An Academic Model for Educating the Mathematically Talented

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Abstract

A usually unrecognized aspect of the "school reform" movement during the past two decades has been the huge increase in extracurricular *academic* efforts on behalf of intellectually exceptionally able boys and girls. Whereas in 1971 few students less than 14 years old took the Scholastic Aptitude Test (SAT), by 1990 more than 100,000 did. Those who score well are offered special, supplemental educational opportunities. The movement began at Johns Hopkins University in 1971 with the creation of the Study of Mathematically Precocious Youth (SMPY) and spread within a dozen years to other private universities, i.e., Duke, Northwestern, and the University of Denver. Also, many public universities have begun such talent searching and educational facilitating. This article traces the origin and development of the network of independent centers and projects based on the SMPY model.

As this issue of *GCQ* demonstrates, there are several main approaches to supplementing the education of intellectually talented students. Creativity, thinking skills, futurism, curricular flexibility via "revolving doors," various types of "enrichment," and even mystically based programs are among the most common. Straightforward extensions of the regular curriculum, which I shall discuss in this article, gained some prominence during the past two decades. Also, emphasis on extracurricular academic opportunities increased. Much of the academic orientation seems to have been sparked by the Study of Mathematically Precocious Youth (SMPY), which I started at Johns Hopkins University in 1971 and have directed ever since.

The original goal of SMPY was simple: identify those boys and girls who before age 13 reason exceptionally well mathematically as shown by a score of at least 500 on the mathematical part of the College Board Scholastic Aptitute Test (SAT-M) and help them find the special, supplemental, accelerative opportunities they sorely need in order to move ahead faster and better in mathematics and related subjects such as physics and computer science. SAT-M is intended mainly for high school seniors of above average intellectual ability. The average college bound male twelfth grader scores 500 on it; a 12 year old who scores that high is approximately the top 1 in 100 of that age group with respect to quantitative aptitude. The 500-800M scorers at age 12 or less have the already developed ability to benefit from faster-paced mathematics.

For example, about half of them can score higher on a standardized test of knowledge of first-year algebra before they take the course than the average student who has already studied that subject systematically for an entire school year, 135 hours or more. Many can also excel in mathematics contests such as MathCounts, the American Junior High School Mathematics Examination (AJHSME), the American High School Mathematics Examination (AHSME), and the American Regions Mathematics League (ARML).

Much of the history of SMPY is embodied in Keating & Stanley (1972), Stanley (1973), Stanley, Keating, & Fox (1974), Keating (1976), Stanley, George, & Solano (1977), George, Cohn, & Stanley (1979), Benbow & Stanley (1983), Stanley & Benbow (1986), and Stanley (1991). Below I shall review briefly some of the developmental aspects of SMPY as its precursors emerged over the years from 1938 onward.

Early Origins

My interest in intelligence testing was kindled while I relaxed as a beginning graduate student at the University of Georgia during the second 6-week summer session of 1938, taking Professor Herbert Bonar Ritchie's tests and measurements course and clinical psychologist Wendell Sharman Phillips' adolescent psychology course. I had just turned 20 years of age, after having taught a year (eighth-grade general business and ninth-grade commercial arithmetic) at Fulton High School in Atlanta, Georgia. Professor Ritchie had us take a variety of intelligence tests, notably (if my memory is correct) the Otis Self-Administering Test of Mental Ability, the Ohio State University Psychological Examination, the American Council on Education Psychological Examination, and the Miller Group Test, predecessor to the Miller Analogies Test. For a while thereafter, I administered such tests to my students, my parents, my girl friends, and my sister's boy friends, undoubtedly making a real pest of myself. Later, when I had gained enough seniority to capture a chemistry class to teach, I used a nationally standardized achievement test to evaluate my students' knowledge at the end of the school year.

After I had served for 44 months in World War II, my interest in intelligence simmered a bit during graduate school at Harvard (1945-1949). It erupted mildly a few times during the 1950s but did not really boil over until almost the end of the 1960s. In 1968, a summer school instructor, Doris Lidtke, had called my attention to a most remarkable boy taking a summer computer science course at Johns Hopkins University after completing the seventh grade. He was helping graduate students with their Fortran language programming. By January of 1969, I was administering a number of difficult tests to this 13-year old. Among them was the SAT. His scores were so startling that I thought he might be the ablest kid in the USA. Soon, however, others even abler came to light in the Baltimore area.

Here was a challenge. What was one to do with this extremely advanced youngster after he completed the eighth grade, middle year of the junior high school, in the "enriched" curriculum? It seemed to me that he needed Advanced Placement Program work at the eleventh- or twelfth grade level, but no local high school (public or private) would even consider accelerating him that much. Thus, somewhat despondently, he, his parents, and I decided that he should try becoming a regular student at Johns Hopkins. It might prove difficult for someone his age, but there seemed no other feasible alternative. The Johns Hopkins dean, a renowned biologist, admitted him readily, on my recommendation, to take honors calculus, sophomore general physics, and computer science. Instead of the Cs and Ds we had feared, during the first semester he earned B+ in calculus, A in physics, and a very high A in computer science. By age 17 he had a BA and an MA in computer science. By age 24 he had received a PhD in computer science from Cornell University.

In 1970 another 13-year-old entered Johns Hopkins. He, too, majored in computer science and earned excellent grades. These two pioneers were followed in 1972 by a young man accelerated two years in grade placement who earned 40 semester-hour credits of straight As his first year and went on to graduate in mathematics from Princeton University, Phi Beta Kappa and *summa cum laude*, the month he had his twentieth birthday. He has become a superb cardiologist.

These three marked successes led to my espousing extreme acceleration in grade placement too vigorously (e.g., see Stanley, 1978b, 1989). We of SMPY have learned over the years that there are preferable ways to accelerate the subject-matter attainment of most youths who reason exceptionally well mathematically, but at this point some of them were unavailable and others were not yet developed sufficiently (see Brody and Stanley, in press).

Talent Searches

SMPY began officially in September of 1971 supported by a $266,100 5-year grant to Johns Hopkins University, with me as principal investigator, from the newly created Spencer Foundation, located in Chicago. This enabled me to attract as highly able beginning graduate students in psychology Lynn H. Fox and Daniel P. Keating. We set about trying to find via word of mouth and various advertisements some talented boys and girls to help. The quality of the ones who sought us was excellent, but it soon became apparent that casting a wider, deeper net was desirable in order to get a critical mass of young students with whom to work and from whom to learn how to facilitate the utilization of talent better. We decided to conduct a systematic annual talent search via above-grade level testing of seventh and eighth graders of top 5% mathematical ability as judged by their score on the mathematical part of an achievement test battery administered routinely in their schools. The first much talent search was held at Johns Hopkins on 4 March 1972. A total of 450 boys and girls took difficult mathematics and/or science tests. We found much mathematical talent, with SAT-M scores ranging up to 790 (800 is the highest possible). The story of that pioneering testing is set forth in Keating & Stanley (1972), Stanley (1973), and Stanley, Keating, & Fox (1974). For the concept of above-level testing, see Stanley (1954, 1990).

SMPY held similar but modified talent searches in January of 1973, January of 1974, December of 1976, January of 1978, and January of 1979. Two years were skipped (January of 1975 and January of 1976) because the SMPY staff became overloaded with accumulated work. We were administering and scoring all tests given, besides devising ways to facilitate the education of the high scorers and producing several books and numerous articles about our work.

SMPY's First Fast-Paced Mathematics Classes

By June of 1972 SMPY set up a mathematics class for the quantitatively ablest 1 in 200 boys and girls, most of whom had recently completed the sixth grade. Our intent was to shorten drastically the amount of time required to complete the 4½ years of precalculus: 2½ years of algebra, 1 year of geometry, ½ year of trigonometry, and ½ year of analytic geometry. After about 20 hours of instruction that summer, the group was "shaken down" to the ones deemed ready to move ahead fast on Saturday mornings during the school year. They completed at least 2 years of the precalculus sequence well. Eight finished it all in about 120 hours of instruction. We called that class "Wolfson I" because it was taught by a remarkable physicist turned mathematics teacher named Joseph Wolfson, who now teaches mathematics at Phillips Exeter Academy in New Hampshire and sparks the American Regions Mathematics League. The next year there was a Wolfson II class, composed primarily of persons who had completed the eighth grade. For many of the students enrolled, the classes proved a godsend because they enabled these youngsters to avoid the boredom, tedium, and frustration of the regular mathematics curriculum, which proceeded at a snail's pace for them. Figuratively, they were starved for mathematics at the proper pace and level and rejoiced in the opportunity to take it straight rather than being "enriched" with math puzzles, social studies discussions, trips to museums, critical thinking training not closely tied to mathematics, and so forth.

Those two Wolfson classes and the many more experimental classes we conducted are reported fairly fully in Stanley, Keating, & Fox (1974), Keating (1976), Stanley, George, & Solano (1977), George, Cohn, & Stanley (1979), Benbow & Stanley (1983), Mezynski & Stanley (1980), Bartkovich & George (1980), Bartkovich & Mezynski (1981), Stanley & Stanley (1986). Stanley (1990), and Swiatek & Benbow (in press). Many variations were tried, in school and out of school. As will be discussed later, residential summer programs began in 1980.

SMPY's DT-PI Model

Wolfson functioned as the formal instructor of about 20 able youths, going through standard mathematics with them extremely fast and more rigorously than the teacher of a typical high school class can. It soon became obvious that although those who could keep up with his pace benefited enormously, about half of the class fell behind. They had to be dropped or assigned another instructor who proceeded more slowly. This led us to devise a more individually paced method, which we termed the DT-PI Model. Diagnostic Testing is followed by Prescribed Instruction. One determines what the student does not yet know and helps him or her concentrate on just that, rather than working through a textbook from page 1 to the end. Approximately 20 students in a classroom proceed individually at a mentor-paced rate. Three instructors or teaching assistants, each rather young and mathematically precocious, circulate around the room to help individual students. Ideally, there is virtually no lecturing or group work.

Like most simple-sounding ideas, the DT-PI Model is not easy to implement. Many regular teachers resist it because they are accustomed to teaching the group rather than individually within it. It requires the preparation of specific instructional materials to address specific deficits in each student's knowledge. Yet when done properly, it is probably the fastest, most effective way to help quantitatively talented youths learn mathematics well, anywhere from 1 to 4½ years of the algebra through analytic geometry sequence in 3 intensive weeks. A few markedly talented students 12-14-years-old have mastered the entire precalculus sequence in that short a time, or the equivalent spread over Saturdays, and then gone on to excel in Advanced Placement Program calculus (see Mezynski & Stanley, 1980; Mezynski, Stanley, & McCoart, 1983).

For details about the DT PI model, see Stanley (1976, 1978a, 1979, 1986), Benbow (1986), Stanley, Lupkowski, & Assouline (1990), Lupkowski, Assouline, & Stanley (1990), and Stanley & Stanley (1986).

CTY is Created

During the 1970s SMPY was a ferment of talent searching, each year encompassing more students and a wider geographical area, and program experimentation and evaluation. Ten times yearly we issued a newsletter, *ITYB* (Intellectually Talented Youth Bulletin), to inform students, parents, and teachers about our principles and practices and to suggest supplemental activities. We sent out many packets of information, without cost to the requesters. (SMPY still does that, some 500 per year). It became increasingly obvious, however, that we were vastly overworked by the demanding routine of talent searching and conducting various courses. The operational burden of SMPY had become too great for our resources, leaving us little time for the crucial developmental and research phases.

Also, we realized that SMPY was not nearly broad enough. Deliberately, we had concentrated almost doggedly on what might be called the "500-800 on SAT-M Before Age 13 Group." Although we administered the verbal part of the SAT (SAT-V) and took this additional information into consideration when counseling our "proteges," we had no direct interest in boys and girls who scored less than 500 on SAT-M, no matter how high their SAT-V scores might be. Students could not even enter the annual talent search unless they were seventh graders or, if in a higher grade, met a rigorous age criterion, *and* had scored at least the 97th percentile of national norms on the mathematical part of a standardized achievement test battery. Considerably fewer girls than boys met this standard. A strongly academic verbal component in the talent search was badly needed.[1] It might even help predict success in the higher reaches of "pure" mathematics, theoretical physics, or computer science theory.

Finally, residential summer programs were needed. SMPY itself conducted only commuter ones, 1972-1979. Residential programs can be more intensive than commuter ones, and of course they can serve a much wider geographical area and encourage participants to be far more interactive socially.

Thus, in 1979 I spoke with Johns Hopkins President Steven Muller and arranged to have created, independent of SMPY, a unit on campus to conduct talent searches and academic programs. This, intially titled the Office of Talent Identification and Development (OTID), began that year. A few years later its name was changed to the Center for the Advancement of Academically Talented Youth (CTY).

OTID's first summer (3-week) residential program was conducted at St. Mary's College in Maryland in 1980. SAT-V and verbal courses found equal footing with SAT-M and mathematics and science courses in the January of 1980 talent search and summer programs. Especially, the number of girls participating in the talent search immediately became virtually identical to that of the boys.

By 1990, CTY had 37,000 students in its talent search covering 19 states and some foreign countries. It had about 4000 3-week summer enrollees on its campuses at Franklin and Marshall College and Dickinson College, both in Pennsylvania; Wheaton College in Massachusetts; Skidmore College in New York State; the University of Redlands in California; and a site in Geneva, Switzerland. Also, there were CTY commuter programs on the Johns Hopkins campus.

SMPY's "700-800 on SAT-M Before Age 13 Group"

If SMPY gave up all that in 1979, what did it have left to do? We simply raised the SAT M criterion from 500 to 700, a score equaled or exceeded by only 7% of college-bound male high school seniors and 2% of such females. Boys and girls 12-years old or less who score that high, usually without much formal mathematical background, are the best 1 in about 10,000 mathematical reasoners their age. They are the upper one-hundredth of 1% of their age group. This is enormous intellectual potential, indicative of ability to learn much mathematics and related subjects extremely fast and well. The creation of OTID-CTY enabled SMPY to seek the 700-800M scorers and concentrate its efforts on them. SMPY's role became informing, motivating, encouraging, or even (in extreme cases) shaming these high scorers into using their abilities for their own academic and personal advancement and for the good of society. All this is without financial cost to the student, being funded primarily by grants from philanthropic foundations.[2]

SMPY's most effective tool is its precollege newsletter, about 20 single-spaced pages four times per year. To those beyond high school, SMPY sends an "Alumni" newsletter twice each year. Students and parents who peruse each issue carefully and file away the copies for later reference have a great advantage over equally bright youngsters and their parents who do not.

Receiving information, encouragement, and examples of success early and over many years, typically from age 12 onward, enables interested, alert members of SMPY's "700-800 on SAT M Before Age 13 Group" to forge ahead via curricular flexibility for which they bargain in school and, especially, via supplemental academic activities outside the school. Within the school they can often move ahead faster and better than the "age-in grade lock step" in mathematics and science. For instance, some might start algebra a year or two early, complete 2 years of mathematics (such as Algebra I and II) in one school year, and/or test out of a year of general science in order to start biology a year early.

Outside of school, or extracurricularly within it, are many special opportunities: mathematics and science clubs, TV "bowl" academic teams, science and mathematics contests, Advanced Placement Program classes and examinations, academic classes or programs on Saturdays or Sundays and during summers, college courses taken for credit on a part-time basis while the student is still in high school, correspondence courses, mentorial and tutorial arrangements, and so forth. Some clever SMPYers have devised ingenious combinations, such as the two males who at age 17 graduated simultaneously, with high honors, from both high school and college! Also, accelerative procedures often enable a student to enter college with room in his or her schedule to sample the humanities and social sciences broadly while forging ahead in mathematics and science.

Curricular flexibility within the junior or senior high school plus effective *articulation* of in-school with out-of-school academic experiences are two key concepts of SMPY. Young students and their parents must become persuasive negotiators with educational officials. The youth should assume considerable responsibility for his or her educational decision making. If he or she is able enough to be in SMPY's 700-800M group, it is already time to begin participating actively in the family's educational decisions.

The momentum of the "cumulative educational advantage" (see Zuckerman, 1977) built up in high school can continue its positively accelerated rate throughout college, graduate school, and professional life. Cushioned by the splendid academic experiences and already earned college credits with which they begin post-high-school study, many SMPYers sample collegiate curricular offerings both broadly and deeply. Some complete two or even three majors during the four years (e.g., mathematics, physics, and Greek or English). Some earn a bachelor's and a master's degree concurrently. A few choose to graduate in 3 years or less. Importantly, most enter ready for more advanced courses in certain areas than the majority of their college classmates and thereby get a head start.

Examples of SMPYers' Successes

Does identifying youths who reason extremely well mathematically early and persistently providing them information, encouragement, and role models, really help these quantitatively brilliant boys and girls achieve better than they would do otherwise? It is not possible to answer this question rigorously because, from the first, SMPY has chosen to devote its efforts to all the young 700-800M youths found, rather than reserving any of them as a control group (see Stanley, 1977; Stanley & Benbow, 1986). Yet the accomplishments of this small group (640 in the USA born from 1968 onward and 225 in the People's Republic of China) are so impressive that logic and probabilities strongly suggest great influence. See Stanley, Huang, & Zhu (1986) for the origin of SMPY's 700-800M group in China; also see Stanley, Feng, & Zhu (1989).

The annual International Mathematical Olympiad (IMO) high school competition is an excellent example. The U.S. team consists of six members, the end result of four eliminations that begin with approximately 400,000 who took the American High School Mathematics Examination (AHSME). These 400,000 were drawn from at least 9,000,000 high school students. SMPY works with less than 300 American tenth, eleventh, and twelfth graders. Yet every year since 1979 there has been at least one SMPYer on the US IMO team, and they have done well. In 1986 there were four, in 1987 three, in 1988 two, in 1989 four, and in 1990 four.[3] Thus, in 3 of the 5 years two thirds of the team consisted of SMPYers. The "odds" on this (having 17 of the 30 be SMPYers) are (17/1500)/(13/45,000,000), nearly 40,000:1. Of course, this is a rough, hypothetical calculation, but to dismiss it completely would mean having to assume that somehow SMPY managed to find at age 12 or younger most of the country's youths who would, anyway, make the IMO team four or more years later. SMPY's searching procedures aren't nearly that predictive (just the 700-800M score before age 13, and *nothing* else), nor its crystal ball that clear. We believe that SAT-M is the most direct single measure to use at age 12, but without much information giving and encouragement from then on, many of these youths might not have heard of the IMO, or even the AHSME, or had the motivation to plug away at mathematics enhancing opportunities from MathCounts to IMO until some such students were highly successful.

The annual Putnam (college mathematics) Competition is another good example of how SMPYers dominate top-level contests. In December of 1989, 2392 students from 373 colleges and universities, chiefly their best math students, participated. From SMPY's small group (less than 400) came two in the top six ("Putnam Fellows"), one in the next four, and many others. This is typical. Several years ago, a 16 year old SMPYer was a Putnam Fellow.

In 1990, 2 of the 400,000 taking the AHSME earned perfect scores (quite unusual). Both are SMPYers, one only 13 years old when tested.

SMPYers do extremely well in the annual national Westinghouse Science Talent Search (WSTS) among high school seniors. From the approximately 100 eligible SMPYers in 1990 came 11 who were in the top-300 honors group. Three of these were in the top 40. Two of them ranked fifth and sixth, respectively, and thereby won a $10,000 scholarship each and a free, gala week in Washington, DC (the third won that week and $1000).

In 1989, an SMPYer ranked second in the WSTS and also won a gold medal in the IMO, with one of the 10 perfect scores among the 300 contestants from 50 countries. In 1990, as a freshman at Harvard College, he ranked in the top 10 in the Putnam Competition.

Two of the top 10 in *USA Today*'s list of the most outstanding graduating high school seniors in the nation in 1990 are SMPYers, and so is one of the next 10. The top award of Harvard-Radcliffe Colleges, the Fay Prize, went in 1990 to a female SMPYer: she had also been elected to membership in Phi Beta Kappa as a junior. At age 12 she had scored 780 on SAT-M. The top graduating senior (the University Scholar) at the huge University of California at Berkeley several years ago was a 19 year-old female SMPYer, as was the Mathematics Valedictorian there, a 19-year-old male graduating *summa cum laude*.

In 1990, an SMPYer received his PhD in theoretical physics from the California Institute of Technology at age 21. Several years ago, one received his PhD in mathematics from a top university at age 20. The youngest graduate of Johns Hopkins University ever, at age 15 years 7 months, is an SMPYer. SMPY does not encourage this degree of educational acceleration, but for some intellectually brilliant persons it may be optimum.

There are many other examples of great achievement that I could list, but the above should help document my thesis that early identification via a difficult, above-grade-level test of mathematical reasoning ability, followed by proper information and specific help, can markedly enhance utilization of quantitative potential.

Discussion

Why do many gifted-child specialists consider acceleration of a specifically gifted youth's progress through a particular school subject irrelevant or undesirable? Wallach (1978), himself a noted explorer of creativity, put SMPY's case well in a review of a book resulting from a symposium SMPY sponsored in 1975 (Stanley, George, & Solano, 1977):

> Specificity in defining talent, and instruction geared to the particular form of talent specified, proceeding as rapidly as fits the student's talent and interest but with careful provision to make sure no gaps in knowledge arise, seem to be the major messages that come from SMPY. The students seem to benefit. . . . Selecting for scores on the Torrance Tests of Creative Thinking, or on Welsh's measures of "origence" and "intellectence," does not say much about what to teach or how to teach students, just as was the problem with Guilford's SOI model. . . It is as if trying to be psychological throws us off the course and into a mire of abstract dispositions that help little in facilitating students' demonstrable talent. What seems most successful for helping students is what stays closest to the competencies one directly cares about: in the case of SMPY, for example, finding students who are very good at math and arranging the environment to help them learn it as well as possible. One would expect analogous prescriptions to be of benefit for fostering talent at writing, music, art, and any other competencies that can be specified in product or performance terms. . . . The implication is that the proper psychology of talent is one that tries to be reasonably specific in defining competencies as manifested in the world, with instruction aimed at developing the very competencies so defined. Rather than believing we can teach people to become more "intelligent" or more "creative," we should be teaching them as effectively as possible to master specific disciplines. The SMPY example suggests that the most effective teaching methods will become clear to the extent that we look closely at the structure of the discipline to be taught.

American youths and their nation lose much if the former use little of their intellectual potential from kindergarten through high school. "Enrichment" irrelevant to their special talent, cultural enrichment, and "busy work" do not meet their real needs, that is, assuage their specific mental hunger. Special efforts in college are often too late to undo the long continued earlier boredom and frustration. Just having smaller classes in elementary and high school, paying teachers more, training them better, or even recruiting teachers with greater competence in the subject matter may do little for the ablest. They need curricular flexibility, accelerative supplemental opportunities inside school and outside, and proper articulation and coordination of the various academic experiences. Achievement testing can help much, especially because intellectually brilliant youths usually know far more than their teachers realize.

We of SMPY are glad that its principles, practices, and techniques have been disseminated widely, so that all 50 states have ready access to a national talent search, and all regions to excellent summer programs. More than 100,000 seventh and eighth graders take the SAT each year, versus almost none when SMPY started in 1971. There are regional centers at Johns Hopkins, Duke University, Northwestern University, and the University of Denver; these span all 50 states. Flourishing programs also exist at the University of Wisconsin in Eau Claire, the University of Washington (Seattle), Arizona State University, Sacramento State University, Iowa State University, Purdue University, the University of North Texas, the State of Illinois, Tianjin (People's Republic of China), and other places. All of these were created independent of SMPY at Johns Hopkins, but based at least somewhat on SMPY principles.

Students, parents, mathematicians, and scientists have welcomed this academic emphasis. Teachers have sometimes been reluctant to face the curricular and extracurricular implications of the results of talent searches among seventh and eighth graders via SAT. SMPY has long used a grass-roots, "benignly insidious" approach to schools. SAT scores and interpretations are sent directly to the students themselves. They and their parents are encouraged to negotiate firmly and adroitly with local educators for the curricular flexibility that high-ability students need. As noted earlier, the students are also encouraged to participate fully in many academic extracurricular events, especially contests and residential summer programs. We've seldom tried to get school boards to change their formal policies, but instead sought to help set local precedents such as allowing a student to take algebra a year early. Other parents of equally talented youths, knowing about the precedent, can use it to get their son or daughter similar treatment.

Conclusion

Perhaps at least partly because of its informal, local approach, SMPY does not seem to have greatly influenced official national educational policy for science and mathematics. Funding for talent searches and accelerative *academic* summer programs is scarce, either from governmental or private sources. National policy for science and mathematics proceeds largely on enhancement of the status quo, rather than embracing novel approaches such as SMPY's. Emphasis is on so-called "enrichment" rather than acceleration, which should itself be highly enriching, and increased scholarships for graduate school but not for accelerative academic summer programs. The SMPY approaches have proved robust, however, because of the dire need they meet.

Footnotes

*I thank Linda K. Brody and Barbara S. K. Stanley for their helpful comments about an earlier draft of this paper.

[1]Actually, there was a Study of Verbally Gifted Youth (SVGY) on the Johns Hopkins campus from 1972 until its funding by the Spencer Foundation was not renewed in 1977. SMPY sponsored SVGY initially, but the two operated independently and soon differed considerably in intent. In 1978 SMPY helped put together an interim verbal program. This was taken over by CTID. For information about SVGY, see McGinn (1976).

[2]To join SMPY's "700-800 on SAT-M Before Age 13 Group," send a photocopy or original of the SAT score report, along with address, to Professor Julian C. Stanley, SMPY, 430 Gilman Hall, Johns Hopkins University, Baltimore, MD 21218. Persons beyond their 13th birthday when tested must earn an additional 10 points on SAT-M for each month *or fraction of a month* beyond that birthday. For example, at age 13 years 2 months 3 days one needs a score of at least 730.

[3]Actually, there were 5 in 1990. SMPY identified the fifth after he had served on the IMO team. The other (sixth) team member had not taken the SAT when young enough to qualify.

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