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The Study of Exceptional Talent

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The Study of Exceptional Talent (SET) identifies students who exhibit extremely advanced mathematical and/or verbal reasoning abilities and helps them find the challenging educational programs they need to achieve their full potential. Specifically, students who score 700–800 on the mathematical or verbal portion of SAT I before the age of 13 are invited to take advantage of SET's counseling and mentoring opportunities. An ongoing longitudinal study tracks the progress of these students, and their achievements to date have been exceptional. SET students, as a group, participate in a variety of accelerated programs, attend highly selective colleges and universities and earn advanced degrees in large numbers. Those who have embarked on their careers appear to be excelling in their chosen fields as well.

Introduction

When Professor Julian Stanley began working with highly precocious young students in the early 1970s under the auspices of the Study of Mathematically Precocious Youth (SMPY) his first protégés entered Johns Hopkins University full-time at ages 13 or 14 (Stanley, 1974). With few resources available to challenge advanced high-school students in those days, full-time college entrance was the only way for these students to access the advanced coursework they needed, and they excelled as college students (Stanley, 1985a,b). One reason they did so well is that Stanley was very involved in counseling them; he helped them choose courses and provided considerable support for their emotional needs.

As the talent search programs grew, trying to meet the needs of increasing numbers of students through individual counseling became more difficult and early college entrance proved not to be the best option for many of them. Consequently, rigorous academic programs, especially summer and distance education courses, were developed by the talent centers and others to meet their needs. Today, the majority of talent search participants are well served by utilizing these educational opportunities to supplement their school programs.

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Within the talent search population, however, those students who score at the highest levels on above level aptitude tests often still require a more individualized approach. In particular, 12 year olds who earn scores on SAT I at the level of high-school seniors who are admitted to the most selective colleges and universities may find it extremely difficult to be challenged for the next 4 or 5 years before they enroll full-time in college. Students with such exceptional abilities can also be at risk of social isolation if their interests and abilities differ greatly from their agemates. Julian Stanley recognized the special needs of extremely precocious students when he established the '700–800 on SAT-M before age 13 group'. This effort was the precursor of what is now the Study of Exceptional Talent (SET).

The '700–800 on SAT-M before age 13 group'

After Stanley helped create the Center for Talented Youth (CTY) to handle the operational aspects of the Johns Hopkins talent search and academic programs, he turned his attention to counseling the most precocious mathematical reasoners on an individual basis and studying their progress. In 1980 he established a national talent search for students scoring 700–800 on SAT-M before age 13. Students could qualify by participating in a university-based talent search or by taking SAT-I on their own.

Students selected for what was commonly referred to as the '700M group' were counseled about ways to accelerate and enhance their educational programs. They also received newsletters that described some of these opportunities and that spotlighted the achievements of members of the group. It was hoped that reading about other students like themselves would motivate them to excel. Most importantly, they were encouraged to meet each other so that they could interact with peers who shared their interests and abilities and thus enhance their social and emotional development.

Some of these students entered college early, as Stanley's first prodigies did (see, for example, Brody *et al.*, 1988). Increasingly, however, these high scoring students were directed towards accelerating their coursework subject by subject and encouraged to partake in rigorous summer programs, national and international competitions, 'Advanced Placement' and part-time college courses, internships and other challenging opportunities (Stanley & Benbow, 1983; Stanley & Stanley, 1986; Stanley, 1987, 1989, 1991). Fortunately, this period witnessed a huge growth in the number of supplemental educational programs available for advanced high-school aged students in the USA.

Research was also an important component of this initiative, as Stanley and his associates hoped to identify the critical factors and interventions that would help extremely talented adolescents achieve their full potential. Among the students who exhibited exceptional mathematical abilities, verbal abilities were found to vary greatly. Although the group on average scored higher than college-bound seniors on the verbal portion of SAT-I, scores ranged from 280 to 760 (Stanley, 1988). Students in the '700M group' were also found to outperform high verbal

scorers on tests of non-verbal reasoning and processing speed (Benbow & Minor, 1990).

Gender differences emerged early in the '700M group', as they had in the early talent searches (Benbow & Stanley, 1980). In the first 3 years of searching for students who qualified for this group Stanley found approximately 12 males for every female, which generated considerable controversy when these statistics were published (Benbow & Stanley, 1983).

The parents of the students with high mathematical ability were found to be rather well educated, averaging a master's degree for fathers and a bachelor's degree for mothers (Stanley, 1988). A sizeable number of the parents were immigrants, particularly from Asian countries. This led to renewed speculation that being a recent immigrant can enhance motivation to excel academically (Stanley, 1985c; Moore & Stanley, 1988).

The social and emotional adjustment of extremely able students is often a concern and was investigated among those achieving high mathematical score. Compared with a group of students who are much less gifted, no differences were found in self-esteem, depression or the incidence of discipline problems as a result of social or emotional difficulties. The highly mathematically able students were also compared with a group achieving high verbal scores, and were found to experience fewer difficulties with peers than the verbal group. The highly verbally able students were more likely to perceive themselves as unpopular and there were other indications that higher verbal ability may be related to some social and emotional problems (Brody & Benbow, 1986; Dauber & Benbow, 1990).

The establishment of SET

In 1991 SET was established at CTY under the direction of Linda Brody. SET was created to continue to identify, serve and study students who qualified for the '700M group' and its role expanded to include those achieving high verbal scores in the talent searches. At that time a score of 630 or above on SAT-V was required to join SET as a verbal qualifier. In 1994, when SAT was renormed, the requirement to join SET became 700 on either SAT-M or SAT-V. These scores represent approximately the 95th percentile among college-bound high school seniors. Among 12-year-olds these scores represent at least the top one in 10,000 of the population, although those scoring high on the verbal test are rarer than those scoring high on the mathematical test, and only approximately the top one in 100,000 of the population qualifies for SET on both the mathematical and verbal criteria.

Today there are almost 4,000 students in SET, ranging in age from recent qualifiers who are 11 or 12 years of age to students in their mid 30s, who qualified in 1980 when the group was established. Identification for SET is ongoing and new students qualify every year. For counseling purposes SET distinguishes between precollege students and alumni who are in college or beyond. Counseling focuses primarily on middle- and high-school students, while alumni are invited to participate in SET's 'Mentor program' and become mentors to younger students.

SET members are encouraged to develop individualized educational plans that utilize the best combination of educational resources and opportunities available to meet their own unique needs (Brody, 2004a). Typically, acceleration in the student's area(s) of strength is encouraged, supplemented by a variety of relevant academic and extracurricular opportunities (see Brody & Blackburn, 1996). Group meetings of SET members in local geographic areas supplement the individual counseling that is offered to SET members (Muratori, 2004a). Precollege SET members also receive *Imagine*, CTY's award winning magazine that spotlights challenging academic opportunities, as well as a newsletter. A separate newsletter is published for SET alumni. Online resources, including a listserv and links to resources, are also utilized and a web site focusing on mathematics and science is being developed.

Descriptive studies of the SET population reveal a large Asian-American population in the group and currently more Asians qualify for SET in mathematics than any other ethnic group. They are less well represented among those students with high verbal scores, where Caucasians are in the majority. The Asian-American SET students come predominantly from homes where their parents were educated in their home country in Asia, at least for their undergraduate education, and they later migrated to the USA. In contrast, most parents of SET members who are Caucasians were raised and educated in the USA (Blackburn & Brody, 1994; Blackburn, 2004).

While more males than females continue to qualify for SET on SAT-M, the gender differences reported in the early 1980s of approximately 12:1 (Benbow & Stanley, 1983) have diminished dramatically. The ratio of males to females qualifying for SET in mathematics in recent years has been approximately 3:1, while the gender ratio of high verbal score qualifiers has been close to 1:1 (Blackburn, 2004). Among mathematical qualifiers gender differences have been found to persist in choice of college major and career aspirations, with comparatively few females choosing the fields of mathematics, engineering, computer science or the physical sciences, in particular, although the biological sciences and medicine are popular choices. It appears that factors other than ability and encouragement contribute to the gender disparities observed in these fields (Blackburn & Brody, 1996; Lubinski *et al.*, 2001).

Studies of family characteristics continue to report a high level of education among SET parents. Recent data show that approximately half of the fathers and close to 20% of the mothers have the equivalent of a doctoral degree, and few of the parents lack at least an undergraduate college degree (Blackburn, 2004). In addition, SET students tend to live with both biological parents and to be the only or oldest child in a small family, so family resources are likely to be supportive. By their own report SET students feel they receive a great deal of encouragement from parents, teachers and themselves for their academic pursuits (Blackburn & Brody, 1996).

The personality characteristics of SET students have also been investigated (Blackburn & Brody, 1996). Compared with both a normative population and a less exceptional but still gifted CTY population, the SET students exhibited stronger

preferences in introversion, intuition and rational decision-making. Among males this research showed that the high mathematics scoring SET students valued theoretical pursuits and cared somewhat less about power or prestige as they looked toward their futures than the general CTY population. The high mathematics scoring SET females also exhibited a relatively high theoretical orientation. This orientation has been linked to achievement in mathematics and science (Fox & Denham, 1974; Mills, 1993).

Muratori (2004b) studied the curricular options a group of SET students pursued in high-school and found almost all of the students took advantage of 'Advanced Placement', International Baccalaureate and/or distance education courses as a way to access college level work in high-school. While whole grade acceleration was not prevalent in the group surveyed (about 10% in this survey had skipped one or more grades), the majority (80%) reported having accelerated in one or more subject areas during their school years and about 75% attended academic summer programs. As a result of utilizing these options, 90% reported being at least somewhat challenged during high-school and 50% said they were very well challenged. Among those who reported being inadequately challenged, some chose to enter college early in order to access more advanced content.

In that same study most students (about 90%) reported finding meaningful friendships in school, although many SET members also found friends through extracurricular and summer experiences. A significant number of the students took part in challenging and prestigious national or international competitions during high-school (Muratori, 2004b). A separate study of middle-school students found considerably less satisfaction with their academic programs (Brody, 2004b), presumably because many of the accelerative options were not yet available to them and/or they had not yet received counseling about options from SET staff.

Specific accelerative strategies have also been evaluated. For example, early college entrance has been an important area of investigation since some SET students still look to this option as a way to escape age-in-grade instruction in their high-schools. In general, SET students who enter college early have been successful, both academically and socially, although there are exceptions (see, for example, Brody *et al.*, 1988). SET staff have authored reviews on early college entrance (Brody & Stanley, 1991; Muratori, 2003; Brody *et al.*, 2004) and a book is planned (Muratori, in press).

Since many high mathematical scoring SET students accelerate their mathematics programs, evaluating their progress in mathematics is crucial. Kolitch and Brody (1992) investigated achievement in mathematics among SET students who had entered their first year of college. Rapid advancement in mathematics was found to be a common practice in this group, with the typical student having taken calculus in Grade 9. Achievement and satisfaction in the group were high, although some students encountered difficulty locating high quality post-calculus instruction as high-school students. It is likely that the increase in distance learning opportunities since this study was done may have helped alleviate this problem.

Follow-up studies by SET researchers, as well as by researchers at Vanderbilt University, who are conducting a 50 year longitudinal study on students identified by SMPY (see, for example, Lubinski *et al.*, 2001), show SET students to be extremely successful, with some on their way to achieving eminence in their fields. The typical college-aged SET student attends a highly prestigious college or university, with the universities most frequented by SET members being Harvard, MIT, Stanford, Princeton, Yale and Caltech (Blackburn, 2004). SET members also pursue doctoral level degrees in exceptionally large numbers (Lubinski *et al.*, 2001) and attend the nation's most prestigious graduate institutions (Brody & Blackburn, 1996). By their mid-twenties many SET members have won prestigious fellowships, published scientific articles, written for literary publications, created video games and/or secured patents (Lubinski *et al.*, 2001). An impressive number of SET members are gaining tenure-track positions at prestigious universities or excelling in their chosen fields in other prominent ways. Of those currently in tenure-track faculty positions, mathematics is the field with the largest representation of SET students, although a significant number are completing graduate studies in other scientific disciplines and may garner tenure-track positions in the near future (Blackburn, 2004).

A final area of inquiry that warrants mentioning is that selected SET students have been included in a study of the role of genes in high intelligence. In the ongoing debate on the extent to which nature and nurture factor into the development of exceptional talent the study of DNA has opened new doors for research in this area (see, for example, Chorney *et al.*, 1998; Plomin, 1999).

Two pathways to educational challenge

Because research has shown that SET students are diverse in their abilities, values, interests, social skills and needs and the opportunities available in their schools and communities vary considerably, SET's approach in working with them is highly individualized, an approach we recommend for parents, educators and counselors who work with gifted students (Brody, 2004a). The importance of individualized programming is illustrated in the example that follows of two young men who qualified for SET, both of whom, coincidentally, scored 790 out of a possible 800 on the mathematical portion of the SAT at age 12. However, one had a much higher verbal score than the other. This factor, along with differing interests and opportunities, led to different choices and pathways.

'Thomas' worked with his parents on mathematics during elementary school without accelerating formally in any way at that time. In middle-school his high SAT-M score in the Johns Hopkins talent search caused everyone, his parents, teachers and guidance counselor, to take notice. He qualified for SET, was encouraged to join the mathematics team and skipped Grade 8 to enroll in an excellent mathematics/science magnet high-school. Since his SAT-V score was not exceptional for his age, he felt challenged by regular high school classes in the humanities, but he took 'Advanced Placement' courses in physics, biology,

chemistry and calculus with his magnet school peers. He sought additional courses through summer programs, worked on an individual research project with a mentor and became heavily involved in extracurricular science and mathematics competitions, where he garnered recognition at the national and international level. He entered college just 1 year younger than is typical, not especially accelerated in coursework, but having had exceptional research and problem-solving experiences through his involvement in activities and competitions.

In contrast, 'James' excelled in both mathematics and language arts from an early age. He attended an elementary school that allowed him to move at his own pace, and he accelerated dramatically. Approaching middle-school and way ahead of his age peers in skills and knowledge, he skipped Grades 5 and 6 and then supplemented his Grade 7 year with an advanced distance mathematics course. In the Johns Hopkins talent search he qualified for SET on both his mathematics and verbal scores, an indication of his exceptional abilities in both areas. In Grade 8 he took several courses at his local high-school and throughout high-school he took courses part-time at a local college. His extracurricular passion was music, leaving little time for the kind of mathematics or science competitions that 'Thomas' pursued, so he sought his academic challenge through college-level courses. He entered college 2 years younger than is typical, but with a large number of college credits behind him. Since he plans to pursue both his love of music along with academic subjects as an undergraduate, he still plans to spend a full 4 years in college before choosing a primary focus for graduate school.

Both of these two young men utilized a variety of resources and options to find the challenge they needed during their precollege years to help them achieve their potential, but they made different choices because of differing abilities, interests and opportunities. James accelerated more in coursework, while Thomas became more involved in research and competitions. Thomas also focused more on mathematics and science, which was his strength, while James needed advanced work in the humanities as well as mathematics and science. Ultimately, both were well served in high-school and are now excelling in college. Additional illustrations of the importance of responding to the individual needs of precocious students can be found in the stories of Terry Tao and Lenny Ng, two of Julian Stanley's most outstanding protégés (Muratori *et al.*, in press).

Conclusion

The premise behind the talent search model is to use above level assessments to identify students whose advanced cognitive reasoning abilities indicate they are ready to master more advanced content than is typically offered to students of their age. The role of SET is to work with the top scorers in the talent searches, the most exceptional students, and to help them find the resources they need to be educationally challenged, to reach their goals and to achieve their full potential. Since highly able students can be at risk of underachievement and of social and emotional difficulties if their needs are not met (Hollingworth, 1942), the work of

SET in serving these students can be crucial for their optimal personal and professional development.

The mission of SET, however, goes beyond helping individual students. SET hopes to impact on society by helping many of the world's most talented students excel. These students have the potential to be the problem-solvers of the future. Considerable evidence to date suggests that older SET students are well on their way to achieving impressive goals and making important contributions. Whether they cure diseases, invent new technologies or teach the next generation, society needs the energy, ideas and creativity that exceptionally talented individuals can offer. In addition, as we study these individuals over time, we learn more about critical factors in talent development, factors that are likely to be relevant to a much larger population than just those who are directly served by SET.

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