Process presented its deliberations in an effort “to infuse the field with new life, fresh perspective or even good substantive criticism, to show that there are lively issues in the investigation of giftedness yet to be pursued” (Feldman, 1982, p. 5). That SSRC Committee believed “that the traditional emphasis on precocious test performance, however productive, has had an unfortunate tendency to narrow the focus of the field, leaving outside its borders many interesting research questions” and urged that “in-sights and findings from developmental sciences” be utilized for the better understanding of giftedness and creativity (p. 5).

While many perennial research themes are still being studied, as the Year 2000 approaches, other topics are now the focus of investigation, often using more insightful or more sophisticated means to probe more meaningful questions. For example, Heller (1992a) submitted the following research topics which seemed important to him in understanding talent and its nurture:

- Development of instructional concepts and pedagogy for the gifted.
- Curricular development for special academic courses, special classes or even special high schools for certain acceleration groups, for enrichment groups and for extracurricular support of the gifted—including evaluation of such courses and programs.
- The construction of identification instruments for process diagnosis (as complement to the “status diagnosis”), the testing of successive decision strategies and multidimensional classification models.
- Construction of area-specific counseling tests for talented adolescents.
- Longitudinal studies of the gifted including analyses of the living environment over a whole life span.
- Study of leisure-time activities of talented adolescents and their influence on personality development.
- Career problems of talented girls and women,

especially in the fields of mathematics, natural sciences and technology.

- Analyses of metacognition, causal attribution, achievement motivation, self control, heuristic skills, the self concept (including sex differences) and self-evaluation of abilities.
- Quasi-experimental intervention studies for counseling and supporting gifted children and adolescents (pp. 75–76).

Definitions and Conceptions of Giftedness

A basic problem in building a theory about giftedness is that it is a multifaceted phenomenon, the nature of which is still at issue. Can a single theory account for the appearance of precocity as in 4-year olds who play chess or who write publishable poems or 10-year olds who are concert-class performers or children who perform exceptionally well on academic tasks or school-age children who develop patentable inventions? Put another way, can a single theory explain the rare Einsteins, Shakespeares, Nijinskys and similar talented individuals as well as the child whose “giftedness” appears to be achieving unusually well academically as measured by standardized achievement tests?

Research and experience over the past decades have underscored the range and variety of individuals whom school personnel and different communities (e.g., cultural, artistic, business and industry) have identified and labeled “gifted” or “talented.” Depending on the criteria being applied, there are some children who are only slightly above average while others are so far above the average as to be extremely rare. In the U.S.A., the latter are sometimes called, only partly in jest, “severely and profoundly gifted”. Some individuals seem to have talent potential in a single area while others appear to have potential in a variety of talent areas. Some individuals who have manifested talent potential seem to have little or no interest or motivation to develop or use that capacity while others are highly interested, motivated, committed and involved. Some youngsters are especially precocious, manifesting unusual talent potential at very early ages, while others are “late bloomers” who do not show unusual potential or performance until much later in their development. There are youngsters who educators believe are academically gifted—i.e., high achievers, good test-takers, good designers and implementers of school projects—but who are not necessarily outstanding performers and producers outside the classroom. Some talent areas seem to be manifested earlier than others. Some “academic absorbers” deal with their learnings in straightforward ways, while others seem to take delight in “playing around” with ideas and challenges in creative and innovative ways.

Thus, the gifted and the talented are clearly a very heterogeneous set of persons and it is this

multidimensional heterogeneity which may preclude a comprehensive theory. The absence of such a theory, however, does not prevent us from deepening our insights and understandings of the phenomena nor intensifying efforts to identify talent potential and nurture talented performance.

Giftedness and *talent* are terms which have been variously defined over the years and a variety of conceptions have emerged related to these diverse definitions. Feldhusen and Jarwan suggest that definitions of giftedness can be classified into six categories: psychometric, trait, social needs orientated, educationally oriented, special talent and multidimensional (see Chapter 13). Eysenck and Barrett view giftedness as a "fuzzy concept" that can be defined in three major ways: "(1) as synonymous with *general intelligence*; (2) as synonymous with *creativity*; (3) as synonymous with special (artistic or scientific) ability" (see Chapter 7).

Renzulli (1982) has asserted that despite efforts throughout the century, "the precise definition of giftedness remains a question with no universally accepted answer" (p. 723). He suggests that the many definitions of gifted range along a continuum from a "conservative" end represented by Terman's definition of the top 1% in general intellectual ability to the more "liberal" definition of Witty who recommended that the definition of giftedness be expanded to include any child "whose performance, in a potentially valuable line of human activity, is consistently remarkable."

Heller (1989) notes that "giftedness belongs to the class of so-called hypothetical "construct" terms whose definition is dependent on the chosen theoretical frame of reference", a term which "is strongly convoluted with relatively complex behavioral phenomena" (pp. 140-141). And the same author suggests:

In a relatively broad sense *giftedness* may be defined as the total of personal (cognitive, motivational) and socio-cultural requirements for learning and performance . . . whereas the *development of giftedness* may be understood as the interaction of internal factors of aptitude and the external factors of socialization (Heller, 1991, p. 174).

Gallagher and Courtright (1986) have argued that "one term, *gifted*, has been used to describe two different constructs . . . [which] "although overlapping, emerge from different traditions and have a number of subtle differences that create confusion and contradiction" (p. 93). One construct derives from the studies of social scientists on individual differences while the other "stems from educational practice and the need for schools to design special educational programs for students who possess abilities and performance far in excess of their age mates" (p. 93). Gallagher and Courtright assert that the educational definition of giftedness has significant policy implications with identification and program goals following from the constructs accepted.

In Sternberg and Davidson's (1986) *Conceptions of giftedness*, some 17 different conceptions of the

construct are presented and discussed by the persons who proposed and advanced them. These constructs, as Sternberg and Davidson put it, "although distinct, are interrelated in certain ways" (p. 3). They divide these different conceptions into those which are *implicit-theoretical*—each presenting "a somewhat different implicit theory of giftedness that seeks to define this elusive concept" (p. 4)—and those which are *explicit-theoretical*—each emphasizing explicit theories of giftedness in terms of cognitive or developmental psychology. The different conceptions of giftedness are also divided between those which are school-centered and those which focus on adult performance and productive behavior.

An example of an implicit-theoretical conception is that of Tannenbaum (1983) who views the interaction of five factors resulting in gifted/talented performance. These include: (1) *general ability* or tested general intelligence with different threshold IQs being required for various kinds of accomplishment; (2) *special ability* or special capacities or affinities for various kinds of work; (3) *nonintellective factors*, a confluence of affective elements such as ego strength, persistence, delayed gratification, etc.; (4) *environmental factors* including "stimulating home, school and community settings [which] are indispensable not only for maximizing potentialities but also for helping to determine the directions they take" and (5) *chance factors*, "unpredictable events in a person's life that are critical both to the realization of promise and to the demonstration of talents" (pp. 87-88).

Another example of clustering the different orientations and conceptions is the following: (1) trait oriented definitions, (2) cognitive component models, (3) achievement-oriented models and (4) socio-cultural/psychosocial oriented models (see Chapter 5). These models have to be seen as complimentary since each of them emphasizes an important aspect.

Sternberg's triarchic theory of intellectual giftedness is an example of an explicit-theoretical conception based on cognitive theory. Sternberg's (1986) theory consists of three subtheories: the first "relates intelligence to the internal world of the individual, specifying the mental mechanisms that lead to more or less intelligent behavior"; the second "specifies those points along the continuum of one's experience with tasks or situations that most critically involve the use of intelligence"; and the third relates intelligence to the individual's external world, "specifying three classes of acts—environmental adaptation, selection and shaping—that characterize intelligent behavior in the everyday world" (p. 223).

Sternberg and Davidson (1986) see definitions of giftedness having particular significance in identification and development:

Giftedness is something we invent, not something we discover. It is what one society or another wants it to be, and hence its conceptualization can change over time and place. If the definition of giftedness is a

useful one, then it can lead to favorable consequences of many kinds, both for society and for individuals. If the definition of giftedness is not useful, valuable talents may be wasted, and less valuable ones fostered and encouraged. It is thus important for all of us to understand just what it is we, and others, mean by the concept of *giftedness* (pp. 3–4).

Many different decisions regarding identification, education and counseling, for example, depend on the often only implicit conception and definition of giftedness. Therefore clarification of underlying constructs is essential for both program and research design.

Definitions, concepts and constructs which guide research and educational planning are much more diverse, much more research and theory based and much more influential on the planning and program decisions being made for the identification and development of talent. As the Year 2000 approaches, it would appear that efforts to develop better theory and conceptions of giftedness and talent in order to improve program and practice will continue but the focus will no longer be on devising a single, comprehensive conception or construct of giftedness and talent. There is increasing recognition that theory building and conceptualization of the phenomena of giftedness have considerable significance in determining what should be done to bring talent potential to talent realization.

Identification of Talent Potential

The procedures and processes by which talent potential is measured have changed dramatically since Terman (1925) selected the 1528 subjects (857 boys and 671 girls) for his life-long longitudinal study: “The standard set for inclusion in the group was 140 IQ for Binet-tested subjects and 135 for high school subjects selected as the basis of the Terman Group Test” (Terman & Oden, 1951, p. 22). High intelligence, as measured by an individual or group test, became the basis for both defining giftedness and identifying gifted individuals.

In Chapter 11, Sternberg has reviewed procedures for identifying alternative approaches to assessing intellectual potential, arguing that “‘giftedness’ can be viewed as quite broader than a high score on a conventional intelligence test” and that “there can be different sorts of tests within each metaphor, depending upon the particular theory within the metaphor that generates the test”.

Feldhusen and Jarwan submit that a sound identification system must deal with a number of issues: “(1) the rationale and goals, (2) defining the target population, (3) use of single or multiple criteria, (4) types of test performance, (5) criteria for test selection and (6) selection strategies (see Chapter 13).

Operational definitions and conceptions of giftedness guide identification and program planning. As Renzulli

(1982) has pointed out: “there are very few educators who cling to a ‘straight IQ’ definition or purely academic criteria for identifying giftedness. ‘Multiple talent’ and ‘multiple criteria’ are almost the bywords of the present-day interest in the gifted” (p. 723).

In the U.S.A., depending on the definition of giftedness or talent, multiple sources of information about individual differences may include some or all of the following:

- Evidence of general ability and/or multiple intelligences including group and individual intelligence tests.
 - Evidence of scholastic achievement, including standardized tests of achievement and teacher grades.
 - Evidence from “creativity” measures, including standardized tests of creativity, divergent thinking and productive thinking.
 - Nomination by teachers on various kinds of rating scales and check lists.
 - Nomination by peers on various kinds of rating scales, inventories, check lists.
 - Nomination by parents on various kinds of rating scales, inventories, check lists.
 - Evidence of productivity through products of individuals such as writings, compositions, sculpture, science projects, reports and so on.
 - Evidence of noncognitive behaviors—for example, work habits, task commitment, self-directedness, pride in accomplishment and so on—on inventories, check lists and rating scales.
 - Autobiography and self-nominations.
 - Evidence from judgment by experts in various talent areas, such judgments based on student products and/or performances, especially in areas such as dramatics, graphic arts, music and so on (Passow, 1985a, p. 2049).
- In addition to relying more on student performance and products in the identification process, another significant development involves the design of environments or settings which provide opportunities for a larger number of students to engage in a self-identification process by participating in enrichment activities which enable them to demonstrate their capabilities and manifest their talent potential.
- Identification procedures have been seriously criticized for their failure to identify gifted in such populations as racial and ethnic minorities, the disadvantaged and poor and those with limited language in their land of residence. There are increasing numbers of such students not only from a given country itself but also displaced by political and/or economic hardship. Increasing attention is being paid to procedures and techniques which will enlarge the talent pool from these seriously underrepresented populations.
- Two examples of such efforts are The National Research Center on the Gifted and Talented at the University of Georgia, U.S.A., which is developing methods for identifying diverse populations and training teachers to recognize such giftedness, and The Center for the Study of Giftedness at the University of Nijmegen, The Netherlands, where work is ongoing in identifying

and providing enrichment for both minority students (primarily Turkish and Moroccan) and disadvantaged Dutch students.

As the Year 2000 approaches, it would appear that the multidimensions of giftedness and the concept of multiple talents will prompt the design and employment of much more authentic and complex identification procedures; less reliance on single tests, particularly tests of intelligence; more design and dependence on self-identification wherein individuals can demonstrate their talent potential by their performances and products; much more use of enrichment curricular opportunities to provide the basis for manifestation of talent potential; and increased efforts to identify talent potential among the many seriously underrepresented populations.

Gifted Education

Perhaps the fundamental question educators of the gifted must deal with has always been and continues to be: What kinds of education and socialization opportunities and experiences are needed to transform talent potential into talented performance? (See Chapters 18 and 19).

More than three decades ago, pointing to the tendency to believe that if only children with talent potential could be identified then they could readily be provided with appropriate experiences to nurture that talent, McClelland (1958) observed:

Suppose we could locate that sleepy boy in the back row, the potential poet; what would we do for him? Would we offer him a liberal scholarship to one of our better private schools? Would we “enrich” his curriculum with special readings in poetry, or in the Greek classics? Or would we perhaps excuse him from school altogether on the ground that he would do better as a self-educated man? Or would we supply him with a vocational counselor who would help him find his real niche in life? . . . The plain fact is that we do not know what we would do; we do not know enough about what goes into the making of a poet . . . we still know far too little to be confident about how to develop talented performance out of talent potential (pp. 23–24).

While what goes into the making of a poet, a scientist, a painter, a musician, an orator or any other talent domain may not be known with the certainty that specific actions will result in nurturing particular giftedness, we do know that the absence of certain kinds of experiences will impede or thwart the realization of talent. For example, a strong case can be made that the “potential poet” whose language is not cultivated and enriched, whose understanding of the beauty and esthetics of language is not nurtured, who has not experienced various genres of poetry, who has not acquired the connoisseurship that enables him/her to distinguish between “good and bad” poetry, who has not

had opportunities to produce poetry, who has not been encouraged to play around with words and ideas and who has not had opportunities to “do poetry”—is not likely to transform his/her potential into superior performance. We do not know that the “potential poet” will emerge but we are pretty certain that without these kinds of experiences and learning opportunities, he/she is very unlikely to become a gifted poet. The same arguments could be made for other areas of giftedness or talent.

Every area of specialized talent has a content and a substance, its very special methodologies and processes, its modes of problem definition and problem solving, its ways of exercising creativity, innovation and originality. A specialized curriculum for the gifted should activate and motivate the commitment and the development of the competencies and affective behaviors needed for nurturing one’s special talent potential. For realizing these purposes advocacy groups play an important role (see Chapter 52).

Curricular Programs and Provisions for the Gifted

Educators planning for the gifted are concerned with designing educational settings and learning engagements that make available opportunities for students to acquire the knowledge, insights, skills, understandings, motivation, interest, values and other learning that will enable them to perform at levels of excellence that might be described as “gifted” or “talented.” Not every potential poet will emerge as a poet but it is unlikely that potential will be realized without appropriate experiences. It is the nature of “appropriate experiences” that is at issue.

For more than a century schools have provided programs of various kinds aimed at nurturing the potential of gifted and talented children and youth. Practically every aspect of the educational process—the goals and objectives, curriculum content, instructional strategies, teaching/learning resources, personnel resources and evaluation and assessment programs—have been modified and adapted “to meet the needs of the gifted”.

As the Marland Report (1971) put it, the gifted “are children who require differentiated educational programs and/or services beyond those normally provided by the regular school program in order to realize their contribution to self and society” (p. 2). The phrase “beyond those normally provided by the regular school program” implies that there is a curriculum which may be accelerated (experienced at an earlier age, in less time than is usual or at a more rapid pace), enriched (experienced in greater depth and/or breadth), or amplified (experienced beyond what is provided for other students, differing in nature or kind).

Programming for the gifted, i.e., the provision of differentiated curricula, raises a number of issues such as: Are there bodies of content and educational experiences that are essential for talent development? Is there a common body of curriculum content for all talent

development? What kinds of specialized curricula are needed to nurture diverse talents?

Are there education imperatives which are applicable to all gifted—i.e., are there learnings which are essential for all gifted and talented, regardless of their specific talent domain? Are there essential learnings that all gifted must experience if they are to achieve maximum self-realization and fulfil their potential? Positions taken on these issues vary widely. Most curricular and instructional programs are based on a particular conception of giftedness albeit in most instances this is only implicit (see Chapters 19 and 21).

There is a general consensus on the need for specialized curricula aimed at nurturing the diverse special areas of talent, providing learning engagements and opportunities that enable the individual to identify and develop the skills, knowledge, insights, understandings and values needed to realize one's area of specialized talent potential. The specialized curriculum starts the individual toward the development of his/her talent potential by activating and motivating the acquisition of and commitment to knowledge, skills and affective behaviors that contribute to talented performance.

Not only are there issues concerning the nature of such specialized curricula but there are questions about the appropriate balance between the differentiated basic or general curriculum and the specialized curricula. Which subjects, which disciplines, which learning opportunities are appropriate at the early stages of talent development and how do these change as the talent matures and comes closer to the behaviors of a gifted adult performer? To what extent should the individual be permitted or encouraged to focus his/her learnings on a specific talent domain or to what extent should he/she be required to engage in basic/general or common learnings? Should the potential poet and the exceptionally able mathematician have opportunities to pursue more intensive study of creative writing or of advanced mathematics "at the expense" of the general or basic education? The issues are essentially questions of what constitutes a sound and appropriate general education which can serve as a foundation or base for the development of specialized talents and what comprises the specialized curricula.

A closely related issue of curricular balance is that of acceleration vis-a-vis enrichment—when and how to accelerate learning and when and how to enrich learning. For many years, literature on gifted education posed acceleration and enrichment as opposing concepts and the controversy still rages among some advocates of each process (see Chapter 20). Passow (1985b) has argued that acceleration "enables the student to deal with more advanced concepts at higher cognitive levels and thus represents an enriching experience" while providing opportunities for more advanced study in the area being accelerated or in another area or areas (p. 37). On the other hand, by providing "learning experiences that enable the student to probe more broadly or more intensively" using advanced resources "enabling

gifted individuals to attain higher levels of insight, understanding, performance, or product development", enrichment also involves acceleration (p. 37).

Both acceleration and enrichment have qualitative as well as quantitative dimensions which make it possible for gifted individuals to pursue differential experiences through a greater variety of opportunities and engagements. Thus, the issue is now beginning to be reformulated, not in terms of acceleration versus enrichment, but rather as the question: *When* is it more appropriate to alter the tempo or pace of instruction and learning and *when* is it more appropriate to alter the breadth or depth of experience and *how* shall this be accomplished?

During the past two decades, mainly in the U.S.A., there has been a proliferation of systems and models for designing programs for the gifted and talented (Fox, 1979; Maker, 1982; Renzulli, 1986). These models may focus on organizing for instruction (i.e., administrative models) or "consist of principles that guide the instructional process and give direction to the content, thinking processes and outcomes of learning experiences" (Renzulli, 1986). Maker (1982) observed that these models differ in terms of the theoretical assumptions made, "both regarding the nature of the learner (for example, learning, motivation, intellectual and emotional characteristics) and the nature or effectiveness of certain teaching methods" (p. 2).

Some ideas of the diverse foci, nature and comprehensiveness of the models and systems that are currently being implemented in the U.S.A. can be gathered from the following listing:

- SMPY's model for teaching mathematically precocious students.
- The Autonomous Learner Model for the gifted and talented.
- The Integrative Education Model.
- The Learning Enrichment Service (LES): A participatory model for gifted adolescents.
- The Purdue Three-Stage Enrichment Model for Gifted Education at the Elementary Level.
- The Purdue Secondary Model for Gifted and Talented Youth.
- The Grid: A model to construct differentiated curricula for the gifted.
- The SOI System for Gifted Education.
- The Enrichment Triad/Revolving Door Model: A schoolwide plan for the development of creative productivity.
- The Secondary Triad Model.
- Cultivating simultaneous student growth in both multiple creative talents and knowledge.
- Talents unlimited: applying the multiple talent approach in mainstream and gifted programs.
- The Enrichment Matrix Model.
- Fostering effective independent learning through individualized programming.
- The Cognitive-Affective Interaction Model for Enriching Gifted Programs.

- The cognitive and affective taxonomies.
- The basic structure of a discipline.
- Discussions of moral dilemmas.
- Creative problem solving.
- Teaching Strategies Program (Maker, 1982; Renzulli, 1986).

A criticism made of many of these models is that, with very few exceptions, they fail to deal with the total curricular experience and usually consider only one aspect of instruction and learning—whether to select and implement a particular system or model depends on the congruence between the conception and assumptions underlying the model and the particular goals of the school's program.

In the early 1920s the reform movement had a great impact on reshaping instructional and educational methods in schools. According to this movement education should be child centered. One of the most prominent reformers was Maria Montessori. Her educational system has been and continues to be a great help in optimizing individual development. Montessori-education like other individualized programs (Jenaplan, Daltonplan) has never so far explicitly formulated a gifted program. But in reality Montessori-education realizes the core principles of gifted education: The level and pace of individual ability determines the content and speed of the individual student. These "hidden" gifted programs should be made explicit and be made better known to parents and teachers.

Another issue regarding a curriculum for the gifted is that of the balance between cognitive and affective development. Most of the focus of curriculum design for the gifted is on cognitive development: the stimulation of problem-solving and thinking skills and academic and intellectual growth. Far less attention is given to the affective development of the gifted (the feelings, values, motivation, attitudes, morality, self-concepts) although a few of the models do attend to this domain (Dixon, Meyer, & Hardy, 1986). Only a few models—e.g., Williams' (1986) Cognitive-Affective Interaction and Betts' (1986) Autonomous Learner Model for the Gifted and Talented—have the affective domain as a major focus. Passow (1992, p. 224) has observed that:

Regardless of their specific interests or degree of talent, a [curriculum] should foster self-direction and independence, intellectual and emotional self-reliance, self-set goals and a love of learning. It should stimulate a desire to create and experiment with ideas and things. It should nurture an understanding and appreciation of one's cultural heritage. It should cultivate what Brandwein (1955) describes as persistence—a willingness "to labor beyond a prescribed time . . . to withstand discomfort . . . to face failure" (p. 10) and questing—"a dissatisfaction with present explanations of aspects of reality" (p. 11).

The processes of nurturing the affective development of the gifted has several dimensions: instructional,

counseling and environmental. From a curricular and instructional perspective, every discipline or subject has the potential for enhancing affective growth through self-awareness, sensitivity to others, understanding, empathy, esthetic appreciation, interpersonal understandings and moral values (see Chapter 29). From the counseling perspective, gifted and talented students face particular affective problems of a personal and interpersonal nature for which guidance and support are needed. From the environmental perspective, classroom, school and community climates are powerful influences on student behavior and learning, especially on affective development: self-concepts, attitudes, motivations, task commitments, (see Chapters 28 and 29). As educators of the gifted have become more concerned with the affective dimensions nurturing talent, more attention is being given to the curricular, guidance and climate for learning as these have an impact on affective development.

Still another dimension of curricular significance for the gifted focuses on interdisciplinary study. Curriculum content, Passow (1982) has suggested, should "include more elaborate, complex and in-depth study of major ideas, problems and themes that integrate knowledge with and across systems of thought" (p. 7). Curricula which are organized across themes or problem areas, using interdisciplinary approaches of a high order, drawing on knowledge and multidisciplinary resources appropriate to deriving understandings and gaining insights into those problems and themes are increasingly being perceived as germane to the education of the gifted (see Chapter 19).

Another curricular issue focuses on the suitable balance between individual and group activity for the gifted. Independent study and individualized instruction are widely advocated for gifted students: opportunities to pursue their own interests, concerns, problems and preoccupations on their own and by themselves. On the other hand, in addition to the learnings which come from interaction with students with a wide range of abilities, there is a good deal of research regarding the stimulation and exhilaration that come from interaction with other equally able gifted students. A differentiated curriculum for the gifted must provide opportunities for independent study as well as group learning activities depending on the particular goals and objectives being pursued.

Dishart (1980) is critical of curricula which must be either enriched or accelerated in order to be used with gifted and argues:

Educational programs for the gifted should be based upon the needs of the individual learners rather than upon making up for the program deficits in a curriculum for the nongifted. There is a resultant difference between enriching or accelerating an inadequate and inappropriate curriculum and designing an adequate and appropriate curriculum for use in the first place (p. 26).

As the Year 2000 approaches, educators of the gifted

are taking heed of the concept of differentiated curricula which are “adequate and appropriate . . . in the first place”. Educational planners are giving more thoughtful attention to the creation of a community of learners, to problems of sequence and articulation over the school years, to the devising opportunities for individualized/independent study, to meaningful implementation of the concepts of acceleration and enrichment and to integrating curricular elements for the gifted with the total curriculum.

Moreover, increasingly planners are beginning to think in terms of curricula and learning experiences which extend beyond the classroom and into the community, using a broad array of relevant resources, both school and nonschool. Mentorships and apprenticeships, for example, relate students with talent potential to talented adults who provide learning opportunities and serve as role models (see Chapter 42).

There is, as yet, no certainty regarding appropriate and adequate curricula for the gifted but gradually the “busy work” and “fun-and-games” approaches to educating the gifted are being eliminated and there is increasing understanding and congruence between operating concepts of giftedness, goals and objectives and the design of learning opportunities and learning environments.

Extracurricular Programs and Experiences

Learning experiences outside school are often necessary and in any case very useful for the development of giftedness and talent, especially creative productivity. Because such individual activities are self-regulated learning processes, special interests are supported in an optimal way. Community facilities and opportunities for individualized leisure time activities are very important not only for the development of domain-specific competencies (e.g. see Chapters 22 and 23) but also for the enhancement of self-concept and task commitment. Furthermore, leisure time activities offer chances for many relationships between gifted peers, which are important for the development of giftedness and talent. Therefore extracurricular programs like after school working groups, Saturday and summer programs or academics, olympics, competitions, etc. (see Chapter 33), provide gifted adolescents with a great variety of challenging experiences (Feldhusen, 1991).

Such learning opportunities are especially supportive for the development of gifted or talented girls and women (see Chapter 40). Inasmuch as the risk of limited socialization experiences, e.g. in the field of technology, is quite higher in gifted/talented girls than in boys, balancing leisure time activities are necessary for girls in such fields. An affiliated problem is the lower participation quota in competitions of girls in comparison with boys. Hence group competitions offer useful supplementary learning experiences for girls.

Community Agencies and Institutions

As schools come to understand more about the nature of giftedness and its nurture, community agencies and institutions are being recognized as another essential element in talent development. Kough (1958) has argued that there are many specialized areas that schools can expose students to but often they cannot provide the expertise needed for developing potential to a high level as well as nonschool group and that “many of the educational functions which are directed by the schools can be enhanced by community activities” (p. 378).

Research and experience support the idea that education, socialization and enculturation take place in many different settings and that many agencies and institutions, besides the school, teach. A second important idea is that there are personnel and material resources in nonschool agencies which can enrich the learning opportunities and thus challenge gifted and talented students far beyond that which the school can do (see Chapter 43).

Community agencies and institutions often have far more appropriate, up-to-date and state-of-the-art equipment than those that the school can provide. Such agencies and institutions are not only sources for much needed materials and equipment but, equally if not more importantly, they are the places where practising specialists—scientists, artists, musicians, researchers, artisans, technicians, media personnel, writers, government leaders, other professionals and other creative and productive individuals—are available who can serve as mentors, teachers and role models for young persons with talent potential (see Chapter 42).

Increasingly, the human and material resources of nonschool individuals and groups are being used to extend educational opportunities and challenges for the gifted and talented. These resources are now recognized as not being simply enriching but, in many cases, they are absolutely essential and critical in talent nurturing efforts. A sound mentoring experience, for example, can have a significant impact on both the cognitive and affective growth of the child.

Administrative and Organizational Arrangements

Curricula may be implemented and learning opportunities for the gifted may be provided in a variety of settings. These settings can be in or out of school, within regular classes, special classes or special schools, part-time or full time, beginning at and available in every grade level.

Special groups may be organized on the basis of ability, achievement, aptitude, interests or motivation and may involve students or the entire school population. Groups may meet for a few minutes a day or for the entire school day. The groups may be organized for a variety of purposes such as practice for debate or academic bowls, for drama or chess. Groups may

include special classes or sections, special schools or school-within-schools.

Despite the various kinds of grouping used in providing for the gifted, the general practice—usually called ability grouping or tracking—has a long and controversial history on philosophical, psychological, sociological and educational grounds (see Chapter 32). Because ability grouping has been an issue and been studied for almost a century, there is a considerable body of research available but the controversy is hardly resolved. In the United States, ability grouping/tracking has been linked to provisions for the gifted and, from time to time, has been condemned as “elitist” and “undemocratic”, hindering both equity and excellence. Currently the U.S. pendulum is swinging away from ability grouping and there seems to be a growing emphasis on cooperative learning.

Some gifted programs do separate the gifted from other students but, except for full-time special classes or special schools, complete isolation is rare. Research has indicated that, depending on the circumstances, there are positive outcomes from the stimulation of gifted students interacting with each other and the competition as well as the cooperation that occurs in those settings.

Grouping and tracking are organization procedures intended to facilitate teaching and learning. What appears to be emerging is a consensus that the issue is not one of grouping versus no grouping but rather one of *what kinds of grouping*—together with other elements of curriculum and instruction—are needed to foster optimum learning for all children, including those believed to have talent potential. A balance needs to be attained between learning experiences optimally engaged in with intellectual and creative peers and those that are best experienced with a broad mix of learners.

A variety of special schools for the gifted and talented, schools which usually have selected admissions and which provide distinctive domain specific learning opportunities, are still rare. Examples of such schools are the Bronx High School of Science (U.S.A.), The Israel Academy of Arts and Science (Israel) and the Yehudi Menuhin Music School (U.K.). In Europe there are many secondary schools for Dance, Music and the Fine Arts. In the United States there has been a growth of residential Governor's schools which select students from entire states who are gifted in specific areas: The North Carolina High School for Mathematics and Science, The North Carolina School of Fine Arts, The Louisiana School for Arts, Science and the Performing Arts and The Illinois Math and Science Academy exemplify such state supported selective special-purpose schools.

Despite the attainments of such schools, as with other forms of grouping, they continue to be controversial. The basic argument advanced for their support is that they provide the kind of stimulating environment and appropriate personnel and material resources which are not possible in any other setting. The argument against such special schools is that they are elitist, undemocratic

and use scarce resources needed by other less able students. Although the issue of special schools has never been resolved to the satisfaction of all because of the deep philosophical and political differences, to the extent that the student body is inclusive of minorities and disadvantaged gifted—i.e., the equity question is dealt with, special schools and special programs appear to be more acceptable.

As the Year 2000 approaches, it seems likely that the many controversies surrounding various kinds of administrative and organizational provisions will not be resolved, essentially because they are part of the larger issue of equity and excellence. Planners of programs for the gifted will need to draw on research for support of special provisions but use these insights in the context of planning rich opportunities for learning for all (see also Chapter 31).

Socio-Emotional Development, Counseling and Guidance

Superior performance is determined by the interaction of many factors, cognitive, affective and social. The social and emotional issues, including self-concept can release or inhibit the full use of an individual's abilities (Tannenbaum, 1983; VanTassel-Baska, 1989). How an individual functions cognitively is affected by and affects the individual's affective functioning—cognitive and affective systems are congruent and interactive. Tannenbaum argues that:

Ability alone cannot facilitate great accomplishment. It also requires a confluence of various nonintellective factors such as ego strength, dedication to a chosen field of productivity or performance, willingness to sacrifice short-term satisfactions for the sake of long-term accomplishment and many others. These traits are integral to the achieving personality regardless of the areas in which the talent manifests itself (p. 88).

Regardless of specific interests or degree of talent, opportunities are needed to foster such qualities as self-direction and independence, intellectual and emotional self-reliance, self-set goals and a love of learning, a desire to create and experiment with ideas and things—all affective behaviors. Opportunities are needed to cultivate what Brandwein (1955) called *persistence* a willingness “to labor beyond a prescribed time . . . to withstand discomfort . . . to face failure” (p. 10)—and questing “A dissatisfaction with present explanations of aspects of reality” (p. 11).

As a group, gifted children tend to be more highly motivated, often have a strong desire for self-advancement and unusual emotional depth and intensity; they tend to have higher self-concepts and stronger ego strengths; are inclined to be greater risk-takers; tend to be more sensitive to the expectations

and feelings of others; often express idealism and a sense of justice earlier and tend to be more independent, more forceful and more competitive.

By virtue of their being "different", the gifted often encounter socio-emotional problems which can become serious ones. For example, sometimes, the gifted child's cognitive development far outstrips his/her affective development and adults expect equally "mature behavior", creating problems by such expectations. Adult uncertainty about the nature of giftedness can result in their pressuring a child to conform or behave in particular ways or in their avoiding or ignoring recognition of unusual ability. Excesses in either direction can contribute to socio-emotional problems which require guidance and counseling.

Classroom curriculum and instruction can be boring and unchallenging or the classroom climate and school environment can influence student behavior and learning, positively or negatively.

Allen and Fox (1979) have categorized the affective problems of gifted children as environmental, interpersonal and intrapersonal. *Environmental* problems arise in a school setting where lack of a sufficiently interesting or challenging curriculum leaves the child felling bored, resentful, hostile or disengaged. School problems arise when mediocrity is accepted, excellence is not recognized or rewarded and superior performance is denigrated or ignored. *Interpersonal* problems stem from the gifted child being perceived as "different" by peers, teachers and adults whose consequent behavior may cause the gifted student to reject or deny his/her potential in order to become "more acceptable". Interpersonal problems may also arise when parents, teachers, counselors and other

adults have unrealistic expectations regarding the gifted child's performance and behavior. The gifted child's *intrapersonal* problems are those of self-concept, self-esteem and self-acceptance which can lead either to the development of appropriate coping strategies or to developing dysfunctional behavioral responses.

In addition to these three classes of problems, the gifted child also faces problems of educational and career choice—decisions regarding higher education and professional pursuits stemming from their greater potential and higher achievements. All of these problems or potential problems call for guidance and counseling which meets the particular needs of gifted children.

The still new history of the counseling of gifted students includes few publications (St Clair, 1989). Some of them are aimed at teachers, others at the students' parents. Some publications also focus on the personality of the individual looking for counseling. Need for counseling arises directly from giftedness or talent when, for example, there is an inappropriate interaction between the gifted child and the environment. Often age-related distributions of counseling needs specific to the gifted/talented can be found: These age-related problems are frequently confounded with gender-related socialization effects (Webb, Meckstroth, & Tolan, 1984; Feger & Prado, 1986; Mönks, 1987; Stapf, 1990; Colangelo, 1991).

According to other recent statistics (e.g., Prado & Wiczerkowski, 1990; Keller, 1992) the following percentage frequencies of counseling problems—related to a German counseling clientele (Geisler, 1991)—may be illustrative of the most frequent counseling needs (see Table 1). Keller (1992), who statistically evaluated the gifted clientele of another counseling center, found

TABLE 1
Percentual Frequencies^a of Counseling Needs Specific to the Gifted (cf. Heller, 1992b)

Boys:		Girls:	
1) Search for nurturance possibilities	43.7%	1) Search for nurturance possibilities	54.5%
2) Academic achievement problems	31.3%	2) Identification of giftedness	45.5%
3) Identification of giftedness	31.0%	3) Educational counseling	24.2%
4) Boredom at school	22.3%	4) Skipping a class	21.2%
5) Doctor's recommendation problems	12.6%	5) Academic achievement problems	15.2%
6) Skipping a class	11.7%	6) Boredom at school	12.1%
7) Behavior problems	11.7%	7) Doctor's recommendation	6.1%
8) Discrepancy between intellectual and social development	10.7%	8) Discrepancy between intellectual and social development	6.1%
9) Educational counseling	8.7%	9) Psychological problems	6.1%
10) Concentration problems	4.9%	10) Discrepancy between intellectual and motivational development	3.1%

^aMultiple listings possible

a quite similar picture. School career planning and individual nurturance of the gifted students were the most frequent needs. Behavior problems only made up about 20%, in contrast to the findings of Müller (1992) who interviewed parents of gifted students. In Müller's study the most frequently reported needs were: (1) behavior problems, (2) study and achievement difficulties, (3) lack of cognitive challenge. However, parental causal attributions of counseling needs do not necessarily reflect the reality as seen from the picture in Table 1. Also in a cross-national perspective we must consider particular differences in focus on the counseling needs (e.g. reported by Webb et al., 1984).

It is particularly interesting to look at the gender differences indicated in the table. Behavior problems and developmental discrepancies are observable in boys more frequently than in girls, although less frequently reported than in the American literature. The number of gifted underachievers is also significantly higher in boys than in girls (see Chapter 37). What can we conclude from this for the counseling of gifted students?

The task of counseling the gifted must be oriented toward the individual needs and thus toward concrete counseling problems and at the same time toward the goal of optimal development of the student. In this sense, the counseling of adolescents is very important in supporting their identity formation. The essential importance of counseling in a sufficient program for gifted is emphasized by Silverman (Chapter 36). Silverman reminds us that the development of gifted children is frequently asynchronous. Such uneven development leads to greater vulnerability for the gifted, especially for the highly gifted. Such children need counseling to assist them in dealing with their intense emotional lives, their heightened awareness and their difficulties in fitting in with age peers and rigid educational systems. Silverman postulates that the aim of counseling is not just the remediation of problems: its main goal should be guidance toward self-actualization.

Those being served by counseling services for the gifted include also the gifted's parents, teachers and other important socialization agents including siblings and peers. Parents and teachers of the gifted often need support because of the specific/unique needs of the gifted. Although scholastic counseling and individual psychological counseling are sometimes indistinguishable because of the inevitable overlapping of these two areas, they can be differentiated as follows: (1) *Scholastic counseling* includes problems of identification, nurturance or cognitive learning and achievement, appropriate classes as well as acceleration measures such as special schools, early admittance to school and skipping grades, extracurricular enrichment activities and guidance toward appropriate post-secondary education; (2) In *individual counseling*, issues such as those listed in Table 1 are prominent.

One must always take the gifted individual's learning and thinking characteristics, interests and social-emotional needs into account (see Chapters 26-28).

One should take the gifted's natural superiority in information processing into consideration when developing programs for the gifted in order to avoid boredom and loss of motivation. An extended period of non-challenging education frequently leads to later difficulties, usually when the task difficulty increases rapidly during secondary education and the gifted elementary school child has not learned how to learn, study or experience academic failure or frustration.

For counseling and nurturing talented girls in particular see Detzner and Schmidt (1986), Wiczerkowski and Prado (1990), Kerr (1991a,b), Beerman et al. (1992).

Counseling services need to be appropriate and adequate also for gifted students with learning disabilities and for those with physical handicaps. Counseling agents should also be trained to deal with populations too often underrepresented in gifted programming such as racial and ethnic minorities, the disadvantaged and those with limited language ability in their current land of residence. Increasingly, all over the world, perhaps especially in the United States and in Western Europe, there are students with the added psychological and/or economic handicaps that come from being uprooted from their original homeland. (Additional counseling concerns are dealt with in Chapters 36-41.)

An integrative model of counseling the gifted has been presented by Perleth and Heller (see Figure 1). The model explicates the necessity for cooperation between various counseling agents (school psychologists, school and vocational counselors, social workers, teachers of the gifted) and institutions (school, counseling agencies, research institutes) in order to meet the challenge of counseling the gifted and talented.

This model is certainly still a far cry from the reality of cooperation between research and education of the gifted. But it makes clear the position of guidance and counseling of the gifted within the context of gifted research and practical requirements of education of the gifted in the school and outside. Thus, it serves as an integrating function for the further development in this field. Particular attention should be paid to the mutual nourishing of research topics and methods and the unsolved practical counseling problems. It is very important to strengthen the training of those involved in counseling students by including the area of giftedness in developmental, educational and clinical psychology. Counseling personnel should be able to identify and counsel gifted students. There is also a need for inservice counselor training programs (Milgram, 1991).

As the Year 2000 nears, it seems likely that increased attention to the mental health and affective development of the gifted will result in making available group and individual guidance and counseling appropriate to the particular needs of the gifted and talented. As educators become more sensitive to the affective characteristics and needs of the gifted, they will design and adopt educational, counseling and socializing experiences to meet those needs.

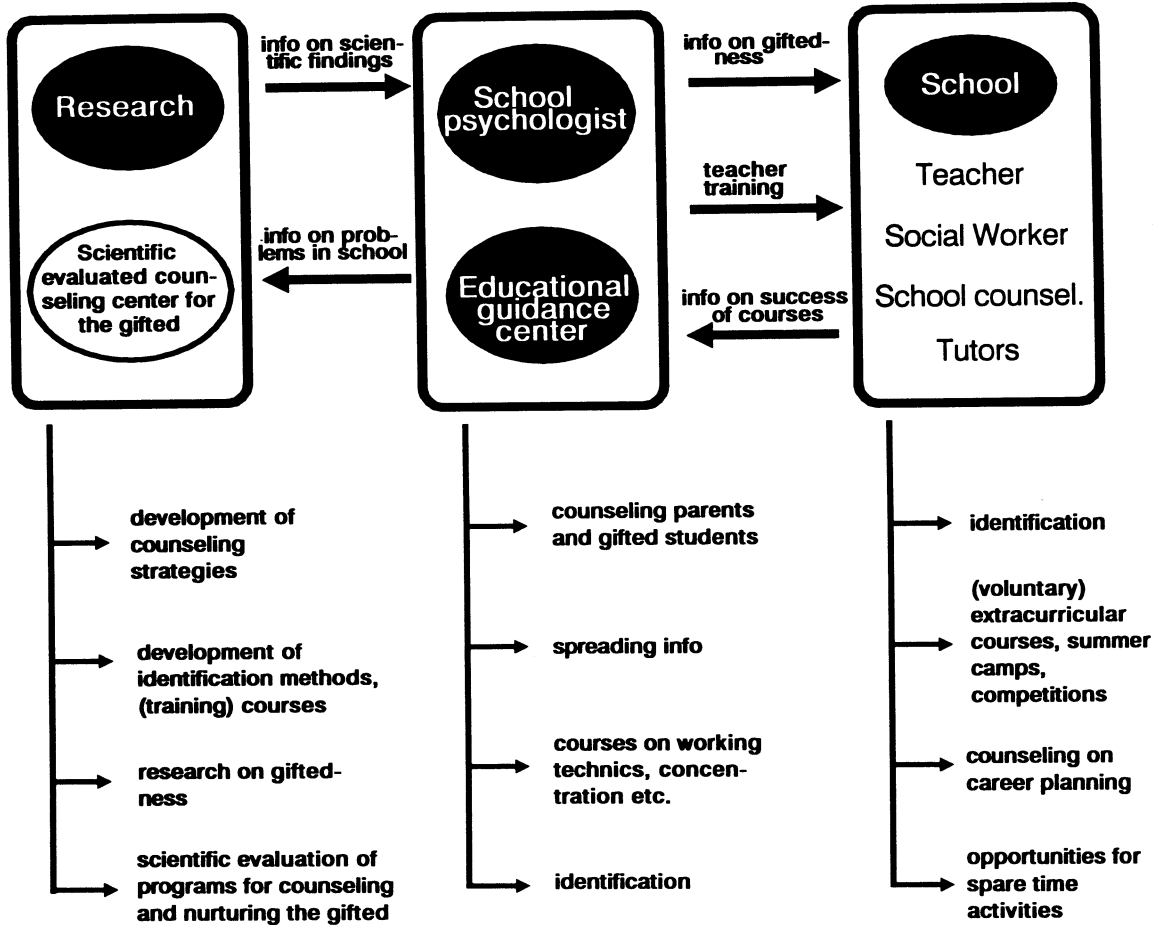


FIGURE 1. Mediating model of counseling the gifted students (cf. Perleth & Heller, 1992, p. 376)

Creativity

In the lexicon of gifted education, the term *creativity* looms large (see Chapter 30). For some researchers, creativity is a basic component of giftedness, a characteristic or trait to be assessed in the process of identifying and selecting gifted and talented students. Some writers use the term as synonymous with giftedness. For others, creativity is a trait to be nurtured if talent potential is to become talented performance. Some researchers write of creative scientists, creative mathematicians or creative artists, for example. Others use the term creativity as synonymous with productive thinking, divergent thinking, critical thinking and even problem solving and view it as a quality to be stimulated and nurtured.

Clark (1992) suggests that “creativity involves the synthesis of all functioning and still more. It includes a spark from another dimension” (p. 49). To Clark,

Creativity is more than intelligence and results from the synthesis of all of our brain’s functions,

the knowing that is processed internally and that which comes to us from outside our system. At least four areas of creativity are being studied: creativity as rational thought, as unique products, as high levels of mental health and as intuitive spark. We must understand all these areas if we are to understand creativity, for it is the integration of all these abilities that allows us to create. Creativity is a holistic concept (p. 68).

A number of theories of the nature of creativity have been advanced—e.g., psychoanalytic, humanistic, personal attribute, developmental stage and right and left brain, to cite a few (Tannenbaum, 1983). These theories attempt to explain the nature of creativity—some in terms of creative processes or abilities, others in terms of creative potential.

Research on creativity has focused on understanding its nature and functioning, on procedures for assessing its nature and on ways of stimulating or nurturing it. Each focus has raised a number of issues. One perennial issue

is the relation between intelligence and creativity—are they distinct and different or are they related and, if so, how? For example, Guilford (1968) theorized that the structure of the intellect consists of 120 abilities and that some of these operations, contents and products are closely related to aspects of creativity. Guilford's work became, as Stein (1986) observed "not only the starting point for those who study the intellect and those who wish to develop creativity tests, but it has also become a model for curriculum development.

A number of test batteries have been developed to identify creativity and these have been replete with controversy. One kind of problem has to deal with the validity of such tests. Tannenbaum (1983), for example, asserts that: "For a test to have good face validity, its content must resemble in some way the essential phenomenon it is measuring. This would be especially difficult to demonstrate in tests of creativity, considering the multidimensionality of the concept, how it develops in the human psyche and the mental processes involved in activating it" (p. 270). There have been a number of batteries of tests of creativity developed, and these have their supporters and their critics. While numerous studies have been done on many such batteries, as Tannenbaum notes, "from the research produced thus far, it is impossible to draw a clear picture about the relationships among tested creativity IQ and achievement" (p. 293).

Efforts to nurture creativity fall into two main categories: one is the development of a number of "programs" for in-school or extracurricular use, and the second is the adaptation of the regular curriculum in order to stimulate the creative processes. Among the former, for example, are programs aimed at direct instruction to nurture creativity—such as the Meyers-Torrance Workbooks, the Purdue Creativity Training Program, Parne's Creative Problem Solving and Williams' Classroom Ideas for Encouraging Thinking and Feeling, to cite a few. Extracurricular programs are exemplified by the Future Problem-Solving Program and the Odyssey of the Mind, both national competitions designed to stimulate creativity. The latter involve a variety of instructional strategies—e.g., differentiated assignments, independent projects, real-life problems—which require students to deal with the regular curriculum in novel and innovative ways resulting in the stimulation of the creative processes. A basic issue posed is the extent to which these various school-centered curricula and activities actually stimulate creativity—however conceptualized and defined—and whether there is a carry-over to fulfillment of potential beyond the classroom. That is, are children who experience these programs and engage in these activities "more creative" in their fields of endeavor as adults?

Tannenbaum (1983) argues that:

The large body of research on creativity is valuable in the sense that it has alerted educators of the gifted to locate children who are proficient in divergent

thinking and to emphasize these though processes in the classroom. However, as a psychological phenomenon, it is hard to evaluate because there is no universal agreement on how to recognize or measure it (p. 324).

Clearly, issues concerning the assessment, identification and nurturing of creativity continue to involve both researchers and practitioners. In the coming years, it is likely that the theories and studies of creativity—its nature, assessment and nurture—will lead to a better understanding of the creative process and its relation to gifted and talented behaviors.

Underachievement

A report by the Fund for the Advancement of Education (1957) framed the problem of underachievement as follows:

Despite the great strides made by American education over the last 50 years, we are still far-short of the goal of enabling and encouraging every young person to develop his full potential. The resulting waste of rich human resources is enormous and is deeply rooted in our educational system, right down to the earliest grades. We must therefore attack the long-run problems of talent supply primarily through our school and colleges (p. i).

The phenomenon of underachievement is both a puzzling and a challenging one—puzzling in its complexities and challenging in the difficulty in reversing or overcoming it (see Chapter 37). Underachievement is essentially a school-centered concept—i.e., most definitions refer to a serious gap between predicted and actual school achievement. As Raph, Goldberg, and Passow (1966) have noted: "The broadest definition of underachievement among the more able would refer to all those who, for whatever reasons, fail to develop their potentialities maximally. Only if it were possible to assess potential with sufficient accuracy to enable prediction of performance for all individuals would such a definition become operationally meaningful" (p. 2). Clearly, the accuracy of assessment and predictions has not reached that stage. Thus, Raph et al. (1976) suggested a much narrower definition of underachievement to include:

intellectual or academic ability on intelligence and aptitude tests but fail to develop their abilities . . . all those who rank in the upper third of the population in ability, but who do not graduate from high school, do not go on to college, or drop out of college before completing their studies, thus failing to acquire the academic preparation needed for the high level jobs they are potentially able to fill (p. 3).

Researchers and practitioners have used variations of this definition but almost all have focused on some

variant of the discrepancy between actual attainment and expected attainment. Tannenbaum (1983) observes that “studies of underachievement show variations not only in symptoms but in etiology as well” (p. 224).

Explanations of the nature and causes of underachievement vary considerably. They include what Raph et al. (1966) called “phenomenological factors related to the underachiever’s self-concept, self-ideal, motivation and adult models” (p. 181) as well as a variety of home and family factors such as parental pressures, expectations and attitudes as well as home climate and support (Butler-Por, 1987). Other researchers focus on school programs and classroom conditions as well as personality characteristics (Rimm, 1986; Supplee, 1990; Whitmore, 1980).

As the Year 2000 approaches, the seriousness of the phenomenon of underachievement and its effects on individuals and society are being recognized and better understood. Because the probable causes of underachievement are so diverse, the intervention strategies proposed for reversing it are diverse as well. Suggested strategies include: changing the classroom climate to affect “the teacher’s values, expectations, educational aims and her ability to establish accepting and supportive relationships between her and the children among the class members” (Butler-Por, p. 103); “systematic curriculum work in basic subjects” together with “stimulating curricula experiences” and curriculum enrichment (Butler-Por, pp. 108–109); focused counseling and guidance; and mentors and role models from the community and school.

Underrepresented Populations—Gifted Minority and Disadvantaged

Over the years, the under-representation of minority groups in programs for the gifted and in various fields of specialized talents has been a real concern for educators and society at large all over the world (see Chapter 39). The minority groups which have been of particular concern in the United States, include African Americans, Hispanic, Native Americans, Asian Americans and the disadvantaged—i.e., children who live in poverty. Some four decades ago, the Conservation of Human Resources Project observed:

Superior performance in any society is limited by the number of individuals with a high order of intelligence but in our society the number of such individuals could be substantially increased through improving the opportunities for members of the lower socioeconomic classes to become interested in and acquiring a good education (Bray, 1954, p. 51).

Research has not contradicted the belief that talent potential is actually equally distributed across lines of race, class and socioeconomic status.

As studies have shown, it is not simply a question of

becoming “interested and acquiring a good education” but rather one of removing a variety of barriers to identifying and nurturing disadvantaged and minority gifted. Passow (1986) identified these barriers as including, but not limited to the following:

- Attitudes and expectations of educators who often do not believe there is giftedness in culturally different populations.
- Over-reliance on intelligence tests as the prime criterion for identification.
- A rigid learning environment and an inflexible curriculum which fail to take into account the individual needs and learning styles of these populations.
- Failure to provide the necessary general education, basic skills foundation and learning-how-to-learn skills which are required for the further development of specialized talents.
- Failure of the schools to understand the significance of a mother tongue other than English, denigrating language habits and speech patterns and failing to provide bilingual education where needed.
- Failure to create a learning environment and a climate for learning in which attention is given to both the affective and cognitive elements or talent development.
- Failure to select, assign and provide appropriate inservice education to teachers, counselors, administrators and other educators who must create the conditions for learning and who, by serving as the gatekeepers for programs and services are critical in talent development.
- Failure to help culturally different students enhance their self-esteem and recognize that systematic and long-term discrimination contributes to lower self-perceptions (pp. 152–155).

In countries around the world, there have been numerous programs aimed at increasing the participation of minority and disadvantaged populations in talent identification and talent development programs. These are generally focused on the perceived barriers and are aimed at using more appropriate multiple techniques and procedures in the identification processes, designing curricula and instructional strategies accelerating and enriching educational opportunities for underrepresented groups, providing appropriate counseling and other affective supports, rendering guidance to families and building support, involving community personnel as a way of extending resources and enlarging learning opportunities, developing culturally pluralistic, multicultural programs, creating a “climate for excellence” in the school and community. Several countries have extended the school day and the school year in order to provide enrichment experiences.

In the United States, the Jacob K. Javits Gifted and Talented Students Education Grants Program provides financial support to help build a nationwide capability in meeting the special education needs of gifted and talented students in elementary and secondary schools. Since its passage in 1988, at least half of the appropri-

tions have gone to proposals designed to serve gifted and talented students who are economically disadvantaged.

An outstanding example of serving such populations is the Inanç High School in Istanbul. This school—for academically gifted students from all parts of Turkey—provides a free quality education for children between the ages of 11 and 18, who are economically disadvantaged.

Currently, there is a clear and widespread recognition that minorities and disadvantaged populations around the world represent the largest reservoir of undeveloped potential available and the identification and development of this talent potential has become especially apparent. The driving force behind the efforts to increase the representation of minorities and disadvantaged populations in the programs for the gifted is essentially one of achieving the twin goals of equity and excellence.

Parents and Families

The family and parents constitute a child's first school (see Chapter 38). Research has shown that parents and families play a particularly important role in the development of the gifted child—especially in the affective domain, in the nurturing of self-concepts, values, attitudes, motivation, interests and commitment. For example, Bloom's (1985) study of 120 "immensely talented" musicians, artists, athletes, mathematicians and scientists" found "strong evidence that no matter what the initial characteristics (or gifts) of the individuals, unless there is a long and intensive process of encouragement, nurturance, education and training, the individuals will not attain extreme levels of capability in these particular fields" (p. 3). Bloom found certain family values in all four talent groups studied: the value of achievement and the importance of doing one's best whatever the task was very important in the subject's homes. The parents' commitment to the productive use of time, the introduction of the child to the talent field, parental encouragement, the provision of resources and materials, the arrangement of learning opportunities were very significant in the child's ultimate achievement. As Bloom and his colleagues concluded:

The parents' interest and participation in the child's learning contributed significantly to his or her achievement in the field. We find it difficult to imagine how these children could have gotten good teachers, learned to practice regularly and thoroughly and developed a value of and a commitment to achievement in the talent field without a great deal of parental guidance and support. The role of the home in supporting the long process of talent development is only one piece of the picture, but it is a crucial one (p. 476).

Parenting of gifted children involves many of the same issues, problems and challenges which arise in the

parenting of any child—but much more. Fine (1977) has observed:

There is a need for parents to be very self aware regarding their personal investments in the child and also to maintain an accurate and balanced perception of the child as a growing person. Gifted and creative children need parents for emotional support and encouragement, for value and behavioral guidance and to set realistic goals; it is appropriate and important that parents of gifted and creative children in fact do fulfill a parenting "contract" with their children (p. 500).

Research has found that having a gifted child in the family affects relations among family members. Coleman (1985) has described the effects as follows:

The presence of a gifted child in a family can affect relationships among family members and their thoughts about their relationships. Changes are a product of the family rearranging itself to deal with a member who presents a behavioral pattern that departs from typical expectations. . . . Once a child is suspected of being different, parental concerns begin to surface. These concerns become enhanced and even exaggerated as the differences between the gifted and other children become clearer and the parents feel the need to respond in some special way. . . . The intrusion of official recognition by the school can create concerns for the family that were previously dormant or non-existent (p. 126).

Mentally and physically handicapped children have had strong advocacy for many years from their parents as well as from other concerned citizens. However, the gifted have a more recent and less effective advocacy. Parents and others who perceive the needs of gifted children have sometimes been hesitant to ask support for those who "have it all." Fortunately, parents have been aided by organizations such as the National Association for Gifted Children (NAGC) in the United States, the European Council for High Ability (ECHA), the World Council for Gifted and Talented Children (WCGT), parent organizations in several European countries and groups on the more local level—organizations who have developed programs of advocacy (see Chapter 52). NAGC, having a 40 year history, has developed a strong legislative branch and has obtained the attention and support of legislators. (This support led to the Jacob Javits Grant which currently funds the National Research Center at four state university sites.) Parents are encouraged to participate in these local, regional, national and international organizations. Thus, parental concerns can be addressed, their understanding increased and their voices strengthened.

As the Year 2000 approaches, there is increased recognition that the identification of talent and its nurture is not a task which can be accomplished by the school alone. Research and experience have made clear that parents and families are essential in

the identification and fostering of giftedness but, just as the school cannot fully develop potential without the nurturance that takes place in the home, parents cannot play out their roles fully without the nurturance that occurs in the school. The role of parents and families in talent development is being acknowledged and studied. Increasingly, meaningful two-way communication channels are being established to facilitate mutual support between home and school. Counseling and advising services are being provided—not just the schools providing services to the parents and family but mutual interaction as parents provide information about the child from which the school can benefit as well.

Needed Research and Related Topics

Finally, some state of the art consequences are formulated. The following topics seem to be of the utmost importance for research on giftedness and talent (for greater detail see Chapter 3):

(1) Increase in *basic research*: Cognitive science studies (see Chapter 8) are needed as a supplement to psychometric studies, e.g., for prediction of excellence (see Chapters 4 and 17). Also longitudinal studies of giftedness are indispensable to uncover causal explanations of intra- versus interindividual differences in changes over the time and of the interactions of developmental variables (Chapter 9). Increasingly interdisciplinary research projects including neuro-psychological and biological approaches (Chapter 7) or genetic studies (Chapter 6) as well as cross-national/cultural studies should continue to be intensified, especially to examine the generalizability or universal validity of many theories in the field. Quasi-experimental and qualitative studies are also increasing our understanding of causes and of developmental changes. Without such basic scientific findings, applied research will wither and the quality of gifted education will be affected in the near future.

(2) Deficiencies in *applied research*: Elaboration of multidimensional and multiple theory based identification strategies as well as process-diagnostic approaches to the diagnosis of giftedness are needed for practical tasks of gifted counseling and education (see Chapters 11–15 and 27). Further desired ends are the development of intervention programs—and prevention measures—for balancing gender-specific differences in cognitive abilities and performances, especially in the fields of mathematics, “hard” sciences and technology, and new conceptions and methods of evaluating school and extracurricular programs.

There is a continuing evolution in the creativity programs from emphasis primarily on divergent thinking in the 1950s and 1960s to models including a wide range of dynamic and expanding conceptions including critical thinking and varied abilities. Most creativity programs are still based on the older, limited models. Hence existing programs and curricular

materials should be rethought in light of new concepts, such as Simonton’s Chance Configuration Theory (1988), or Sternberg’s Investment Theory (Sternberg & Lubart, 1991). It seems especially important to revise one-sided training programs based on promotion of divergent thought processes but neglecting mediation of knowledge (Weisberg, 1992). Investigations of the expertise–novice paradigm could provide useful information to domain-specific and (domain-independent) concepts of creativity (see Chapter 16). Additionally, the life-span approach to exceptionality and the study on late-life potential (cf. Simonton, 1993) should be included in the study of creativity.

Last but not least, more interest needs to be dedicated to the evaluation of new educational gifted programs and of counseling or support measures. In connection with evaluation, problems arise concerning the qualification of teachers, counselors and other gifted education related personnel (Chapter 35).

Real progress in knowledge, which provides a theoretical basis to practice, can be expected only in the long run. Thus, applied research can often serve only to optimize pragmatic procedures. More important is the demand for careful evaluation of concrete identification and effective gifted methods and curriculum. These measures, of course, always depend on value decisions and aims. These values should be explicitly taken into account in corresponding evaluation models. Well planned evaluation can have the positive side-effect of bridging the often criticized gap between scientific research and educational practice (for greater details see Chapter 34). Progress in knowledge from giftedness research is closely connected with material and personnel resources. Internationally these are quite differently distributed (see Chapters 44–51). In the U.S.A. and a few other countries, there are basic training programs for future expert personnel in the field of gifted education. In Europe and in many other countries around the world, inservice training programs dominate, e.g., for teachers and/or counselors. As far as we know, special gifted qualification programs for scientific research personnel are still missing. Hence post-graduate (doctorate) programs are necessary for recruiting the ablest junior scientists into the field of giftedness research. Unquestionably, the scientific and practical outcome of giftedness research is highly dependent on the level of qualification of the scientists working in this area.

On the other hand, “efforts to increase connections between studies of giftedness and mainstream psychological and educational research” (Jackson, 1993, p. 46) are necessary, because most mainstream researchers ignore or pay little attention to gifted journals. “However, studies of giftedness have contributed to mainstream theory and may play some special roles in theory development. Strategies for overcoming barriers to further integration with mainstream research are proposed” by Jackson (1993, pp. 46–50).

Conclusion

As the Year 2000 approaches, there are important advances to anticipate challenging tasks in Gifted Education. Most significant are the increasing tendencies toward interdisciplinary communication in research and practice, cross-cultural research and sharing of conceptions and practices and the continued tendency to perceive giftedness from a developmental perspective. There is evidence of evolving interdependence of research and practice, and we continue to press for greater understanding and awareness of giftedness by highly trained researchers.

The emergence of interdisciplinary approaches to the study of giftedness and related fields is a strong and promising trend. In reflection of a new world order there is increasing cross-cultural research and shared understanding. Internationally there is an increasing awareness of the special needs of gifted students and broader understanding of identification methods. Thus, this handbook may enhance the exchange of information and experience of researchers and practitioners both in the gifted field and in the overall educational field. With encouraged and enlightened teachers, administrators, counselors and parents, gifted young people will more probably be enabled to develop fully their potential and their own contributions to the world.

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Notes on Contributors

Eunice Soriano de Alencar, Ph.D., is Professor of Psychology at the University of Brasilia, Brazil. Over the past 20 years she has carried out research projects and published several books and many articles, especially on giftedness and creativity. She is the President of the Brazilian Association for the Gifted, at the Federal District, and is on the editorial board of several journals in Brazil and abroad. *Address:* Professor Eunice Soriano de Alencar, Universidade de Brasilia, Instituto de Psicologia, Brasilia, DF 70910, Brazil.

Donald C. Ambrose is an educator, administrator, and consultant from Western Canada. He holds a Ph.D. in talented and gifted education, and a Master of Science in educational administration from the University of Oregon; and two Bachelors Degrees from the University of Saskatchewan, Canada. He is currently a member of the Pacific University Faculty in Eugene, Oregon, U.S.A. *Address:* Dr Don Ambrose, College of Arts and Science, Pacific University, 1910 West 22nd Ave, Eugene, OR 97405-1509, U.S.A.

Ornella Dentici Andreani, Ph.D., is a Professor of Psychology and Director of the Institute of Psychology at Pavia University (Italy), Faculty of Arts. In the first phases of her career she worked in educational psychology and vocational counseling. She has done research on identification and nurturing the gifted and on the problems of cultural disadvantage. Then she moved into experimental research on memory and intelligence: growth and decline in the life span; individual differences; imagery and memory. Presently she is directing a large project on the development of intellectual potential and talents. She is author of more than 150 papers and some books (*Le radici psicologiche del talento*, Il Mulino, Bologna, 1972; *Classe sociale, intelligenze e personalità*, Il Mulino, Bologna, 1974; *L'intelligenza: problemi e vie di ricerca*, F. Angeli, Milano, 1980; *Il pensiero in erba*, F. Angeli, Milano, 1991; *La scuola di Ginevra dopo Piaget*, Cortina, Milano, 1992). *Address:* Professor Ornella Dentici Andreani, Istituto di Psicologia dell'Università, p.zza Botta, 6 Palazzo S. Felice, 27100 Pavia, Italy.

Karen D. Arnold, Ph.D., is Assistant Professor of Higher Education, Boston College. She directs the Illinois Valedictorian Project, a fifteen year longitudinal study of high school valedictorians. Her research areas include the higher education of women, the development of academic talent, and the social context of achievement. She is an advisory board member of the *Roepers Review* and co-editor, with Rena Subotnik, of *Beyond Terman: Longitudinal studies in contemporary gifted education* (Ablex, 1993). *Address:* Dr Karen D. Arnold, Boston College, Department of Curriculum, Administration, and Special Education, 207-D Campion Hall, Chestnut Hill, MA 02167, U.S.A.

Alexinia Young Baldwin, Ph.D., is Professor and Head of the Department of Curriculum and Instruction at the University of Connecticut, Storrs, Connecticut, U.S.A. Her work and research in the area of education of the gifted includes the development of the Baldwin Identification Matrix and articles

and research related to program development for gifted children. She has focused much of her work on the minority gifted child. *Address:* Professor Alexinia Young Baldwin, University of Connecticut, Curriculum and Instruction, U-33, 249 Glenbrook Road, Storrs, CT 06269-2033, U.S.A.

Paul T. Barrett, Ph.D., born in 1952 in London, studied at the University of Exeter, U.K. He obtained his degree in Psychometrics in 1981, also at Exeter. He was a research fellow with Prof. P. Kline at Exeter during 1991/1992 and is currently working with Prof. H. J. Eysenck. His special interests include psychometrics, computing, and neuropsychology. *Address:* Professor Paul Barrett, University of London, Institute of Psychiatry, DeCrespigny Park, Denmark Hill, London, SE5 8AF, U.K.

Camilla Persson Benbow, Ph.D., is Professor and Chair of Psychology at Iowa State University, where she co-directs the Study of Mathematically Precocious Youth (SMPY), the Office of Precollegiate Programs for Talented and Gifted (OPPTAG), and a post-doctoral training program in intellectual giftedness. She focuses her research efforts on conducting a 50-year longitudinal study of intellectually talented students, which began in 1972 and now involves over 5000 individuals (as described in this book). She believes strongly that knowledge gained through research should be put back into practice to benefit gifted students and, therefore, conducts research-based summer programs, involving over 400 students per year. The Iowa Talent Search, conducted by OPPTAG, serves over 5000 students annually. Benbow was the first recipient of NAGC's Early Scholar Award in 1985 and in 1992 the recipient of its Distinguished Scholar Award. In May 1991, she was inducted into Johns Hopkins University's Society of Scholars. *Address:* Professor Camilla P. Benbow, Department of Psychology, Iowa State University, Ames, Iowa, 50011-3180, U.S.A.

Sheyla Blumen is a lecturer of Educational Psychology at the Catholic University of Lima, Peru, where she also serves as research assistant of the Interdisciplinary Program of Educational Research. She is the Peruvian delegate to WCGT and Speaker of the Iberoamerican Federation of the WCGT. She is currently participating in the Diagnosis for Improving the Quality of Education in Peru, sponsored by the World Bank and GTZ. Her research interests in gifted education include developmental and multicultural issues in the psychology and education of the gifted children and adolescents. Also, she is a contributor to the *Journal of Psychology*, PUCP, Lima-Peru, and to "Crianza" (Parenting), Lima-Peru. *Address:* Ms Sheyla Blumen, Lic. Psyc., Pontificia Universidad Catolica del Peru, Especialidad Psicologia, Apartado 1761, Lima, Peru.

Eddie J. Braggett received a B.A., Dipl.Ed., M.A., M.Ed., Ph.D., and is Foundation Professor of Education at Charles Sturt University, Riverina, NSW, Australia. He was a postgraduate student at the University of Copenhagen, Denmark, and a postdoctoral fellow at Ypsilanti, Michigan, U.S.A. He has held teaching posts in schools, colleges and universities in Australia and the U.S.A. As a teacher, researcher and writer, he has sought to explore the nature of giftedness and to promote flexible curriculum and administrative practices. He was a consultant to the Australian Commonwealth Schools Commission on the education of gifted children and has travelled widely within Australia and New Zealand while studying provisions for gifted students. Of his numerous publications, five are books on the education of gifted and talented children. He helped establish, and was a council member of the Australian Association for the Education of the Gifted and Talented and has been an Australian delegate to the World Council for Gifted and Talented Children. *Address:* Professor Eddie J. Braggett, Charles Sturt University, Department of Education, P.O. Box 588, Wagga Wagga, New South Wales 2650, Australia.

Colleen S. Browder, Dipl. Psych., is a psychological/educational specialist at a special education institution for children with conduct disorders and developmental delays in Lohhof near Munich,

Germany. She was a Lecturer at the University of Maryland, Overseas Division, and worked for a number of years at the University of Munich doing research on giftedness with Professor K. A. Heller. Her research and publications deal with giftedness, the development of metacognition and cognitive abilities, especially in young children. In addition, she is involved in management development studies, particularly intercultural relations. Born and raised in the United States, she completed her undergraduate work in Portland, Oregon, and her graduate work at the University of Munich. *Address:* Ms Colleen S. Browder, Dipl.-Psych., Heilpädagogisches Zentrum Lohhof, Feldstr. 27, Postfach 1227, 85702 Lohhof, Germany.

Nava Butler-Por, Ph.D., has been involved in gifted education for many years. Formerly at Goldsmith College and now as Director of the Centre for Evaluation and Management in Education at the University of Haifa; she has been concerned with innovations in schools and teacher education. For the last two decades she has been active in the World Council for the Gifted and Talented, and recently in the European Council for High Ability. Butler-Por is the author of *Underachievers in School* (published by John Wiley) and numerous publications in gifted education. She lectures internationally on underachievement and cross-cultural aspects of giftedness. *Address:* Dr Nava Butler-Por, Director of the Centre for Education, Management and Evaluation, School of Education, University of Haifa, Haifa 31905, Israel.

Carolyn M. Callahan, Ph.D., is Professor of Educational Studies at the University of Virginia and Associate Director of the National Research Center on the Gifted and Talented. She has authored more than 50 articles, 10 book chapters and several monographs. She was selected as Outstanding Faculty Member in Virginia and received the Distinguished Scholar Award from the National Association for Gifted Children (NAGC). She is an ex-President of the Association for the Gifted, 2nd Vice-President and member of the Executive Board of NAGC. *Address:* Professor Carolyn M. Callahan, University of Virginia, National Research Center on the Gifted and Talented, Curry School of Education, 405 Emmet Street, Charlottesville, VA 22903, U.S.A.

Seokee Cho, Ph.D., is Director of the Division of Gifted Education and Research at the Korean Educational Development Institute (KEDI) in Seoul, Korea. She is one of the acting directors of the Third Asian Conference on Giftedness in Seoul, 1994. She is also a Consulting Professor for the Gifted Education Program at the CBS Cultural Center in Korea. She is currently the Auditor and Executive Member of the Korean Association for the Gifted. She developed various enrichment programs for the scientifically and academically gifted children. She received her Ph.D. in educational psychology from the University of Alberta, Canada, in 1986. *Address:* Dr Seokee Cho, Director, Division of Gifted Education and Research, Korean Educational Development Institute (KEDI), 92-6, Umyeon-Dong, Seocho-Gu, Seoul, Korea.

LeoNora M. Cohen, Ph.D., has worked in gifted education since 1967 as a teacher, as Coordinator of Philadelphia's Mentally Gifted Program, and as a university professor. Her award-winning dissertation (1984, Temple University), focused on theory for the field. Her commitment to theory development led her to initiate the Conceptual Foundations of NAGC and the Institute for Creative Intelligence. She was Associate Professor at the University of Oregon's C-TAG Institute where she received the Ersted Award for distinguished teaching. She is currently Senior Lecturer and Program Coordinator for the Children with Highly Intellectual Potential (CHIP) Unit, University of Melbourne in Australia. She has two gifted children. *Address:* Dr LeoNora M. Cohen, Senior Lecturer and Program Coordinator, C.H.I.P. Unit, Old Pathology, Department of Educational Psychology and Special Education, University of Melbourne, Parkville, VIC 3052, Australia.

James A. Cross, Jr., Ph.D., is Program Associate at the Center for Creative Learning. The author has worked at all educational levels, and has written numerous publications on creativity and giftedness. *Address:* Dr James A. Cross, Jr, Center for Creative Learning, Inc., 4152 Independence Ct., Suite C-7, Sarasota, FL 34234, U.S.A.

William G. Durden received his Ph.D. in German Language and Literature from The Johns Hopkins University and is Director of the Center for Talented Youth (CTY) and Adjunct Assistant Professor of German at The Johns Hopkins University. He has taught students from kindergarten through graduate school and is the author of numerous articles and book reviews on European literature and language, the education of the gifted, and educational theory. He also chairs the Advisory Committee on Exceptional Children and Youth, Office of Overseas Schools, U.S. Department of State. *Address:* Dr William G. Durden, Director, Center for Talented Youth (CTY), The Johns Hopkins University, 3400 N. Charles Street, Baltimore, MD 21218, U.S.A.

Hans-Jürgen Eysenck was born in Berlin, studied in France, and obtained his Ph.D. and D.Sc. degrees from the University of London, in 1955. He became Professor of Psychology at the Institute of Psychiatry, University of London in 1955, and retired in 1985. He has published some 1000 research articles and some 70 books on personality, intelligence, behavioral genetics, behavior therapy, and social attitudes. *Address:* Professor Emeritus Hans J. Eysenck, University of London, Institute of Psychiatry, DeCrespigny Park, Denmark Hill, London, SE5 8AF, U.K.

John F. Feldhusen, Ph.D., is the Robert B. Kane Distinguished Professor of Education at Purdue University, West Lafayette, Indiana, U.S.A. He is also Director of the Purdue Gifted Education Resource Institute. He has published widely in the field of gifted education, especially in the area of identification and selection practices. He is the chief Editor of *Excellence in educating the gifted* and a contributor to *Comprehensive curriculum for gifted learners*, edited by Joyce VanTassel-Baska. *Address:* Professor John Feldhusen, Purdue University, Gifted Education Resource Institute, South Campus Courts, Building G, West Lafayette, Indiana 47907-1446, U.S.A.

David Henry Feldman, Ph.D., is Professor of Developmental Psychology and Director of the Developmental Science Group in the Eliot-Pearson Department of Child Study at Tufts University. He has served on the faculties of Yale University, the University of Minnesota, and (as a Fulbright Scholar) of Tel Aviv University. Author of more than 100 publications, Feldman was named Distinguished Scholar of the Year 1988 by the National Association for Gifted Children. *Address:* Professor David Henry Feldman, Eliot-Pearson Department of Child Study, Tufts University, Medford, MA 02155, U.S.A.

Chengde Feng is Associate Professor and a faculty member of the Oklahoma School for Mathematics and Science, Oklahoma City, U.S.A. He was Director of Study of Mathematically Precocious Youth, Ttianjin, P.R. China; the Senior Coach of the China Mathematics Association Olympiad Committee; and a Visiting Scholar at the Study of Mathematically Precocious Youth (SMPY), Johns Hopkins University until 1991. He is now a mathematics instructor at Oklahoma School of Science and Mathematics, Oklahoma City, U.S.A. His research is on identifying and nurturing mathematically precocious youth, and on secondary mathematics education. He has been actively involved in organizing special, supplementary, accelerative mathematics courses for mathematically talented students, and in preparing them for a wide variety of mathematics competitions, including the International Mathematical Olympiad (IMO), since 1978. *Address:* Professor Chengde Feng, Oklahoma School of Science and Mathematics, Department of Mathematics, 1141 North Lincoln Boulevard, Oklahoma City, OK 73104, U.S.A.

Mary M. Frasier, Ph.D., is Professor of Educational Psychology at the University of Georgia in Athens, Georgia. She is the Director of the Torrance Center for Creative Studies at the University and Associate Director of the National Research Center on Gifted and Talented and Principal Investigator for the University of Georgia's research for the National Center. Frasier is an ex-President of the National Association for Gifted Children. *Address*: Professor Mary Frasier, Department of Psychology, University of Georgia, 323 Alderholt Hall, Athens, GA 30602, U.S.A.

Joan Freeman, Ph.D., teaches at the Institute of Education at London University. She is author of many books and scientific papers on the development of high-level abilities. Outstanding in her research is a long-term comparison study of gifted and nongifted children. She has been honored with a Fellowship of the British Psychological Society, and is Founder President of the European Council for High Ability. *Address*: Professor Joan Freeman, University of London, Institute of Education, 21 Montagu Square, London W1H 1RE, U.K.

François Gagné, Ph.D., is a Professor of Educational Psychology at l'Université du Québec à Montréal. For the last 12 years he has made giftedness his major research area. His interests include theoretical models, multiple talents, identification, and accelerative enrichment. He has written a book (in French) reviewing the literature on acceleration, as well as numerous articles in both French and English. *Address*: Professor François Gagné, Université du Québec à Montréal, Department of Psychology, P.O. Box 8888, Station A, Montreal, QC, H3C 3P8, Canada.

James J. Gallagher, Ph.D., is a Kenan Professor of Education at the University of North Carolina at Chapel Hill. He has been active in the field of education of gifted students for over thirty years. He has served as President of the Association for the Gifted (TAG) and the World Council for Gifted and Talented and is currently First Vice-President of the National Association for Gifted Children. He is the editor of the *Journal for the Education of the Gifted*, his general textbook *Teaching the Gifted Child* is currently going into its fourth edition and will be coauthored by his daughter, Shelagh Gallagher. *Address*: Professor James Gallagher, The University of North Carolina at Chapel Hill, 137 E. Franklin St—Suite 300, Nations Bank Plaza, Chapel Hill, NC 27514, U.S.A.

Howard Gardner, Ph.D., is Professor of Education and Codirector of Project Zero at the Harvard Graduate School of Education. He is also a consulting psychologist at the Boston Veterans Administration Medical Center and adjunct Professor of Neurology at the Boston University School of Medicine. His research focuses on human cognitive capacities, particularly those central to the arts, in normal children, gifted children, and brain damaged adults. He is the author of numerous articles in professional journals and wide-circulation periodicals. Among his dozen books are *Frames of mind*, *The mind's new science*, *Multiple intelligences: The theory in practice*, and *Creative minds*. In 1981 he was awarded the MacArthur Prize Fellowship and in 1990 he became the first American to win the University of Louisville Grawemeyer Award in Education. *Address*: Professor Howard Gardner, Harvard University, Graduate School of Education, Harvard Project Zero, 323 Longfellow Hall, Appian Way, Cambridge, MA 02138, U.S.A.

David R. George, Ph.D., was until recently Associate Director of Nene College. He has now taken early retirement to pursue his many interests, especially that of working with gifted and talented children. He is President of the National Association for Curriculum Enrichment and a member of the executive committee of the World Council for Gifted and Talented Children. He has lectured widely both nationally and internationally on these subjects and is author of the book entitled *The challenge of the able child*. Prior to this he spent many years teaching and still claims that first and foremost he is a teacher. This devotion to teaching, together with his enthusiasm and expertise, is reflected in all his courses. *Address*: Dr David George, Willowmede, Black Lane, Holcot, Northampton NN6 9SL, U.K.

Léonard J. Goguen, Ph.D., is Professor and current Chair of the Department of Educational Psychology at the Université de Moncton in New Brunswick, Canada. He is a researcher on the educational rights of exceptional children as well as teaching and parenting children and youth qualified as behavior problems or gifted. He is coeditor of *Special education across Canada*, and coauthor of *Educational rights of exceptional children in Canada*. Address: Professor Léonard J. Goguen, Department of Educational Psychology, Faculté des Sciences de l'Éducation, Université de Moncton, Moncton, N.B., E1A 3E9, Canada.

Ban Eng Goh is Program Deputy Director of the Gifted Education Unit in the Ministry of Education, Singapore. She is currently working on her Ph.D. in educational psychology at Purdue University. Her research interests are in cross cultural studies on personality and gender differences in gifted and nongifted children; family influences on cognitive functioning, creativity, and affective and emotional needs of the gifted. Address: Ms Ban Eng Goh, Program Deputy Director, Gifted Education Unit, Ministry of Education, Environment Building, 40 Scotts Road, Singapore 0922, Republic of Singapore.

David Goldstein is Executive Director of the Duke University Talent Identification Program (TIP) and Research Professor of Psychology at Duke University, Durham, North Carolina. He obtained his Ph.D. in Psychology from Syracuse University in 1974 and subsequently served as an Associate Professor of Psychology at Temple University (Philadelphia, PA) and a Visiting Professor of Psychology at the University of California, Berkeley. Goldstein's research interests and publications have focused on individual differences in cognitive development, with a special emphasis on the learning disabled as well as the academically talented. He is currently the President of the American Association for Gifted Children (AAGC) as well as the Editor of the *AAGC Newsletter*. Address: Professor David Goldstein, Talent Identification Program, Duke University, 1121 W. Main St., Suite 100, Durham, NC 27701, U.S.A.

Miraca U. M. Gross coordinates undergraduate and postgraduate programs in gifted education at the University of New South Wales in Sydney, Australia. She holds M.S.E. and Ph.D. degrees in gifted education from Purdue University, U.S.A. She has 22 years experience as a teacher and school administrator, including 12 years as a specialist teacher of the gifted. In 1987 her longitudinal research on Australian children of IQ 160+ won the Hollingworth Award, and in 1988 and 1990 she was awarded Mensa International Education and Research Foundation Awards for her research on the psychosocial development of intellectually gifted children. Her book *Exceptionally gifted children* was published by Routledge in 1993. Address: Dr Miraca U. M. Gross, Senior Lecturer in Gifted Education, University of New South Wales, P.O. Box 1, Kensington, New South Wales 2033, Australia.

Ernst A. Hany is Assistant Professor at the Institute of Educational Psychology at the University of Munich, Germany. He received his degree in psychology in 1984 and his Ph.D. in 1987, under the supervision of Professor Kurt A. Heller (with a thesis on identification of gifted children), both at the University of Munich. Together with Kurt Heller, he is involved in many large-scale research projects on giftedness and creativity, and together they organized the Third ECHA Conference in Munich (October, 1992). His scientific interests and publications cover cognitive processes of thinking and learning, expert system technology in identification of the gifted, evaluation of programs for the gifted, and leisure experiences as a background to creative thought. He is currently completing his post-doctoral (Habilitation) thesis on diagnostic reasoning in complex systems. Address: Dr Ernst A. Hany, University of Munich, Institute of Educational Psychology, Leopoldstr. 13, 80802 München, Germany.

Kurt A. Heller is Professor of Psychology and Director of the Institute of Educational Psychology at the University of Munich. He received degrees in education, special education, and psychology, and

his Ph.D. at the University of Heidelberg. After teaching posts in high and special educational schools (for the deaf and speech disordered) and a post as Professor in Psychology for Special Education at the Teachers College/University of Heidelberg, he became a Professor of Psychology at the Universities in Bonn (1971–1975) and Cologne (1976–1981) before he was called to the University of Munich. Heller is a Fellow of the IAAP, ISSBD, Humboldt Society, and German Society of Psychology (GSP), and coeditor of the GSP-journal *Psychology in Education and Instruction* and the monograph series *Educational Psychology*. He has published over 200 books, psychological tests, chapters, and articles in the field of psychology and (special) education. In the last decade his major research area was high ability. For that he has received over 4 million marks in foundation and government grants. He initiated and conducted the Munich Longitudinal Study of Giftedness and other projects, e.g., on metacognition, technical creativity including cross-cultural perspectives, or gifted counseling. Currently he is involved in several evaluation studies related to state-wide enrichment and acceleration programs, and some international cooperative studies (with China, Korea and Russia). *Address*: Professor Kurt Heller, University of Munich, Department of Psychology, Leopoldstr. 13, 80802 München, Germany.

Fathi A. Jarwan is employed in the Queen Noor Foundation in Amman, Jordan, where he is working with the team developing the Jubilee School for the Gifted. Jarwan directed a study of identification–selection practices in residential schools for able youth in the United States. He received his Ph.D. from Purdue University with Professor John Feldhusen as his advisor. *Address*: Dr Fathi A. Jarwan, Noor Alhussein Foundation, P.O. Box 926687, Amman, Jordan.

Eric D. Jones, Ed.D., is Associate Professor and Coordinator of Graduate Programs in Special Education Programs at Bowling Green State University. He teaches courses in behavior analysis and curriculum development. He has written several chapters and articles and presented many papers on curriculum design, behavioral assessment and program evaluation and the acceleration of gifted students. *Address*: Professor Eric D. Jones, Bowling Green State University, Department of Special Education, Bowling Green, OH 43403, U.S.A.

Lannie S. Kanevsky received her B.A. in Psychology and Kinesiology from the University of British Columbia, her M.A. in Special Education, and her M.Phil. and Ph.D. from Columbia University, Teachers College, in 1988 under the supervision of Professor Abraham J. Tannenbaum. She also taught elementary school and in gifted programs, and coordinated such programs in Vancouver, San Diego, and New York. From 1988–1991 she was on the Faculty at McGill University, and she is now Assistant Professor of Education at Simon Fraser University in Burnaby, British Columbia. Her applied interests include assisting teachers with gifted children in regular classrooms and the development of metacognitive awareness and skills in all students. Her research addresses the dynamic assessment of differences in learning ability and the flexible use of knowledge. Illustrative publications include “Pursuing Qualitative Differences in the Flexible Use of a Problem-Solving Strategy by Young Children” (*Journal for the Education of the Gifted*, 13, 1990, pp. 115–140) and “The Learning Game” in A. J. Tannenbaum and P. Klein’s *To be young and gifted* (Ablex, 1993). *Address*: Dr Lannie Kanevsky, Simon Fraser University, Faculty of Education, Burnaby, British Columbia, V5A 1S6, Canada.

Gerhard Lehwald, Ph.D., studied education at Berlin’s Humboldt University and afterwards worked as a teacher. From 1968 to 1973 he studied psychology at the University of Leipzig, receiving his Ph.D. in 1977 with a dissertation on diagnostic aspects of a differential learning psychology. He obtained the Habilitation in 1983. He is now Professor of Psychology in Leipzig, where he directs many projects concerned with cognitive and motivational development of gifted individuals; curiosity and exploratory activity; learning in different environments. *Address*: Professor Gerhard Lehwald, Institute for the Study of Human Environment, Bernhardt-Göring Str. 152, O4277 Leipzig, Germany.

David Lubinski is Assistant Professor of Psychology at Iowa State University, where he codirects the Study of Mathematically Precocious Youth (SMPY). He received his B.A. and Ph.D. degrees in psychology from the University of Minnesota and, subsequently, completed a two-year postdoctoral training program in quantitative methods in the department of psychology at the University of Illinois. Lubinski's research interests involve assessing individual differences in human behavior, broadly defined; and he is especially interested in identifying different kinds of intellectual giftedness in young adults (e.g., the mathematical, spatial, and verbal talented) and finding optimal ways to enhance their educational and vocational development. He has received two MENSA awards for research excellence. *Address:* Dr David Lubinski, Iowa State University, Department of Psychology, Ames, IA 50011-3180, U.S.A.

Judy L. Lupart, Ph.D., holds a joint appointment as Associate Professor of Educational Psychology and Director of the Centre for Gifted Education at The University of Calgary. Long-term teaching and research interests include special education, assessment and cognition and learning in general, and giftedness and learning disability in particular. Current research focus is on the identification and assessment of "at risk" gifted learners. *Address:* Professor Judy Lupart, The University of Calgary, Center of the Gifted Education, 2500 University of Calgary, Calgary, Alberta, T2N 1N4, Canada.

Norah Maier, Ph.D., B.A., M.A., is Director of Academic Development, Faculty of Education, and Member of the Academic Board at the University of Toronto. She combines field-based experience with theoretic investigations into teacher education in the field of the development of human talent. Among her publications as author and editor she produced *Teaching the gifted: Challenging the average*, 1980. A pioneer in the teaching of thinking she is noted internationally for creative thinking seminars to educational institutions, corporations, government agencies. Founding member and President (1989–1993) of the World Council for Gifted and Talented Children (WCGT). Director of the 10th World Conference of the WCGT in Toronto, August 1993. *Address:* Dr Norah Maier, President of WCGT, University of Toronto, Faculty of Education, 371 Bloor Street West, Toronto, Ontario M5S 2R7, Canada.

Netta Maoz is the Deputy Director of the Youth Activities Section of the Weizmann Institute of Science in Israel. She is active in many extracurricular science education programs for gifted children and science enthusiast—at the Institute and elsewhere—in which all the teachers are active scientists. She gained her Ph.D. in Organic Chemistry at the Technion in Haifa and worked in chemistry research at the Weizmann Institute for Science for several years before joining the Youth Activities Section. *Address:* Dr Netta Maoz, Deputy Director, Youth Activities Section at the Weizmann Institute for Science, Rehovot 76100, Israel.

Gail Martino is a graduate student in the Department of Psychology at Boston College, U.S.A. *Address:* Ms Gail Martino, Boston College, Department of Psychology, Chestnut Hill, MA 02167, U.S.A.

Yuri P. Masharov, Ph.D., is Head of the Department for Design of Infrastructure for Intellectual Activities at the Siberian Branch of the Russian Open University, Novosibirsk, Russia. He graduated from Novosibirsk University in 1992, and received his Ph.D. in artificial intelligence and pattern recognition from the Institute of Mathematics of the Siberian Division of the Russian Academy of Sciences. He came through the Novosibirsk system for selecting and training of gifted children and is an expert in the area of development and managing of human resources. He works with gifted persons in Russia and is author and head of the large-scale project aimed at the socialization of Russian talents. He authored a series of papers and articles on the role of talents in the development of various regions and human civilization as a whole. Masharov is a member of the World Council for Working with

Gifted, and President of joint stock company “Experimental social–scientific complex”. Address: Dr Yuri P. Masharov, Creative Union “Luchik”, PO Box 91, 630090 Novosibirsk, Russia

Emanuel J. Mason received his B.S. in 1965 (Psychology) at the City College of New York, M.Ed. in 1969 (School Psychology, Educational Research), and his Ed.D. in 1972 at the Temple University, Philadelphia, U.S.A. Mason was School Psychologist and Chairman of the Child Study Team, Edgewater Township Public Schools, Edgewater Park, NJ, from 1969 to 1972. In 1972 he became an Assistant, then an Associate and finally became Full Professor, and in 1989 Chairperson at the University of Kentucky, Department of Educational and Counseling Psychology, Lexington, U.S.A. He coauthored three books on educational research, one book on computers in schools, seven coedited conference proceedings and monographs, and over 100 other scholarly works including refereed journal articles, book chapters, research reports, papers presented at professional meetings, book reviews and nonrefereed articles, workshops, etc. Most writings deal with educational and behavioral research methods, psychology applied in school settings, and cognitive approaches to gifted identification and development. Address: Professor Emanuel J. Mason, University of Kentucky, College of Education, Educational Psychology, 245 Dickey Hall, Lexington, KY 40506-0017, U.S.A.

Franz J. Mönks received the Ph.D. degree from the University of Bonn, Germany, in 1966. Professor Mönks joined the Department of Developmental Psychology at the University of Nijmegen, The Netherlands, in 1967. In 1988 he was awarded a professorship on a newly established chair at the University of Nijmegen *The development of the gifted child*, and also became director of the newly founded Center for the Study of Giftedness (CSG) at the same University. He has published and edited many books and numerous articles in professional journals (Dutch, English, and German) on developmental psychology and gifted education. In 1963 he wrote a review article entitled “Contributions to the study of giftedness in childhood and adolescence” published in *Archiv für die gesamte Psychologie* **115**, 362-382. Since the early 1980s he has focused his research and teaching more and more on the development and education of the gifted individual. In October 1992 Mönks was elected President of the European Council for High Ability (ECHA). Address: Professor Franz J. Mönks, Center for the Study of Giftedness, University of Nijmegen, PO Box 9104, 6500 Nijmegen, The Netherlands.

Martha J. Morelock, M.A., is a doctoral candidate working with the Developmental Science Group in the Eliot-Pearson Department of Child Study, Tufts University. She serves on the Advisory Board for the Hollingworth Center for Highly Gifted Children and is a Contributing Editor for the *Roepers Review*. Her publications have focused on extreme giftedness and the phenomenological realities of gifted individuals. Address: Martha J. Morelock, Eliot-Pearson Department of Child Study, Tufts University, Medford, MA 02155, U.S.A.

Adriano Pagnin graduated with a Philosophy Ph.D. In 1972 he became Assistant and 1983 Associate Professor of Developmental Psychology at the University of Pavia, Italy. He also teaches social psychology and developmental psychology in postgraduate schools of psychology and in neuropsychiatry. He has published more than 50 articles and some books, mainly in the areas of adolescent psychology, attitude formation, and creativity (see Vol. *Il pensiero creativo*, La Nuova Italia, Firenze 1974; *Il giudizio morale nell'adolescenza*, F. Angeli, Milano, 1983). Now he is working in the areas of moral and logical thinking in adolescence, attitude change, and moral development in the gifted with Ornella Andreani. He has published articles and chapters in international journals and books on this topic. Another topic of research is social representation of war (about which he has just edited a volume, *Pensare la pace*, F. Angeli, Milano, 1992). Address: Professor Adriano Pagnin, Istituto di Psicologia dell'Università, p.zza Botta, 6 - Palazzo S. Felice, 27100 Pavia, Italy.

A. Harry Passow, Ph.D., is the Jacob H. Schiff Professor Emeritus of Education at Teachers College, Columbia University. He began and directed the Talented Youth Project at Teachers College from 1954–1966. He has done considerable research on the gifted and written numerous books and articles including: *The gifted and the talented: Their education and development* and *Gifted young in science: Promise to potential* (with P. F. Brandwein). Passow is an exPresident of the World Council for Gifted and Talented Children, (1987–1992). He has lectured, consulted and worked on developing giftedness and talent worldwide. *Address*: Professor A. Harry Passow, Teachers College, Columbia University, New York, NY 10027, U.S.A.

Christoph Perleth received his degree in school psychology in 1985 and his Ph.D. in 1992, under the supervision of Professor Kurt A. Heller (with a thesis on metamemory) at the same University. He teaches and researches as an Assistant Professor at the University of Munich. He has been engaged with Kurt Heller in the Munich Longitudinal Study of Giftedness. Besides giftedness research, his major fields of interests are development of and interrelations between cognitive abilities, cognitive strategies, knowledge, metacognition, motivation, and achievement in children of all ability levels, but also psychological diagnostics and research methods. His activities in these fields are documented in a number of publications. *Address*: Dr Christoph Perleth, University of Munich, Institute of Educational Psychology, Leopoldstr. 13, 80802 München, Germany.

Robert Plomin is Distinguished Professor and Director of the Center for Developmental and Health Genetics in the College of Health and Human Development at Pennsylvania State University. After receiving his Ph.D. in psychology from the University of Texas, Austin, in 1974, he moved to the University of Colorado and, in 1986, to Pennsylvania State University. His research interests have focused on the application of genetic research strategies to the investigation of behavioral development. He is exPresident of the International Behavior Genetics Association and American Psychological Association Distinguished Scientist Lecturer for 1993. *Address*: Professor Robert Plomin, Center for Developmental and Health Genetics, S-211 Henderson Building, College of Health and Human Development, Pennsylvania State University, University Park, PA 16802, U.S.A.

Tania M. Prado, Dipl. Psych., is research assistant and lecturer at the University of Hamburg, Department of Developmental and Educational Psychology. Her research interests include diagnosis of high ability, in particular cognitive abilities, and development and evaluation of counseling strategies for the gifted. Results of her work are documented in a number of publications. In addition she is a board member of the Counseling Centre for the Gifted at the University of Hamburg, which is supported by the William Stern Society for Research on Giftedness. *Address*: Ms Tania M. Prado, Dipl. Psych., Counseling Centre for the Gifted, Department of Psychology II, University of Hamburg, Von-Melle Park 5, 20146 Hamburg, Germany.

Michael C. Pyryt, Ph.D., is an Assistant Professor of Educational Psychology and Coordinator of Field-Based Research, Program Evaluation and Development of the Centre for Gifted Education at The University of Calgary in Canada. His research involves the application of multivariate techniques (discriminant analysis, factor analysis, path analysis, and multivariate analysis of variance) to topics in gifted education such as the identification of gifted, factors predicting success in the Terman Study, self-concept differences between intellectually gifted and average-ability adolescents and developmental differences in the learning styles of gifted students. *Address*: Dr Michael Pyryt, Centre for Gifted Education, The University of Calgary, 2500 University Drive N.W., Calgary, Alberta, Canada.

Nancy M. Robinson, Ph.D., a developmental and child-clinical psychologist, is Director of the Halbert Robinson Center for the Study of Capable Youth. She graduated from Stanford University in 1958,

and has served on the faculties of the University of North Carolina (1959–1969) and the University of Washington (since 1969). Previously known for her work in mental retardation, her current interests are precocity in language and mathematics, and family relationships of gifted children. *Address:* Professor Nancy M. Robinson, Halbert Robinson Center for the Study of Capable Youth, University of Washington, NI-20, Seattle, WA 98195, U.S.A.

Karen B. Rogers, Ph.D., is Assistant Professor of Gifted Studies in the Gifted and Special Education Program of the Graduate School of Education, Professional Psychology, and Social Work at the University of St Thomas in St Paul, Minnesota. She has published widely on research-supported program practices for gifted learners, research synthesis, curriculum systems, and arts education. She was named “Early Scholar of the Year 1992” by the National Association for Gifted Children. *Address:* Dr Karen Rogers, University of St. Thomas, Graduate School of Education, 2115 Summit Avenue, St. Paul, Minnesota 55105, U.S.A.

Cheryl E. Sanders is an Instructor of Psychology at the University of Colorado (Boulder). *Address:* Ms Cheryl E. Sanders, Instructor of Psychology, University of Colorado, Department of Psychology, Boulder, CO 80304, U.S.A.

Wolfgang Schneider received his diploma in psychology in 1975 and his Ph.D. in 1979, both under the supervision of Professor Franz E. Weinert at the University of Heidelberg. After a visiting fellowship at the department of psychology, Stanford University, in 1981 and 1982, he joined Professor Franz E. Weinert and his research group at the Max Planck Institute for Psychological Research in Munich, working as a Senior Scientist (until 1989) and an Associate Research Professor in the developmental psychology research unit. He has been a full Professor of Psychology at the University of Würzburg since 1991. Schneider’s research interests include topics like memory development, metacognition, knowledge acquisition, and the early prediction of reading and spelling. He has published several books and about 100 articles on these issues. *Address:* Professor Wolfgang Schneider, University of Würzburg, Department of Psychology, Wittelsbacherplatz 1, 97074 Würzburg, Germany.

Andrzej Sekowski, Ph.D., is an Associate Professor in the Department of Psychology at both The Maria Curie-Skłodowska University and The Catholic University in Lublin, Poland. He specializes in the areas of psychology concerning gifted people and rehabilitation. Since 1990 he has been a member of The General Committee of the European Council for High Ability. He has conducted research in Poland, the United States, Germany, and the Netherlands. He has published two books, and his articles have appeared in several major scientific journals. As a fellow of the Alexander von Humboldt Foundation, he is currently a Visiting Professor in the Department of Educational Psychology at the University of Munich (until 31 March 1994 c/o Prof. K. A. Heller, Munich). *Address:* Dr Andrzej Sekowski, Maria Curie-Skłodowska University, Department of Psychology, 20-050 Lublin, Poland.

Bruce M. Shore received his B.Sc. with concentrations in Mathematics and Psychology, Teaching Diploma in Mathematics and Science, and M.A. in Education from McGill University in the 1960s. After teaching secondary school mathematics, he received his Ph.D. from the University of Calgary in 1971, under the supervision of Professor Philip E. Vernon, formerly of the University of London. He joined the faculty at McGill University in 1971, where he is currently Professor of Education, Chair of the Department of Educational and Counseling Psychology, and Director of the McGill Giftedness Centre. His research is on thinking processes underlying high performance in mathematical and scientific thinking, on school experiences (e.g., research and inquiry) which enhance the development of such thinking. He is also interested in the quality of the general knowledge base underlying practices in gifted education and the interface between gifted and general education. Illustrative publications

include: *Recommended practices in gifted education*, with Dewey Cornell, Ann Robinson, and Virgil Ward (Teachers College Press, New York, 1991), and “Metacognition and flexibility as a part of a redefinition of high ability” in F.D. Horowitz and R.C. Friedman’s *The gifted and talented: Theories and reviews* (Washington, American Psychological Association, 1993). *Address*: Professor Bruce M. Shore, McGill University, Faculty of Education, 3700 McTavish Street, Montreal, Quebec, H3A 1Y2, Canada.

Linda Kreger Silverman, Ph.D., is a licensed psychologist and Director of the Gifted Child Development Center and the Institute for the Study of Advanced Development, in Denver, Colorado. Editor of two journals: *Advanced Development* and *Understanding Our Gifted*, she has edited the new textbook, *Counseling the gifted and talented* (Love, 1993). For nine years she served on the faculty of the University of Denver. *Address*: Dr Linda Kreger Silverman, Director, Gifted Child Development Center, 777 Pearl Street, Denver, CO 80203, U.S.A.

Dorothy A. Sisk, Ph.D., has been intensely involved with the education of gifted and talented children. She has been the coordinator of teacher training programs for gifted and talented students at the University of Southern Florida and former Director of the Office of Gifted and Talented, Health, Education and Welfare in Washington, D.C. She is the former Executive Administrator of the Secretariat of the World Council for Gifted and Talented Children. Sisk specializes in the field of creative behavior and leadership development. She has conducted numerous training sessions throughout the U.S.A. and international seminars in Bulgaria, Brazil, Canada, France, Germany, Israel, Mexico, Portugal, Hungary, Russia, the Philippines, Taiwan, and South Africa. Currently, she directs the Center for Creativity, Innovation and Leadership at Lamar University, Beaumont, Texas. Some of her clients include Xerox, Procter and Gamble, Parke-Davidson, Warren Lambert, AT&T and Bell Laboratory. Sisk is author of *Creative teaching of gifted; Children of promise and developing leadership*. She is also coauthor, with Doris Shallcross, of several books: *The growing person; leadership; making things happen and intuition, an inner way of knowing*. *Address*: Dr Dorothy A. Sisk, Conn Chair in Gifted Education, Lamar University, P.O. Box 10034, Beaumont, Texas 77710, U.S.A.

Marion R. Sortore is program Associate at the Center for Creative Learning in Sarasota, Florida. She has worked at all educational levels, and has written publications on creativity and giftedness. *Address*: Ms Marion Sortore, Center for Creative Learning, Inc., 4152 Independence Ct., Suite C-7, Sarasota, FL 34234, U.S.A.

W. Thomas Southern, Ph.D., is Associate Professor and Coordinator of Gifted Education Programs at Bowling Green State University, and serves as a consultant for the Office of Gifted Programs at Indiana University. His research interests include: the effects of accelerative options; the efficacy of simulations in instruction; and the identification and educational needs of special populations of gifted and talented minority students. *Address*: Professor W. Thomas Southern, Bowling Green State University, Department of Special Education, Bowling Green, OH 43403, U.S.A.

Pieter Span, Ph.D., is Professor Emeritus of Psychology at the University of Utrecht, The Netherlands. His major investigations have been into individual differences in the development of cognitive styles, with particular reference to the highly able. He has edited a variety of scientific research journals and handbooks. He was part founder of the European Association for Learning and Instruction, and of the European Council for High Ability, and has a private practice for highly able children. *Address*: Professor Emeritus Pieter Span, University of Utrecht, Department of Education, Heidelberglaan 2, 3584 CS Utrecht, The Netherlands.

Julian C. Stanley, Ph.D., is Professor of Psychology and Director of the Study of Mathematically Precocious Youth (SMPY) at Johns Hopkins University. Stanley had a distinguished career in the fields of psychological testing, research methodology, and statistics before devoting himself to working on behalf of mathematically gifted youth. Since 1979, he has devoted himself almost exclusively to work with boys and girls who before their thirteenth birthday had scored at least 700 on the mathematical portion of the Scholastic Aptitude Test. Stanley and his staff have been seeking sorely needed accelerative opportunities for these children. *Address*: Professor Julian C. Stanley, Study of Mathematically Precocious Youth (SMPY) at the Johns Hopkins University, Department of Psychology, 430 Gilman Hall, 3400 N. Charles Street, Baltimore, MD 21218-2690, U.S.A.

Robert J. Sternberg is IBM Professor of Psychology and Education at Yale University. He was graduated *summa cum laude*, Phi Beta Kappa from Yale in 1972, and received his Ph.D. at Stanford in 1975. Sternberg is a Fellow of the American Psychological Society, and is currently editor of the *Psychological Bulletin*. He is the author of over 300 books, chapters, and articles in the field of psychology. He has received over \$5 million in government and foundation grants to study intelligence and related topics, and is currently involved in several projects in the schools, including the development of a program for teaching practical and creative intelligence for schools to sixth-graders. Sternberg has won numerous awards from various organizations, including the American Psychological Association, American Educational Research Association, Guggenheim Foundation, Society for Multivariate Experimental Psychology, and the National Association for Gifted Children. Sternberg is married to Alejandra Campos, and has two children, Seth (13) and Sara (12). *Address*: Professor Robert J. Sternberg, Yale University, Department of Psychology, Box 11 A Yale Station, New Haven, CT 06520-7447, U.S.A.

Rena F. Subotnik, Ph.D., specialist in gifted education at Hunter College and research/curriculum consultant to the Hunter College Campus Schools, has been awarded research and training grants with the National Science Foundation, the Javits Grant program of the U.S. Department of Education, and the Spencer Foundation. She was the winner of the 1990 Early Scholar Award of the National Association for Gifted Children, and currently serves on the editorial board of the *American Educational Research Journal* and as chairperson of the Research and Evaluation Division of the National Association for Gifted Children. Together with Karen Arnold she is coeditor of the forthcoming volume: *Beyond Terman: Longitudinal studies in contemporary gifted education* (Ablex, 1993). In 1992 Subotnik became Associate Professor at the Department of Educational Foundations, Hunter College, New York. *Address*: Professor Rena F. Subotnik, Hunter College, Educational Foundations, 695 Park Avenue, New York, NY 10021, U.S.A.

Arne E. Tangherlini, M.A., is a graduate of Harvard University and The Johns Hopkins University Master's Program in Writing. He has been a teacher, a novelist and served as an instructor in The Johns Hopkins University Center for Talented Youth (CTY) writing program for four years. He most recently was a CTY Staff Writer and is presently on the faculty of the International School, Manila, Philippines. *Address*: Mr Arne Tangherlini, M.A., International School, Manila, P.O. Box 1526, MCPO, 1255 Makati, Metro Manila, Philippines.

Abraham J. Tannenbaum, Ph.D., is Professor Emeritus of Education at Teachers College, Columbia University, New York, where he spent 22 years as director of programs for majors in the nature and nurture of the gifted. He also directed a collaborative project involving seven universities designed to prepare future leaders in education of gifted children. He is author of *Gifted children* (Macmillan, 1983) and coeditor (with Pnina S. Klein) of *To-be young and gifted*. *Address*: Professor Abraham Tannenbaum, 787 Caffrey Avenue, Far Rockaway, New York, 11691-5301, U.S.A.

Cedric A. Taylor, Ph.D., is Dean of the Faculty of Education at the University of Port Elizabeth, South Africa. He is also Professor of Didactics and Head of the Department of Didactics. In 1984 he established the first Vacation School for gifted high school students in South Africa. He is a member of the Executive Committee of the World Council for Gifted and Talented Children. *Address:* Professor Cedric A. Taylor, University of Port Elizabeth, Faculty of Education, P.O. Box 1600, Port Elizabeth 6000, South Africa.

Lee Anne Thompson received her Ph.D. from the University of Colorado, Boulder, U.S.A., where she was a predoctoral fellow at the Institute for Behavioral Genetics. She is currently an Assistant Professor of Psychology at Case Western Reserve University where she has conducted a twin study of high and low cognitive ability. She is on the editorial board for the journal *Intelligence* and has authored numerous chapters and research articles on developmental behavioral genetics, intelligence and mental retardation. *Address:* Dr Lee Anne Thompson, Department of Psychology, Case Western Reserve University, Cleveland, OH 44106-7123, U.S.A.

Donald J. Treffinger, Ph.D., is President of the Center for Creative Learning in Sarasota, Florida, U.S.A., and Professor of Creative Studies at Buffalo State College. The author has worked at all educational levels, and has written numerous publications on creativity and giftedness. *Address:* Professor Donald J. Treffinger, Center for Creative Learning, Inc., 4152 Independence Ct., Suite C-7, Sarasota, FL 34234, U.S.A.

Günter Trost, Ph.D., is Director of the Institute for Development and Talent Research in Bonn, Germany. Trost's research interests and publications are in the areas of long-term follow-up studies to investigate the determinants of outstanding achievement, and in psychological assessment for admission to higher education as well as for personnel selection. *Address:* Dr Günter Trost, Director, Institute for Test Development and Talent Research, Koblenzer Strasse 77, 53177 Bonn, Germany.

Klaus K. Urban, Ph.D., is a Professor in Psychology for Special Education at the University of Hannover, Germany. He has served as Executive Committee Member and Vice-President of the World Council for Gifted and Talented Children; currently he is an Executive Committee Member of ECHA and Chairman of the German Association for Researching and Promoting Giftedness (ABB). His several national and international publications since 1980 deal with various aspects of giftedness and focus recently on creativity. *Address:* Dr Klaus K. Urban, University of Hannover, Department of Special Education, Bismarckstr. 2, Postfach 6009, 30063 Hannover, Germany.

Joyce VanTassel-Baska is The Jody and Layton Smith Professor of Education at the College of William and Mary in Virginia, U.S.A., where she has developed a graduate program and a research and development center in gifted education. Formerly she initiated and directed the Center for Talent Development at Northwestern University. She has also served as the state director of gifted programs for Illinois, as a regional director of a gifted service center in the Chicago area, as coordinator of gifted programs for the Toledo, Ohio public school system, and as a teacher of gifted high school students in English and Latin. She has worked as a consultant on gifted education in over 40 states and for key national groups, including the U.S. Department of Education, National Association of Secondary School Principals, and American Association of School Administrators. She currently serves on the editorial board for *The Journal for the Education of the Gifted* and *Gifted Child Quarterly* and is exPresident of The Association for the Gifted of the Council for Exceptional Children. She is also a member of the Board of Directors of the National Association of Gifted Children. She has published widely including four recent books: *Comprehensive curriculum for gifted learners* (with John Feldhusen, et al.); *Patterns of influence: The home, the self and the school* (ed. with Paula Olszewski-Kubilius); and *Excellence in*

educating the gifted (with John Feldhusen and Ken Seeley); and *Planning effective curriculum for the gifted*. She has also published nine monographs, 22 book chapters, and 48 articles in journals. Her major research interests are the disadvantaged gifted as a special population and effective curricula interventions with the gifted. She holds B.A., M.A., M.Ed., and Ed.D. degrees from the University of Toledo. *Address*: Professor Joyce VanTassel-Baska, College of William and Mary, P.O. Box 8795, Williamsburg, VA 23187-8795, U.S.A.

Harald Wagner, Ph.D., is Director of the institute *Bildung und Begabung*, Bonn, Germany, a nonprofit organization which is responsible for four annual nationwide competitions in mathematics, foreign languages and art design, as well as residential programs for highly able secondary school pupils. He was Assistant Professor in developmental psychology at the University of Hamburg and coordinator of talent searches and educational programs. *Address*: Dr Harald Wagner, Gf, Bildung und Begabung e.V., Wissenschaftszentrum, Postfach 201448, 53144 Bonn, Germany.

James T. Webb, Ph.D., is Professor and Associate Dean at the School of Professional Psychology, Wright State University in Dayton, Ohio. A clinical psychologist, Webb directs the SENG (Supporting Emotional Needs of Gifted) program which provides diagnostic and counseling services for gifted children and their families, and training for doctoral psychologists. He is the senior author of *Guiding the gifted child: A practical source for parents and teachers*. Webb served on the Board of Directors of the National Association for Gifted Children, and was President of the American Association for Gifted Children. *Address*: Professor James T. Webb, Wright State University, School of Professional Psychology, Dayton, OH 45435, U.S.A.

Wilhelm Wiczerkowski, Ph.D., chairperson of the 6th World Conference on Gifted and Talented Children, Hamburg (1985) is Professor of Psychology and Director of the Department of Developmental and Educational Psychology at the University of Hamburg. In the late 1970s, he was the main initiator of a movement to intensify research and practical support measures for the gifted in Germany. He initiated and directs various research projects: the Hamburger Model—Identification and fostering of verbally gifted students, and the Counseling Centre for the Gifted. Among his publications are books and articles in the fields of cognitive and linguistic (bilingual) development and, especially, on gifted children. *Address*: Professor Emeritus Wilhelm Wiczerkowski, University of Hamburg, Department of Psychology II, Von-Melle-Park 5, 20146 Hamburg, Germany.

Ellen Winner, Ph.D., is a Professor of Psychology at Boston College, and a Senior Research Associate at Harvard Project Zero. She is the author of *Invented worlds: The psychology of the arts* (Harvard University Press, 1982), and *The point of words: Children's understanding of metaphor and irony* (Harvard University Press, 1988). *Address*: Professor Ellen Winner, Boston College, Department of Psychology, Chestnut Hill, MA 02167, U.S.A.

Wu-Tien Wu received his Ph.D. in school psychology from the University of Kentucky, U.S.A. in 1975. He became a Professor of the National Taiwan Normal University (NTNU) in 1979. He is the Head of the Special Education Center, Graduate Institute of Special Education, and Department of Special Education of NTNU and was awarded the Distinguished Educator of the Year 1985 and received a Distinguished Research Award in Taiwan, 1988. He served the Presidency of the Special Education Association, R.O.C. between 1987 and 1988. He has been instrumental in developing a number of G/T programs in Taiwan and actively involved in international G/T activities. He was the Conference Director of the 2nd Asian Conference on Giftedness held in Taipei, July 24–27, 1992 and is currently on the Executive Board of the World Council for Gifted and Talented Children. *Address*: Professor Wu-Tien Wu, National Taiwan Normal University, Graduate Institute of Special Education, Taipei, Taiwan 106, R.O.C.

Carolyn Yewchuk, Ph.D., is Associate Professor in the Department of Educational Psychology, University of Alberta, and a liaison to the Centre for Gifted Education, The University of Calgary. She has served as a Canadian delegate to the World Council for Gifted and Talented Children, and is Program Cochair for the Tenth World Gifted Conference in Toronto. *Address:* Professor Carolyn Yewchuk, University of Alberta, Educational Psychology, 6-102 Education North, Edmonton, Alberta, T6G 2G5, Canada.

Zha Zixiu is the leader of the Cooperative Research Group of Supernormal Children of China, and Associate Professor in the Institute of Psychology of the Chinese Academy of Sciences (IPCAS). She has devoted herself to the research on child developmental psychology since 1959. She was the Director of the Department of Developmental Psychology of IPCAS from 1974 to 1987. Now she is a member of the Council of the Chinese Psychological Society and the Chinese Developmental Psychology Committee. *Address:* Professor Zha Zixiu, Institute of Psychology, Chinese Academy of Sciences, P.O. Box 1603, Postcode 100012, Beijing, P.R. of China.

Rachel Zorman, Ph.D., is a senior researcher in the Szold Institute in Jerusalem. She serves as the director of the cross cultural program identifying and nurturing hidden potential in the arts and sciences. Zorman's specializations include: developing identification methods for specific gifted programs, devising alternatives for identifying talent in specific subpopulations, such as the gifted disadvantaged, and evaluating gifted programs. *Address:* Dr Rachel Zorman, Senior Researcher, The Szold Institute, 9 Columbia St., Jerusalem 96583, Israel.

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