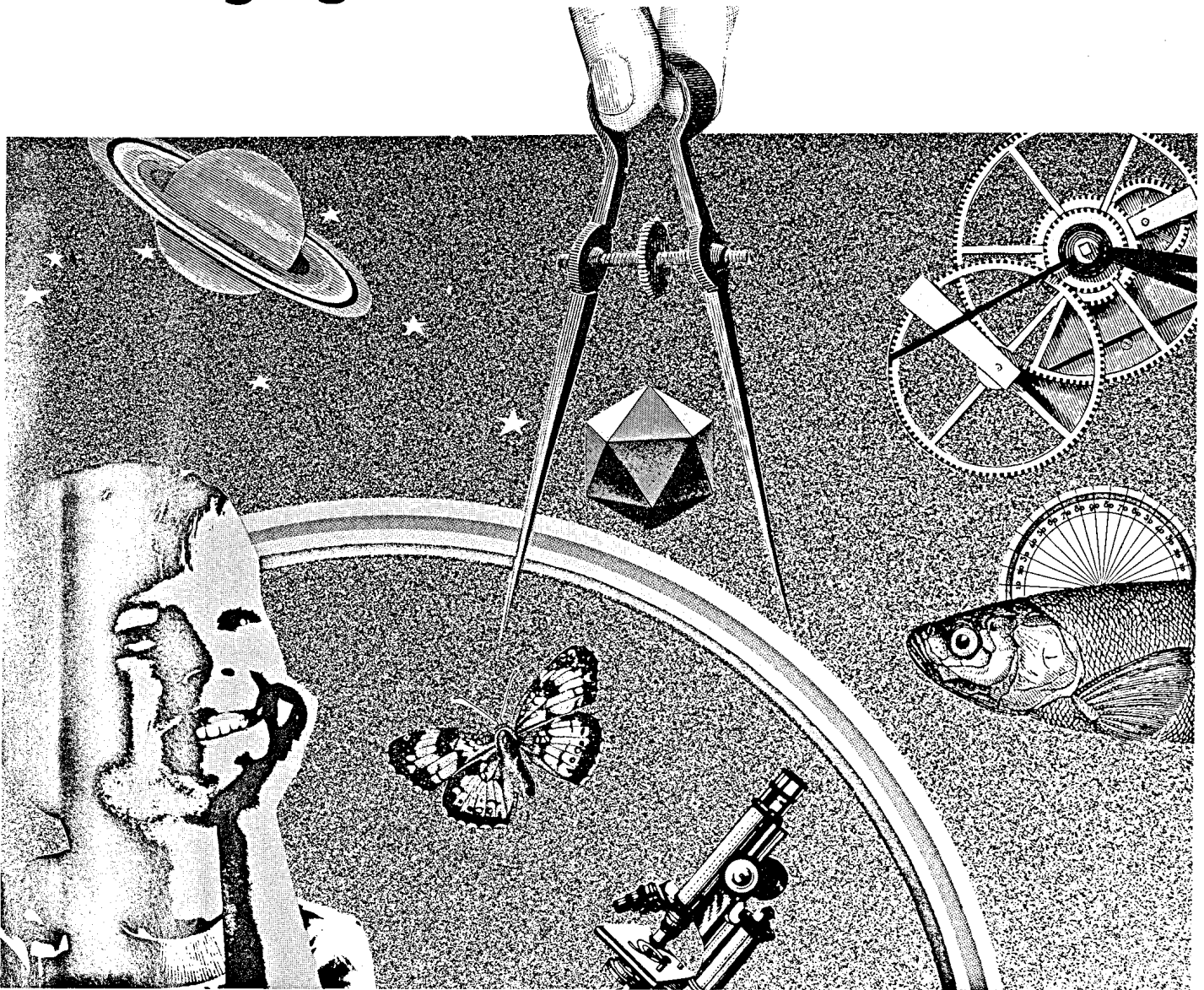


Challenging Gifted Students



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talented students becomes an even greater national concern. What model programs exist for these students, and further, given the critical teacher shortage mentioned, what can school districts do with scarce fiscal and human resources?

While the selection process, funding structure and target populations may vary, programs for gifted math and science students share several important characteristics—rapid pace and highly focused instruction.

An early prototype and perhaps the most widely known and replicated program used by individual schools, school systems and state departments of education was designed by Julian Stanley, director of the Study for Mathematically Precocious Youth (SMPY) at the Johns

Hopkins University. Stanley began his work in 1969 with one precocious Baltimore boy who scored 699 on the SAT-M when he was 13 years old. Since then, the program has grown to involve more than 3,500 students in longitudinal studies of precocity in mathematics, enabled many prodigies to leapfrog grades to graduate from college or graduate school before the age of 18 and led to national talent searches for both mathematically and verbally precocious students. About 16,000 students of seventh-grade age from the mid-Atlantic states are involved each year in talent searches coordinated by the Office of Talent Identification and Development at the Johns Hopkins University. Similar searches are conducted by Duke University (Durham, North Carolina), Arizona State University (Tempe, Arizona) and Northwestern University (Evanston, Illinois). Students must score

500 or above on the SAT-M to qualify for math programs; 630 or above on the SAT-V to qualify for foreign language and writing courses; and 700 or above on the SAT-M to qualify for fast-paced summer residential academic programs conducted by Duke and Johns Hopkins. Fast-paced biology and chemistry sessions are also offered at Johns Hopkins.

By giving 12-year-old students who score 500 or above on the SAT-M only the instruction they need and using skilled mentors (frequently slightly older, similarly talented students), Stanley has found students can master Algebra I in about 15 hours. One third of these students can master Algebra 2, Algebra 3, plane geometry, trigonometry and analytical geometry with only 35 hours of instruction. Stanley estimates this is less than six percent of the time normally required to

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by Cindy Tursman, Managing Editor, AASA

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prepare high school students for calculus. Completion times for highly able students involved in Stanley's intensive summer programs are even shorter, Stanley says.

Instruction is highly focused—Stanley uses diagnostic testing followed by prescribed instruction—to save students hundreds of hours of classroom “incarceration.” This time can be better spent on related subjects such as physics, computer science or accelerating progress through high school and college, according to Stanley, “so students can devote their most productive years to research.”

Stanley encourages local school systems to help students enroll in Advanced Placement (AP) and college courses. He also recommends mentors be found for exceptional students and points out that mentors can be math teachers, undergraduate or graduate students or even able older students. “SMPY's youngest paid mentor to date was only 10 years old,” Stanley says, “his pupil was six.” Stanley has even set-up “calculus mentors by mail” for exceptional students.

Stanley says he occasionally encounters resistance from educators who question the validity of standardized tests, feel every child should be required to take a year of algebra, no matter how unnecessary, or think that being in class will somehow be good for a student's social and emotional development. “It makes no sense, however, to allow youths who have valuable ability to languish in what are, for them, painfully slow-paced mathematics and science classes,” Stanley says. Moreover, studies of SMPY students by Solomon and George and others show these fast-track students experience little social or emotional difficulties in college classrooms and their scholastic performance surpasses their equally talented, but underchallenged peers.

Based upon his research and work with gifted students, Stanley recommends early identification of gifted students and allowing students to take courses appropriate to ability and achievement level, regardless of age. Stanley reports that a program for preschoolers at the University of Washington has achieved “radically accelerative as-

pects, surpassing even SMPY's emphasis on educational acceleration.”

SMPY Spin-offs

As Stanley's work has become nationally known, hundreds of seventh-graders have taken advantage of a “smorgasbord of accelerated opportunities,” and spin-offs of Stanley's model have cropped up in Carrol County, Maryland; St. Paul, Minnesota; Chicago, Illinois; Berkeley, California, and elsewhere.

His work has also heightened interest in sex differences in mathematical reasoning (the ratio of boys to girls who score 700 or more on the SAT-M, for example, is 14 to 1), societal factors, brain symmetry (left-right brain hemisphere functions) and biological factors which may affect learning. Stanley has found, for example, that girls who score extremely high on math reasoning also have high verbal scores, whereas this is not necessarily true of boys. This would seem to support other research findings which suggest girls' brains are not as asymmetrical or specialized as boys' in using the right hemisphere to process spatial and other nonverbal information.

Lynn Fox, also with the Johns Hopkins University, has conducted numerous studies concerning role models and the genesis of mathematical aptitude and achievement in girls. In one investigation of students who participated in the Hopkins summer fast-paced programs, Fox found girls were less confident in their mathematical ability than boys and more risk adverse (less willing to compete in math competitions, for example). Stanley also says fewer girls than boys attend the special sessions even though they are equally qualified, and many of the girls shy away from competitive situations. Fox suggests females be taught mathematics in a more “social,” less analytical manner. These and other findings suggest areas for further research in both environmental and biological factors which may affect cognition.

Coordinated through the State Department of Education and nine regional service centers, the state of Illinois offers fast-paced math classes in area colleges

and universities to students who score 430 or above on the SAT-M. Seventh or eighth grade students attend university campuses one-half day per week. In the Chicago area, for example, approximately 200 students are enrolled in such classes. Richard Ronvik, director of gifted and talented programs for the Chicago Public Schools, says that while initially there was some resistance to granting high-achieving students high school diplomas, administrators and teachers gradually came to see that doing so was in the best interest of the students and the school system. Other programs in Chicago include courses provided by ten museums for gifted seventh through twelfth grade science, humanities and art students. Math and science students must score 450 on the SAT-M to qualify for special classes at the Adler Planetarium and Shedd Aquarium. Programs for K-8 students include full-time programs at four area high schools (schools within schools). Approximately 1,500 students attend these schools which emphasize a classical education, including instruction in Latin and Greek. Some 500 pull-out programs in individual schools throughout the city are also available for students who score in the top five percent on standardized tests.

John Lunny, math supervisor for the Charles County Schools in Maryland, pioneered a SMPY spin-off for eighth grade students who score an aggregate of 80 or above on the PSAT. The classes began with volunteer teachers from industry but are now taught by certified math teachers and college professors. Students attend evening classes in high school and college algebra, computer science and calculus and compete in math contests. Students may transfer credits earned at Charles Community College to four-year institutions. About 25 students in the 17,000 student district participate in the program per year.

Another SMPY spin-off, once handled by the Minnesota State Department of Education, but now coordinated through the University of Minnesota, involves gifted science and math students in an after school program taught by high school teachers and university professors.

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A five-year program and fast-paced classes are designed for about 1,200 students at the Duluth and St. Paul campuses.

Other Programs

A countywide school for gifted fourth through eighth grade students in Sarasota, Florida, provides flexible scheduling, grouping by ability, accelerated classes, inter-discipline study and early graduation. Students must meet a variety of entrance criteria, including IQ scores of 130 or above. Students may attend classes at other high schools or area colleges and universities. John Woolever, principal of the Pine View School, says high school students are active in professional experience programs which enable them to serve internships with doctors, lawyers, marine biologists and other professionals. Students built a boat equipped to study marine biology that is used by all students in the county and attend summer institutes at the Mote Marine Laboratory. Woolever says one recent graduate with a entrepreneurial flare opened a computer business in Sarasota upon graduation.

(Pine View began through a grant under the 1965 Elementary and Secondary Education Act and was the first federally funded program for the gifted in the United States.)

In addition to regular classes and supplemental experiences for gifted students, many schools districts are finding creative solutions to the critical need for special programs for gifted math and science students. The Montgomery County, Maryland schools, for example, recently transformed a closed school into a center for special and interrelated studies which emphasizes math, science, computer and art experiences for gifted students.

Gifted seventh and eighth grade science and math students in White Bear, Minnesota, can attend "high potential" classes at Central Junior High School. About 120 students each year are involved in the program which emphasizes accelerated progress, logic and latitude for decision making, according to Roger Worner, assistant superintendent for curriculum.

Students may also attend classes at two area high schools. Similarly, high

school students are enrolled in college math and science classes offered at off-site locations of the University of Minnesota. Five or six students in the district graduate early from high school each year.

The Albert Schweitzer Program, designed for K-12 gifted students to identify and solve problems in their own communities, is coordinated through the Minnesota State Department of Education. Lorraine Hertz, who heads up the project, formerly directed an after school project for science students based upon Stanley's model. The Schweitzer program is the second phase of the Minnesota Future Problem Solving Program, initiated by the department of education and the Honeywell Corporation. The first phase trained 390 educators in problem-solving techniques to teach their students. "Perhaps the gifted student programs have been slightly self-centered," Hertz says. "Now it is time to complete the circle and demonstrate to gifted students that they can experience as much pleasure from helping others as in helping themselves." Students will use problem-solving techniques to identify strategies and people to tackle problems in their schools and communities.

In 1982, students in one fourth of the nation's high schools took the annual college-level AP examinations in 12 subject areas. Individual teachers and school administrators in such communities as Huntsville, Alabama; Hutchinson, Minnesota; Hinesburg, Vermont; Oklahoma City, Oklahoma; Pendleton, South Carolina, and elsewhere have started their own AP programs, frequently with no outside resources other than their own initiative, time and talent. In Hutchinson, Minnesota, for example, a high school biology teacher who tutored students on his own time, later received funding support. Due to his successful program, the high school now has AP classes in English, mathematics and other courses as well as a teacher training component. Donn Hoffman, director of curriculum and instruction for the high school, says the success of the program hinged on four ingredients: administrative support for its expansion; key teachers who were recruited to teach classes; teacher training

and teacher autonomy to develop courses.

Science Centers

Science centers across the country, including the Science Resource Center (Meza, Arizona, Public Schools), Talcott Mountain Science Center (Avon, Connecticut) and the Maryland Science Center (Baltimore, Maryland) offer rays of hope for gifted math and science students, despite dismal forecasts concerning math and science education. (See accompanying story.) Every year, for example, more than 2,000 above-average students attend accelerated math and science courses designed by the Maryland Academy of Sciences, Baltimore. Special seminars are offered at the Maryland Science Center and colleges throughout the state for two "tracks" of gifted students: those who score above the 90th percentile on standardized tests, have IQ's of 120 or better and A's and B's in science and math-related subjects; and students who are under the age of 14, place above the 97th percentile and are considered scientifically and mathematically precocious. The classes are open to public, private and parochial school students.

Every year, an advisory committee of scientists, teachers, principals, science supervisors and academy personnel reviews evaluations and future course plans. Instructors for all programs are practicing professional scientists and science educators. Eleventh and twelfth grade students are exposed to an in-depth study that emphasizes laboratory work with a scientist. Recent courses have included digital electronics, architecture, astronomy, symbolic logic and microbial ecology.

In 1980 the director of the Department of Education's Office of Gifted and Talented estimated that of the 2½ million gifted and talented children in the nation, only about 12 percent are provided with the types of accelerated programs they require. The programs mentioned here are just a few of the ways scientists and educators are working together to beat the odds and increase the probability exceptional students will lead fulfilling lives and make outstanding contributions to society. □