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AUTHOR	Stanley, Julian C.
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ABSTRACT

This paper contains a brief description of the founding and early years of the Study of Mathematically Precocious Youth (SMPY) from 1968 to the present. Several of the guiding principles behind SMPY are discussed. SMPY led to the formation of strong regional, state, and local centers that now blanket the United States with annual talent searches and academic summer programs. Among their main tools are the assessment tests of the College Board including the SAT, high school achievement tests, and Advanced Placement Program (AP) examinations. Identifying, via objective tests, youths who reason exceptionally well mathematically and/or verbally is the initial aim of SMPY and its sequels. The 12- or 13-year-old boys and girls who score high are then provided the special, supplemental, accelerative educational opportunities they sorely need. (Contains 42 references.) (Author/NB)

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In the Beginning: The Study of Mathematically Precocious Youth (SMPY)

Julian C. Stanley

Johns Hopkins University

Abstract

This is a brief description of the founding and early years of the Study of Mathematically Precocious Youth (SMPY) from 1968 onward. Several of its guiding principles are discussed. SMPY led to the formation of strong regional, state, and local centers that now blanket the United States with annual talent searches and academic summer programs. Among their main tools are the assessment tests of The College Board: SAT, high school achievement tests, and Advanced Placement Program (AP) examinations. Identifying, via objective tests, youths who reason exceptionally well mathematically and/or verbally is the initial aim of SMPY and its sequels. The 12- or 13-year-old boys and girls who score high are then provided special, supplemental, accelerative educational opportunities they sorely need.

I thank Camilla Benbow, Carol Blackburn, Linda Brody, Susan Hellerman, Daniel Keating, and Barbara Stanley for their helpful comments. This is scheduled to appear in a volume entitled Psychometric and social issues concerning intellectual talent, edited by Camilla P. Benbow and David Lubinski and to be published by the Johns Hopkins University Press.

SMPY began on 1 September 1971 as the result of a serendipitous occurrence almost three years earlier. Rising eighth grader Joseph Louis Bates had been observed during the summer of 1968 by Towson State University computer science instructor Doris K. Lidtke, who was helping with a summer computer science program for local kids at Johns Hopkins University. She called his extreme intellectual precocity to my attention and sought my assistance. I was somewhat hesitant and perhaps even reluctant at first to get involved: there were too many other pressing duties. But I did, and my life and career were never to be the same again.

In January of 1969, then, I was faced with the challenge of Joe and how to help him. I had little knowledge to draw upon, since up until that time most of my work was limited to measurement issues. I let my interest and expertise in measurement guide me. Thus, I decided to administer to Joe the College Board Scholastic Aptitude Test (SAT), several College Board achievement tests, and some other standardized exams, because I felt that I needed to know more about Joe in order to work effectively with him. It seemed to many then, including myself, that this was a bold, perhaps even rash, move. After all, Joe was only 13 years old. At the same time, he was taking college courses. My reasoning was that, if he could handle college level material, then why not college-level tests?

My hunches did not lead me astray, fortunately. His scores were startlingly excellent. This sparked my interest and commitment. I began casting around for high schools, public or private, that would allow him to take mainly eleventh and twelfth grade Advanced Placement Program or honors courses. Principals and headmasters thought this a ridiculous suggestion (probably as ridiculous as taking college-level tests!), so--quite reluctantly--Joe, his parents, and

I decided to let him try being a regular student at Johns Hopkins--seemingly an even more ridiculous suggestion. We feared that he would find the courses that seemed best for him initially (calculus, computer science, and physics) too difficult, but our options were severely limited. Yet, to our great surprise and pleasure, Joe thrived and went on to receive his B.A. and Master's degrees in computer science at age 17. Then, still 17, he became a doctoral student at Cornell University. Today, more than 25 years later, Dr. Bates is an outstanding researcher, striving at Carnegie Mellon University to bring drama to "virtual reality" (see Peterson, 1992).

Joe's success as a freshman started me thinking, but I remembered the old proverb, "One swallow does not make a spring." Fortunately, Jonathan Middleton Edwards and his mother entered the scene, having heard of Joe. They insisted that 13-year-old Jonathan be given the same opportunities Joe was receiving. I was skeptical at first, but extensive testing and summer courses taken in 1970 by Jonathan convinced me that he was as academically promising as Joe. Jonathan, too, made excellent grades, majored in computer science, and in 1974 became an independent computer consultant. Today he is the technical wizard of a large computer software company he helped found.

The success of Joe and Jonathan encouraged me to embark upon a new line of scientific inquiry.

The Founding of SMPY

These experiences, together with my long-term but almost latent interest in intellectually talented youths (e.g., see Stanley, 1954), made me receptive in 1970 to a call for grant proposals from the newly formed Spencer Foundation. It had plenty of money but no established list of potential grant seekers, whereas I had some tentative ideas about how to find "youths who reason exceptionally well mathematically" and to provide them the special, supplemental, accelerative educational opportunities they sorely need and, in my opinion, richly deserve for their own development and the good of society. My 4.5-page, double-spaced proposal won a $266,100 five-year grant, ending in 1976. Generously, the Spencer Foundation renewed its support until 1984, but at lower levels. With that the Study of Mathematically and Scientifically Precocious Youth (SMSPY) was born. (Shortly thereafter, the "and Scientifically" was dropped, because mathematical reasoning ability is prerequisite for most scientific achievement nowadays.)

From the pool of applicants for graduate study in the Department of Psychology at Johns Hopkins in 1971 I recruited two outstanding doctoral aspirants, Lynn H. Fox and Daniel P. Keating. Both earned their Ph.D. degrees under my direction in three years while spending an enormous amount of time and high-level effort developing SMPY (e.g., see Keating & Stanley, 1972; Stanley, Keating, & Fox, 1974; Keating, 1976; and Fox, Brody, and Tobin, 1980).

For awhile, during the fall of 1971, we located math-talented boys and girls via local publicity. Then, in March of 1972, Dan, Lynn, and I conducted a mathematics and/or science talent search involving 450 youths (7th and 8th graders) of upper-5% ability in the Greater Baltimore area. Its success was much more than anticipated by any of us (see the photographs), and we became committed to talent searching. In the next, what came to be annual, 1973 search we added SAT-Verbal. We realized that use of mathematical reasoning ability is mediated by verbal reasoning ability, which SAT-V measures. From this rather humble beginning the talent search concept began to grow and blossom, and its influence spread (see chapter by Van Tassel-Baska in this volume).

Over the next two decades the talent search was to become one of the most frequently used identification procedures for gifted students in the U.S. Student participation grew from 450 to 150,000 students annually, with the geographic area covered expanding as greatly. Now the whole nation and some foreign countries are participating. Moreover, to the present, nearly all academic talent searches in the United States and elsewhere rely heavily on our choice of instrument--the SAT or, in some searches, the American College Testing Program (ACT) battery. Even the definition of a mathematically precocious youth (i.e., a boy or girl who scores at least 500 on SAT-M before age 13) has been adopted widely, as has the definition of a verbally precocious youth (i.e., one who scores at least 430 on SAT-V before age 13). Each of those two scores defines at least the top 1 percent of that age group. But now I have run ahead of my story.

Early Offshoots of SMPY

At first, verbally talented individuals were not served by SMPY. This was an omission with which we felt uncomfortable. Thus, we helped form at Johns Hopkins another group, the Study of Verbally Gifted Youth (SVGY), to serve such students. It won a large grant from the Spencer Foundation to study youths who reason exceptionally well verbally. That lasted from 1972 until 1977, at which time the grant was not renewed (see McGinn, 1976, and Stanley, George, & Solano, 1977). A few years later, after a stopgap arrangement, interest in serving the verbally precocious manifested itself fully again, but now with a different organization, a sequel to SMPY. We shall return to that story later.

The Intellectually Gifted Child Study Group (IGCSG), created by Dr. Lynn H. Fox in 1975, also was an outgrowth of SMPY and is an integral part of its early story. It flourished for several years with Spencer Foundation support, focusing its work on gifted females and then on learning-disabled gifted students (e.g., Fox, 1976; Fox, Benbow, & Perkins, 1983; Fox, Brody, & Tobin, 1980, 1983). IGCSG closed its doors upon Dr. Fox's departure from Johns Hopkins in 1982, but its legacy has continued.

Educational Intervention: The Evolvement of Fast-Paced Classes

Identification and description are insufficient if we are to help precocious youth develop their abilities optimally. Identified students need to be served; they require some forms of educational intervention, not unlike students at the other end of the ability continuum. This leads to another strand of the SMPY story, a strand that developed in tandem with identification and became an integral part of the fabric uniquely known as SMPY.

By June of 1972, it had become clear that we needed to do something for the children identified as mathematically precocious. Thus, in haste, we decided to create a special, fast-paced mathematics class for the mathematically ablest young students we had found. Joe Bates' chief mentor in the seventh and eighth grades, Paul R. Binder, was to teach this, but instead brought along Joseph R. Wolfson to take over. Mr. Wolfson, a physicist by training who after obtaining his Master's degree from the University of Chicago discovered while conducting the class that he preferred to teach mathematics, worked expertly with about 20 boys and girls, most of whom had just completed the sixth grade. All were of top 1 percent ability mathematically and also verbally or in nonverbal reasoning. The class was a huge success (Fox, 1974; Benbow, Perkins, & Stanley, 1983; Swiatek & Benbow, 1991b) and was followed by a string of successful classes.

As we continued to conduct talent searches for ever-larger numbers in 1972, 1973, 1974, 1976, 1978, and 1979, we experimented incessantly with many different ways of speeding up the learning of mathematics from algebra through Advanced Placement Program Level BC calculus (two semesters of college credit), as well as the learning of biology, chemistry, and physics (Fox, 19774; George & Denham, 1976; George, Cohn, & Stanley, 1979; Benbow & Stanley, 1983a; Stanley & Benbow, 1986; Stanley & Stanley, 1986; Stanley, 1976, 1990, 1993). This led to refinement and extension of our procedures. We also experimented with other forms of acceleration, or curricular flexibility (what came to be our preferred term), to develop what we called the SMPY smorgasbord of accelerative opportunities (Stanley & Benbow, 1982).

Large-Scale Spread and Extension of the SMPY Model

My wife for 32 years died in late 1978. She had been ill with mestasticized breast cancer for nearly six years. I was exhausted from teaching my university classes, looking after her, expanding SMPY, and developing the SMPY model. Thus, in 1979, I went to President Steven Muller of Johns Hopkins and, in 15 minutes, arranged to create at Johns Hopkins, independent of SMPY, the Office of Talent Identification and Development (OTID) to take over operational aspects. Its first director was William C. George, a long-time staff member of SMPY. Later, OTID was renamed the Center for the Advancement of Academically Talented Youth (CTY) and the directorship turned over to Dr. William G. Durden (its current director). Starting in 1979, OTID took off like a rocket in January of 1980 with an expanded talent search, now including verbal and general ability. The first residential program of fast-paced courses followed that summer. CTY has expanded ever since, now serving over 60,000 young boys and girls each year in its talent searches and over 4,000 in its summer programs, which offer a great variety of courses.

Soon thereafter, SMPY helped the other regional talent searches get started, at Duke University, Northwestern University, and the University of Denver. Also, it helped create programs in Illinois, Minnesota, Wisconsin, Arizona, California, Pennsylvania, Iowa, Indiana, Texas, North Carolina, China, Australia, Costa Rica, Germany, Ireland, and Spain. SMPY itself also continued programmatic work, but chiefly on behalf of youths who before age 13 score extremely high on SAT-M (≥ 700): 1 in 10,000 of their age group. This came to occupy much of my time, and continues to do so.

There are two establishments, created rather late in SMPY's evolvement, that need to be singled out and noted at this point. They are the ones that will continue SMPY's work and move it into the next century. SMPY at Iowa State University was established in 1986 when my long-term student and colleague, Dr. Camilla P. Benbow, moved there. Not only does SMPY at ISU conduct, through the Office of Precollegiate Programs for Talented and Gifted, a talent search and several educational programs based on the SMPY model, it is also carrying out the SMPY longitudinal research program (see #7 below). The vast SMPY data base, currently with an N of 5,000, is located there and being augmented annually (see the description provided in Benbow et al., this volume, and Lubinski & Benbow, 1994). This longitudinal study is the largest of its kind in the world, even exceeding the classic Terman Genetic Studies of Genius (Oden, 1968). It provides much of what we know about the characteristics of gifted students today, their needs, and their development. Finally, Dr. Linda E. Brody established the Study of Exceptional Talent (SET) in 1991 at Johns Hopkins' CTY. As described in her chapter (Brody & Blackburn, this volume), intensive counseling and facilitation of this country's mathematically and verbally ablest youth, done in an individualized manner, is being continued there.

Some of SMPY's Chief Principles

It might be profitable at this time to step back and reflect on SMPY's accomplishments. SMPY's work has now spanned more than two decades, and its influence is wide-spread. During this time we have learned much about mathematically precocious youth and how to help them. What are some of the most important principles derived from SMPY's work? They are delineated below:

1) It is crucial to find--via systematic, objective, well-focused procedures--youths who reason exceptionally well in the content domain of your specific interest. For SMPY, this was mathematics. The annual talent search among a given age group, such as seventh graders (in whom SMPY specializes), seems essential. Yet, with their exclusive use of a mathematics and a verbal assessment, the talent searches miss one group of talented students crucial for the continued progress of this nation. They are the spatially gifted (see the chapter by Humphreys and Lubinski, this volume). This omission needs to be addressed. Nonetheless, the principle remains the same: if you want to make rabbit stew, first catch a rabbit. Otherwise, you'll have squirrel stew, skunk stew, or no stew.

2) Thus far, SAT-M, augmented by SAT-V, provides the most secure, appropriately difficult way to assess the quantitative aptitude of upper-3%-ability 12-year-olds. CTY and others (e.g., Lupkowski & Assouline, 1992) are using the Secondary School Admissions Test (SSAT) and other exams at above grade level at younger ages (Mills, Ablard, & Stumpf, 1993; Stanley, 1994). Moreover, spatial ability (e.g., the ability to rotate objects in space mentally) also is currently assessed in already identified

mathematically talented students (i.e., SAT-M $\geq$ 500), and its predictive value above SAT-V is being determined (Benbow & Lubinski, 1994). It will be interesting to learn how useful these approaches will be.

3) Besides the test-based systematic talent-search concept, wherein each student's abilities are carefully assessed, perhaps the virtually unique contribution of SMPY has been its emphasis on acceleration in its many forms and on fast-paced academic courses. In the latter, students are individually and quickly paced by a mentor through a standard high school subject, such as first-year algebra, biology, chemistry, or physics (see Lynch, 1992). Appropriately gifted students can master a whole year of high school subject matter in three intensive summer weeks. Of course, it is essential that this involve appropriate articulation of out-of-school academic experiences with the relevant in-school courses. For example, the student who masters Algebra I in three summer weeks should move into Algebra II that fall. Those who master first-year high school biology should move into AP biology that fall to work for college credit, or find some other advanced science experience.

4) SMPY emphasizes subject-matter acceleration more than gradeskipping. Yet they are only two of the approximately twenty main ways to accelerate one's educational progress. Various kinds of curricular flexibility are encouraged (e.g., see Southern, Jones, & Stanley, 1993) and now have gained wide acceptance by the educational community. Actually, the change in acceptance of acceleration by the educational community from 1971, when SMPY started, to the present day is one of SMPY's major accomplishments. In 1971 acceleration was an anathema to most educators. Today it is endorsed by the

National Association of Gifted Children (NAGC). It also has been shown to have positive relationship with academic achievement up to 10 years after implementation (Swiatek & Benbow, 1991a; Charlton, Marolf, & Stanley, In press).

5) SMPY's DT-PI model, involving diagnostic testing followed by prescribed instruction, enables students in fast-paced academic situations to concentrate on just what they do not yet know, rather than being forced to work through a textbook from page 1 onward (see Benbow, 1986). It is an effective means of putting challenge back into instruction for gifted students and has long-term positive outcomes (Swiatek & Benbow, 1991b).

6) Comprehensive newsletters aimed directly at the talented students themselves are a prime way to help a large group across the country acquire information about special opportunities and show each other how much can be done by the well-motivated (see Benbow et al., this volume, and Brody & Blackburn, this volume).

7) Long-time longitudinal follow-ups of the youths who reason extremely well mathematically (and verbally) are highly important. Dr. Camilla Persson Benbow, Professor and Chair of the Department of Psychology at Iowa State University in Ames, Iowa, and her close colleague, Professor David Lubinski, are conducting such studies of SMPY's excellent scorers, 1972-1982, as well as on Midwestern students more recently identified by them, 1987 to present. This study, which includes 5,000 gifted individuals grouped into 5 cohorts of students, is planned to continue for at least 50 years (see Lubinski & Benbow, 1994). To date, data have been or are being collected via comprehensive questionnaires on individuals considered gifted using SMPY's criteria, at ages 13, 18, 23, and 33. This is truly a modern-day extension of Terman's classic

longitudinal follow-up study, 1921-present (Oden, 1968).

8) University programs that cover the four school grades 11-14 in two years via college courses have been one of my "hobbies" (see Stanley, 1991). They are one of the most effective means of meeting the educational and social needs of gifted students in the last years of secondary school.

9) In a fax message dated 11 March 1993, Dr. Keating emphasized to me that ". . . one of the important principles dvanced (in theory, research, and practice) by SMPY is a workable model of educating for individual development, as opposed to categorical placement approaches that dominate most of contemporary education. I think this is a potentially generalizable way of dealing with developmental diversity. Folks who are interested in a wide range of educational issues could learn from the SMPY experience."

10) Benbow and Stanley (1980, 1981, 1982, 1983b) helped start a strong, still-continuing debate about gender differences on cognitive tests. For their later work on this topic, see Benbow et al. (1988), Benbow (1990), Stanley et al. (1992), and Stanley (1993, 1994).

Conclusion

In summary, I have been amazed at how quickly and well SMPY's principles, practices, and techniques caught on and spread (see Van Tassel-Baska, this volume). The growth and adoption of the SMPY model can be described as exponential since its modest beginnings in 1972 when SMPY conducted a 450-person talent search and a 20-person fast-paced math class. All over the United States and in some foreign countries, many thousands of intellectually highly talented children have been recognized and facilitated educationally. Quite a few schools and school systems have been encouraged or even forced to adopt more curricularly flexible ways to accommodate those of their students certified by the talent searches as being excellent reasoners mathematically and/or verbally. This increasing acceptance of several types of acceleration has been gratifying to observe.

As yet, the impact of these ideas on national educational policy has been less than I had hoped. Perhaps this is due to our approach. Mostly, we have "burrowed under" the particular school in what I, coining an oxymoron, term a "benignly insidious" manner. SMPY has sent the SAT scores directly to the examinee, who then could work with his or her parents in the local school situation and community to secure needed curricular adjustments and other opportunities to move ahead faster and better in academic areas of his or her greatest precocity. SMPY almost never tackles school boards directly. There are too many, and it is extremely difficult to effect long-term change in their stated policies.

It would be inappropriate, however, to bring this chapter to a close without mentioning that the accomplishments of many of the mathematically precocious students have been almost unbelievably excellent and continue to be so. That, however, is a story Drs. Benbow and Lubinski are developing through their longitudinal research (see Lubinski & Benbow, 1994). Perhaps at some future time I shall supplement their reports and Charlton, Marolf, and Stanley (in press) with case studies of other highly successful and less successful SMPYers. [Those who cannot wait for such may want to consult the two case histories provided by Gallagher (this volume).] Mathematical precocity is an intriguing topic; it certainly captured my interest back in January 1969 when I first met Joe Bates, and continues to do so.

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Printed Name/Position/Title: JULIAN C. STANLEY, PROF. DR.

Organization/Address: (SMPY), JOHNS HOPKINS UNIVERSITY, BALTIMORE, MD 21218-2686

Telephone: 410-516-6179

FAX: 410-516-7239

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