Opening Doors for the Gifted

A flexible curriculum will provide valuable learning options for gifted students, according to directors of the Study of Mathematically Precocious Youth at The Johns Hopkins University

By Camilla Persson Benbow and Julian C. Stanley

Three principles derived from the bedrock of developmental psychology have important implications for teaching and educational practice. First: learning is a sequential and developmental process. Second: there are large differences in learning status among individuals at any given age. In other words, although the acquisition of knowledge and the development of patterns of organization follow predictable sequences, the rates at which children progress through these sequences vary considerably. Finally, effective teaching involves assessing students' status in the learning process and posing problems that slightly exceed their level of mastery. Too-easy work produces boredom; too-difficult work cannot be understood. This can be referred to as a problem of matching.

These three principles have important implications when one works with intellectually talented students. Clearly, gifted students are not at the same level academically as their average-ability classmates, nor do they work at the same pace. To learn effectively, the gifted child needs to be offered material slightly beyond what has already been mastered. What is offered in the regular classroom cannot possibly meet this requirement. Thus, the curriculum must be adapted to match the gifted child's developmental stage and special abilities. On the basis of over 10 years of experience with thousands of intellectually talented students, the Study of Mathematically Precocious Youth (SMPY) believes that curricular flexibility, rather than change, seems the best approach.[1]

Identification and characterization

Before the curriculum can be adapted for gifted students, they must be identified in a systematic manner. Teacher recommendation has been shown to be ineffective. Thus, SMPY developed the concept of an annual mathematics talent search and conducted six separate searches in the Middle Atlantic area from 1972 to 1979. In each talent search, 7th (and in early years 8th) grade students, already known to have scored in the top three percent in mathematical ability on standardized in-grade achievement tests, took the College Board Scholastic Aptitude Test (SAT), mathematics (SAT-M) and verbal (SAT-V) sections. The SAT is designed to measure the mathematical and verbal *reasoning* ability of able 11th and 12th graders. SMPY's primary criterion for mathematical aptitude was a high score on the mathematical part of the SAT. Obviously, SMPY searches for already developed mathematical *aptitude*.

We found our seventh grade students scoring as well as or better than a national sample of high school students. Moreover, there was a large difference between boys and girls in mathematical reasoning ability.[2]

The first six latent searches were conducted to seek young people who reason extremely well mathematically. The purpose was to find suitable students with whom to develop educational principles, practices, and techniques that schools themselves could adapt to their own needs. In the seventh talent search, conducted in January 1980, SMPY relinquished that important service function to a newly-created agency under the provost of Johns Hopkins. This was called the Office of Talent Identification and Devel-

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opment (OTID), now named the Center for the Advancement of Academically Talented Youth (CTY). CTY does not, however, search only for mathematically talented students. It adapted the talent search model to also discover verbally and/or generally talented students. That program is being described in a separate article in this issue of *American Education.*

As part of the model developed by SMPY, students who score extremely well on the SAT were brought back for further testing with a battery of cognitive and evaluative measures. We found that mathematically precocious students are also advanced in their specific abilities and in their knowledge of science and mathematics. Moreover, they are generally more inter-personally effective and socially mature than their nongifted peers and thus more likely to face successfully the social and emotional challenges presented by their unique talents. Mathematically precocious students have high theoretical but low religious orientation. They prefer investigative careers.

Our mathematically talented students generally come from larger than average families with well-educated parents pursuing high-status careers. Student SAT scores did relate positively to their parents' educational level and fathers' occupational status, but not to the number of siblings in the family or sibling position.

Most SMPY participants do well in school, in mathematics, and in science and exhibit a strong liking for those subjects. Yet students with the highest aptitude showed a trend for liking school less than students with somewhat less aptitude.

Educational options for the gifted

Through such careful testing and assessment of backgrounds, each highly able student is carefully characterized. Their resulting cognitive, evaluative, and achievement profiles help us design an appropriate educational program for virtually every one of them. Each is offered a smorgasbord of educationally accelerative opportunities from which to choose. Some of the options are: skipping grades; graduating a year early from high school; entering a course or several courses a year or more early; completing two or more years of a subject in one year; being tutored via SMPY's diagnostic testing followed by a prescriptive instruction approach; taking regular college courses on a part-time basis while still enrolled in a secondary school; earning credits through examination; and earning the master's degree concurrently with the bachelor's. Thus, SMPY utilizes already available educational options but adapts them to the needs of talented students.

The chief exception to this approach are the fast-paced mathematics and science classes pioneered by SMPY. Here, several years of mathematics are completed in one year or summer. A high school science class can be covered excellently in three intensive weeks during the summer. Our key to accomplishing such results is that we teach youngsters only those things they do not yet know, which is discovered through diagnostic testing. Then, through prescriptive instruction, concepts not yet mastered are covered.

Through curricular flexibility, academically advanced students need to be identified early and helped to progress

SMPY proceeds via the individually talented youth and his or her parents and teachers. No attempt is made to change the school's programs. Curriculum revision would take far more time and resources than SMPY could possibly muster. At best, it would probably benefit only the intellectually talented youth's younger siblings or perhaps his or her children, not the talented person here and now. Programmatic efforts by others are essential, but SMPY is content with the results secured thus far for individuals eager to move ahead faster and better than the usual school curricula permit. In so doing, precedents are set. Thus, special facilitation becomes easier for the next qualified youth. The effectiveness of this approach is vouched for by the numerous school systems that have adopted and adapted some of SMPY's procedures.

To best give the reader the flavor of what is done, we will present a case history. This is an extreme example of precocity and achievement. It readily illustrates, however, what can be accomplished by highly able students when they are given flexibility.

Colin Farrell Camerer, born December 4, 1959, is the only son in an upper-middle class family of four children. As an accelerated 8th grader in SMPY's 1973 Talent Search, Colin achieved close to the top score of SAT-M and an extremely high score on SAT-V. Through SMPY's first fast-paced mathematics class, which began when he had just finished the 6th grade, Colin learned 4½ years of pre-calculus mathematics in 14 months of chiefly two-hours-per-week sessions. He skipped four grades in junior and senior high school and entered The Johns Hopkins University with sophomore standing through course work in the Advanced Placement Program and college credits earned while attending grades 8 and 11. In high school he participated in wrestling, the TV quiz team, and student government. At barely 17, Colin finished his work for the B.A. degree in quantitative studies at Johns Hopkins after only five semesters. During his undergraduate years, he was on the Hopkins varsity golf team, was described as an "all-rounder," and held a variety of jobs, including summer work as an associate editor of a weekly newspaper. His hobbies include skiing, tennis, golf, horseracing, and writing. In September 1977 Colin went to the University of Chicago and earned his M.B.A. degree at 19 and a Ph.D. in finance at barely 22.

When only 21 years old, and with several research publications already to his credit, he became an assistant professor in the Kellogg Graduate School of Management at Northwestern University and a consultant to businesses.

Acceleration

The above case study readily illustrates that SMPY's educational method relies heavily on acceleration. Much concern has been expressed about the presumed dangers of acceleration, especially with respect to social and emotional development. SMPY conducted and commissioned several studies on the effects of acceleration. Not one of these lent support to the notion that acceleration can cause difficulties for able students. Use of acceleration continues to be supported by research results.[3]

Readers may wonder, "Why hurry?" One part of the answer is that boredom stifles interest and sharpness of thinking. Moreover, accelerated youths who reason extremely well mathematically will tend to go much farther educationally, in more difficult fields and at the most demanding universities, than if they were left age-in-grade. They will tend to get an outstanding education before entering the job market at an early age. This enables them to be fully functioning professionals during their peak mental and physical years. Both creative contributions and those of the "normal scientist" are likely to be enhanced greatly by the better base laid earlier and by the in-depth pursuit of important special fields.[4] Finally, Zuckerman[5] found that a common thread among Nobel laureates was their systematic, long-term accumulation of educational advantage. Accelerating a student's education is such an advantage.

The "700 M's"

As mentioned earlier, SMPY no longer conducts the talent searches and associated educational programs. CTY at Johns Hopkins does. One of SMPY's chief activities since November 1980, however, has been to find, across the country, boys and girls who before their 13th birthday score at least 700 on SAT–M. Students older than 13 must score at least 10 points more on SAT–M per month or fraction of a month they are beyond 13 years. Only five percent of college-bound 12th grade males and one percent of college-bound 12th grade females score that high. Yet in two years we have found 165 boys and 12 girls who qualify. They come from across the nation and represent approximately the top 1-in-10,000 in mathematical aptitude. These students are being worked with intensively by the staff of SMPY to ensure that they receive an appropriate education.

This special talent search is conducted simply. Any interested youth may secure from a senior high school a copy of the official SAT practice booklet, "Taking the SAT," study it, take the test, and if the score on SAT–M is at least 700, send a copy of the score report to SMPY, Department of Psychology, The Johns Hopkins University, Baltimore, MD 21218.

Conclusion

We conclude that academically advanced students need to be identified early and, through curricular flexibility, helped educationally in major ways. Rather than providing special programs, it is better to allow students to advance to a level of the curriculum commensurate with their abilities. Thus, instead of having teachers of the gifted, we need coordinators of educational opportunities for the gifted. Moreover, Julian Stanley has proposed longitudinal teaching teams in each subject matter. Thereby each student could advance at his or her own pace within each subject. Yet SMPY's most salient finding from working with 35,000 gifted young students over a ten-year period is that school systems need far more curricular flexibility than most of them have. ■

NOTES

[1]For further information see Camilla Benbow and Julian Stanley (eds.), *Academic Precocity: Aspects of its Development,* Baltimore, MD: The Johns Hopkins University Press, in press; Julian Stanley and Camilla Benbow, "Educating Mathematically Precocious Youths: Twelve Policy Recommendations," *Educational Researcher,* 1982, *11* (5), 4-9; Julian Stanley and Camilla Benbow, "Using the SAT to find intellectually talented seventh graders," *College Board Review,* Winter 1981–82, No. *122,* 2–7, 26.

[2]This conclusion was documented in Camilla Benbow and Julian Stanley, "Sex differences in Mathematical Ability: Fact or Artifact?", *Science,* 1980, *210,* 1262–1264; Camilla Benbow and Julian Stanley, "Mathematical Ability: Is Sex a Factor?", *Science, 212,* 118–119; Camilla Benbow and Julian Stanley, "Consequences in High School and College of Sex Differences in Mathematical Reasoning Ability: A Longitudinal Perspective," *American Educational Research Journal,* 1982, *19,* 598–622.

[3]A collection of studies evaluating the effects of acceleration can be found in William George, Sanford Cohn, and Julian Stanley (eds.), *Educating the Gifted: Acceleration and Enrichment,* Baltimore, MD: The Johns Hopkins University Press, 1979.

[4]See Thomas Kuhn, *The Structure of Scientific Revolutions* (2nd ed.) (International Encyclopedia of Unified Science, Vol. 2, No. 2), Chicago, Ill.: University of Chicago Press, 1970.

[5]See Harriet Zuckerman, *Scientific Elite: Nobel Laureates in the United States.* New York, NY: Free Press, 1977.