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ABSTRACT

The three phases (finding seventh and eighth grade mathematically talented students, studying them, and helping them educationally) of the Study of Mathematically Precocious Youth (SMPY) are detailed, and examples of the superiority of educational acceleration over educational enrichment are pointed out. Results of standardized intelligence tests are seen to be less helpful than scores on the mathematics part of the College Entrance Examination Board's Scholastic Aptitude Test in identifying gifted students for SMPY. Four types of enrichment (busy work, irrelevant academic, cultural, and relevant academic) are described and contrasted with academic acceleration. Presented is the case of 11 1/2-year-old boy who was helped educationally by entering college before completing high school. Stressed is the need for flexibility that makes a variety of educationally accelerative possibilities (such as grade skipping and college courses for credit) available for the student. (SBH)

ABSTRACT of

Brilliant Youth: Improving the Quality and Speed of Their Education

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Before one can identify intellectually talented youths, one must define "intellectual talent" sufficiently precisely to lead to a feasible searching procedure. There are two main ways to do this. The more common of these is by overall intellectual ability as measured by a test of general intelligence such as the Stanford-Binet or the Wechsler scales. This, following in the tradition set by Lewis Terman, is the way gifted children are labeled in states such as California and Pennsylvania. Then within the identified group (minimum IQ 140 or 132 or 130, etc.) special abilities such as knowledge of general vocabulary, verbal reasoning, mathematical reasoning, nonverbal reasoning, mechanical reasoning, spatial relationships, and language usage can be studied.

The other main approach is via one or more special abilities, with general intelligence studied later within the identified group. For example, the top criterion of the Study of Mathematically Precocious Youth (SMPY) was a score of at least 640 on the mathematical part of the College Board's Scholastic Aptitude Test (SAT-M) earned as a seventh or eighth grader. All those persons were, by the nature of SAT-M, splendid reasoners mathematically. Many of their other abilities were then studied.

In the paper the three phases of SMPY (finding mathematically talented youths, studying them thoroughly, and helping them educationally) are discussed in detail, with numerous examples of the superiority of educational acceleration over so-called educational enrichment.

Brilliant Youth: Improving the Quality and Speed of Their Education[1]

Julian C. Stanley[2]

Thank you, Frank, for that generous introduction. Because it came from an outstanding faculty member at my academic home for 14 years, the University of Wisconsin, it is doubly appreciated.

I also thank the program chairman of Division 15, Ellis Page, who invited me to talk here today. It is peculiarly fitting that my speech should be sponsored by the Divisions of Educational Psychology, Evaluation and Measurement, and Developmental Psychology, because during its five-year existence my longitudinal Study of Mathematically Precocious Youth at The Johns Hopkins University has drawn heavily on all three of those fields. Finding, studying, and helping 12 or 13 year old boys and girls who reason extremely well mathematically demands all the intellectual resources my associates and I can muster. We deal every day with difficult problems of learning and motivation, testing and test interpretation, and development.

All of our youths reason well and have good-to-superb IQ's; in other respects they are at least as varied as any average group of students, though generally at a higher level. Some are much more extroverted than others. Many will study fairly diligently, whereas quite a few won't. Some are vastly better at mechanical comprehension or spatial relationships than others. Knowledge of college-level general science

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[1]Speech presented at the annual meeting of the American Psychological Association in Washington, D.C., on 3 September 1976.

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varies greatly within the group, even though its mean score on such a test is high. Some cry out against the slow pace of school, whereas many put up with the educational status quo without much protest.

If youths rather homogeneous with respect to both age and high mathematical reasoning ability differ greatly in other ways, how much more must the differences among the various talent groups be. If, as most persons who study or aid the so-called gifted do, we had defined inclusion in the group in terms of that great global composite of mental abilities called general intelligence and usually summarized in an IQ, the difference would also have been large, especially with respect to school subjects. High IQ does not represent great aptitude in any one field, such as mathematics; the child with IQ 200 may not be nearly as fine a math student as another child with a somewhat lower IQ. The former may simply lack the necessary mathematical reasoning ability and related skills. What the high IQ does show, of course, is that its bearer scored well on many of the items of the intelligence test, but not necessarily on any one subtest. You know this well, but many teachers in states such as California and Pennsylvania that distribute funds for the gifted according to a count of children with IQ's at least 132 or 130 or some similar figure find it difficult to keep the distinction in mind. If youths are identified by IQ, why not group them for instruction according to it? Homogeneous grouping in a subject such as beginning algebra is difficult enough to achieve when one uses the most relevant measures possible. It is weak indeed when the grouping variable is as heterogeneous a composite as IQ.

None of us can be unaware of the often violent controversies centering around intelligence testing these days. In our Study of Mathematically Precocious Youth, described in the handout, we do not find IQ's per se essential or even very helpful. The strongest grouping variable for special fast instruction in college-preparatory high-school mathematics that we have found is the score on the mathematics part of the College Entrance Examination Board's Scholastic Aptitude Test (let's call it SAT-M), administered to seventh and eighth graders after they have carefully studied practice materials for the test. But, as Thurstone found and McNemar emphasized, if one runs intelligence out the front door, it tends to return soon via another entrance. Rate of learning as measured by a verbal reasoning test has proved important in our fast-math classes. Even then, variation in the success of students within the class is still appreciable.

The crucial variable related to success among bright, mathematically apt youths in their learning of mathematics fast and at a high level of rigor is deceptively simple: willingness to do a moderate amount of homework promptly and well between class meetings (usually once each week). Many otherwise able junior high school youths refuse to do even two or three hours of substantial homework carefully each week. In homogeneously grouped classes where the level of the subject matter is apporpriate for the ability of the students the reluctant studiers fall behind, whereas in their regular classes they usually get a free ride because their ability vastly exceeds that of most of their classmates.

As those of you familiar with the literature on academic underachievement know, this lack of willingness to do school work is related to a number of personal and socioeconomic variables. Getting such a student to study is analogous to curing an alcoholic or changing a homosexual's sexual interests, not readily done by any techniques psychology has yet developed. Exhortation is especially ineffective.

Perhaps this preamble indicates the difficulty of defining the first two words in the title of this speech, "brilliant youth." My preference is for a multi-aptitude approach. For example, a student who scores in the upper 5% of his or her age group on national or local norms for any one of the eight Differential Aptitude Tests might be said to be talented in that respect--that is, show high numerical ability, verbal reasoning ability, nonverbal reasoning ability, mechanical comprehension, spatial relationships ability, spelling ability, language usage knowledge, or clerical speed and accuracy. (Administer both forms in order to increase the reliability of the scores.) This person might then be studied further via a number of other aptitude and achievement tests and interest inventories.

For example, a 12-year-old who made virtually a perfect score on the DAT numerical ability test might take the Scholastic Aptitude Test in order to determine how much better he or she reasons mathematically than verbally compared with older students. A college-level test of general science knowledge would also be useful.

That is indeed the identification plan followed by our study. Youths who score quite high on the Scholastic Aptitude Test--Mathematical are then tested further for two full days to chart their other aptitudes, knowledge, interests, values, and personality characteristics. One cannot help talented youths properly without first knowing a great deal more about them than can be gleaned from school records.

Psychologists over the years since Terman began the gifted-child movement in 1921 have a poor record for actually helping the intellectually gifted educationally. Terman's pioneering study, now the classic one, was meant to be descriptive rather than interventional. Hollingworth did help the gifted in many ways, but she died at age 53 and by that time had become overburdened with more varied activities on their behalf than she could handle well. Being preoccupied with the "why" of behavior, nearly all educational, measurement, and developmental psychologists who study the gifted stop short of trying vigorously to facilitate their education. When examined closely, most that purports to improve the education of the highly gifted is seen to be weak stuff indeed. Long ago, educators appropriated a glamorous-sounding word with which to disguise their slight efforts and fend off gifted children and their parents. Seldom is the term "enrichment" even defined, but its name camouflages much evasion and inaction.

The major flaw lies in the very concept of "enrichment," rather than primarily in its implementation. Picture the extremely high-IQ child or the child with an unusual special intellectual talent such as great mathematical reasoning ability and superior IQ as he or she enters kindergarten. Almost surely this youngster already knows most of the academic material that will be presented in class or can learn it virtually instantaneously. Let us take as a hypothetical example a youth with Stanford-Binet IQ 140 on September 1 in a school system where to enter kindergarten in September one must become five years old sometime during the calendar year. The "typical" student would be 5 years and 2 months old when school began, and in an intellectually unselected community would have a mental age of 5 years 2 months and an IQ of 100. A child of that age with an IQ of 140 would have a mental age of 7 years 3 months--that is, more than two years above the average child entering the kindergarten and, in fact, slightly above the average child entering the second grade.

Of course, various factors can modify that simplistic analysis. One of these depends on the child's birthday. If a high-IQ student is extremely young in grade, the discrepancy will be far less initially.

The 140-IQ youth born on December 31 who enters kindergarten at age 4 years 8 months will have a mental age of about 6 years 6 months. Even this is one and one-third years above the average of the typical class, however. Pity the brilliant youth who is old-in-grade. One born on January 1 would be half a year older than his or her typical kindergarten mate and have a mental age more than two and one-half years higher. If you expect to have unusually bright children, arrange to have them born late in the year so that they will be somewhat less overqualified than if born during the winter. Though not a believer in astrology, I can readily see how in this respect birthdate might be important.

Family and community influences make considerable differences, too, of course, as do special abilities in relation to the resources of the particular school. My main point is that the intellectually brilliant child usually begins school knowing far more than most of his or her classmates as well as being able to learn new material much faster than they. Yet teachers almost uniformly want to keep this child in the standard age-in-grade lockstep for 13 years and, even then, send the student off to college with little or no advanced standing. At most, they may try to make the brilliant pupil increasingly overqualified each year while rigidly denying all but the mildest accelerative opportunities to the youth. Alternatively, they may offer various types of "enrichment" essentially irrelevant to the child's major intellectual needs and talents.

Let me hasten to note at this point that few of these teachers are stupid or vicious. Rather, nearly all of them are well-meaning professionals convinced without evidence that the so-called social and emotional development of the child will suffer greatly if he or she leaves the age-in-grade group during even a little of the entire educational cycle. Only under special circumstances will a few teachers and educational administrators permit some forms of acceleration, usually quite mild.

Also, it must be noted that some teachers and educational administrators ignore the gifted in their schools and even claim that they have none. Several curriculum coordinators and mathematics supervisors have been appalled when we found and certified to them a large number of mathematically highly talented youths in their school systems. Some even wanted to know what we planned to do for these students, now that they had been identified, as if their schools had no special responsibility to such students except to keep them unrecognized. Thus it is easy for a university professor who conducts a state-wide talent search to be viewed almost as a troublemaker by some educators within the state. Fortunately, the illogic of their implicit argument won't stand much public scrutiny.

Also, because I make my academic home in a department of psychology and have no connection with teacher training (Johns Hopkins does not have a department of education in its day school), my study is relatively immune to the usual pressures toward conformity that state departments of education can exercise through their control of teacher certification.

I am convinced that the overly glamorously entitled supplemental educational procedures known as "enrichment" are, even at best, potentially dangerous if not accompanied or followed by acceleration of placement in subject matter and/or grade.[3] Stated more simply, for highly precocious youngsters acceleration seems to me vastly preferable to most types of enrichment. This appears to be especially true where

[3]This portion of the paper is based on my article in the Spring 1976 issue of the Gifted Child Quarterly.

mathematics and mathematics-related subjects are concerned.

But what do I mean by "enrichment" and "acceleration"? Unless we agree on the differences between such processes, my points may be obscured in the minds of those who consider enrichment to be a form of acceleration and acceleration as being enriching. To me, "enrichment" is any educational procedure beyond the usual ones for the subject or grade or age that does not accelerate or retard the student's placement in the subject or grade. Admittedly, some ambiguity remains after this definition, because it does not tell what is usual for the subject, grade, or age. Illustrations of four types of enrichment may produce more agreement among us.

One of these forms of enrichment--unfortunately, quite commonly used--is what might be termed "busy-work." It consists of more of the same, greater in quantity than is required of the average student in the class but not different in level. One of our most mathematically precocious boys, an eighth grader with an IQ of 187 who had already skipped a grade, was required by his Algebra I teacher to work every problem in each chapter of the textbook, rather than just the odd-numbered ones. He could have completed the whole course with distinction in a few hours without needing to work many problems, but his teacher was trying to hold him for 180 50-minute periods. It is a pity that at the beginning of the school year he was not allowed to take a standardized algebra test, learn the few points he did not already know, and move on to Algebra II within a few days.

At the end of the seventh grade a boy less able than he scored above the 99.8th percentile on a standardized algebra test (missing only two items out of 40) without ever having had the course called "algebra."

Another, more mathematically brilliant boy scored 40 out of 40 when still a seventh grader. These are not typical youngsters, of course, but in three years of math talent searching in Maryland we have found more than 200 others rather like them.

There is a happy ending to the story of the boy oppressed by busywork in his beginning algebra course. After the eighth grade he studied all of his mathematics part-time at the college level, for credit. This took him through college algebra and trigonometry, calculus, advanced calculus, and linear algebra with an initial B and subsequent A's. He also completed an introduction to computer science course in the Johns Hopkins day school with a grade of A at age 12. Furthermore, he completed college chemistry through two semesters of organic chemistry with A's. At age 15 years, 2 months he became a full-time student at Johns Hopkins, having sophomore status because of his 39 credits already earned and living happily in a dormitory. As an electrical engineering major he completed the first college year with eight A's and only one B. After two highly successful summers doing research with General Electric and then the Bell Telephone Laboratories, he plans to return to Johns Hopkins this fall to complete his final year and receive the B.A. degree at age 17.

Though this boy did manage to turn the usually stultifying effects of busy work into great motivation to detour further such obstacles and forge ahead, it would seem quite difficult to make any general positive case for this type of "enrichment."

A second type often used is what I shall term "irrelevant academic enrichment." It consists of setting up a special subject or activity that is meant to enrich the educational lives of some group of intellectually talented students. It pays no attention to the specific nature of their talents. If the activity is, for example, a special class in social studies, it may be meant for all high-IQ youths. The math whiz may enjoy it as a temporary relief from the general boredom in school, but it will not ameliorate his or her situation in the slow-paced math class. It may be essentially irrelevant to the youngster's main academic interests. Much of creativity training divorced from subject matter falls into this category.

My third type of enrichment, "cultural," might also be considered irrelevant to the direct academic needs of intellectually gifted students, but it seems much more worthwhile. The special social studies class already used as an illustration of irrelevant academic enrichment merely introduces earlier what should, in a good school, be available at a later grade level. Cultural enrichment means supplying aspects of the performing arts such as music, art, drama, dance, and creative writing that are usually slighted in public schools, and other cultural subjects such as ancient foreign languages. These can serve the unmet needs of many students, however, not just of those with high IQ's or special intellectual talents such as great mathematical reasoning ability or superb mechanical comprehension. If supplied specifically for those students talented in one or more of the performing arts or in languages, cultural enrichment becomes merely a type of "relevant enrichment," which I describe next.

If a student is given advanced material or higher-level treatment of in-grade topics in areas of his or her special aptitudes, the enrichment might be said to be "relevant" to those abilities. For example, mathematically able youths might have a unified integrated modern-mathematics curriculum from kindergarten through, say, grade 7, in lieu of the usual mathematics sequence for those eight grades. This could be splendid, but imagine the boredom that would surely result if as eighth graders such students were dumped into a regular Algebra I class.

If the special mathematics curriculum extended from kindergarten through the twelfth grade, it would be crucial that students completing it well should not begin in college with the standard introductory mathematics courses there. The same considerations could be adduced for splendid English, science, or social science curricula. The more relevant and excellent the enrichment is, the more it calls for acceleration of subject-matter or grade placement later. Otherwise, it just puts off the boredome awhile and virtually guarantees that eventually it will be severer than ever.

Thus in my taxonomy there are four main types of enrichment: busy work, irrelevant academic enrichment, cultural enrichment, and relevant academic enrichment. All of these except cultural enrichment may be viewed as horizontal, because they are usually tied closely to a particular grade or narrow age range and are not meant to affect the age-in-grade status of the participating students.

By contrast, academic acceleration is vertical, because it means moving the student up into the higher school level of a subject in which he or she excels, or into a higher grade than the chronological age of the student would ordinarily warrant. If a seventh grader is allowed to take algebra, usually at least an eighth-grade subject, that is subject-matter acceleration. If a student is allowed to skip a grade, that is grade acceleration.

Often these two types of acceleration should go together. For example, if a high-schoool student scores well enough on the calculus test of the national Advanced Placement Program, he or she will earn quite a few credits that would be accepted by many colleges. At Johns Hopkins such persons would enter ready to take advanced calculus and also with 27 percent percent of the credits needed to complete the freshman year. Passing three or four Advanced Placement courses will give sophomore status at a number of colleges such as Harvard.

Entering college before completing high school is another example of grade-skipping. We have helped an 11 1/2-year-old boy to become a full-time college student, quite successfully, at the end of the sixth grade. He skipped grades 7 through 12. Two 13-year-old boys entered Johns Hopkins right out of the eighth grade. A 14-year-old came at the end of the ninth grade. Another 14-year-old enrolled as a college sophomore after skipping grades 7, 9, 10, and 12. It will be illuminating to see in some detail how he accomplished this remarkable speed-up.

We first heard of this boy, whom I shall call Sean, in the fall of 1971. As a sixth grader whose twelfth birthday came that December 4, he was over-aged in grade. According to local rules he could have been a seventh grader, but his parents had moved to Baltimore from another section of the country that had more restrictive entering regulations. Sean had greatly impressed the teachers in the elementary school he attended, so during the summer following the fifth grade he had participated in a special computer-science project conducted by the Maryland Academy of Science. Through local newspaper publicity the Academy heard of our new programs for mathematically and scientifically precocious youths. It recommended Sean to us, thereby making him the first participant in our five-year study that the Spencer Foundation had recently funded, although before the study began we had enrolled two 13-year-olds as regular freshmen at Johns Hopkins.

Sean proved to be exceptionally able, both quantitatively and verbally but especially with respect to mathematical reasoning ability. He had not yet learned much mathematics, however. For example, he did not know the rule for dividing one common fraction by another (that is, invert the second fraction and then multiply), but learned the rule and its proof quickly--as Professor Higgins said in "My Fair Lady," "with the speed of summer lightning."

Sean was not in a high enough grade that year to enter our first mathematics competition, which was restricted to seventh and eighth and underage ninth graders. It was not until we formed our first fast-mathematics class in June of 1972 that he, now 12 1/2 years old, began to get special educational facilitation from us. The story of that class is told in Chapter 6 of our Mathematical Talent book, published by the Johns Hopkins University Press in 1974, which covers the background and first year of our study, and in its sequel Intellectual Talent, which appeared this year. The class continued until August of 1973, and Sean was one of its two stars. He completed four and one-half years of precalculus mathematics well in 60 two-hour Saturday mornings, compared with the 810 45- or 50-minute periods usually required for Algebra I through III, plane geometry, trigonometry, and analytic geometry.

Sean skipped the seventh grade, which in Baltimore County is the first year of junior high school, and in the eighth grade took no mathematics other than the Saturday morning class. Also, during the second semester of the eighth grade he was given released time to take the introduction to computer science course at Johns Hopkins. He found this fascinating and at age 13 readily made a final grade of "A."

While still 13 years old Sean skipped the ninth and tenth grades and became an eleventh grader at a large suburban public high school. There he took calculus with twelfth graders, won a letter on the wrestling team, was the science and math whiz on the school's television academic quiz team, tutored a brilliant seventh grader through two and one-half years of algebra and a year of plane geometry in eight months, played a good game of golf, and took some college courses on the side (set theory, economics, and political science). He even successfully managed the campaign of his 14-year-old friend for the presidency of the student council. This left time to prepare for the Advanced Placement Program examination in calculus, and entirely by studying on his own, also in physics. He won 14 college credits via those two exams.

During the summer after completing the eleventh grade Sean took a year of college chemistry at Johns Hopkins, as usual earning good grades. That enabled him to enter Johns Hopkins in the fall of 1974 with 34 credits and therefore sophomore status. He lived at home and commuted to the campus with his mother, who took a position at Johns Hopkins in order to make this easier (14-year-olds aren't permitted to drive automobiles, no matter how far along in college they are!). During the first semester he took advanced calculus, number theory, sophomore physics, and American government, making A's on the two math courses and B's on the other two courses. Also, he began to get involved in campus politics. He got along well socially and emotionally. As he told an Associated Press reporter who asked about this, "Either social considerations take a poor second to intellectual ones, or there are no negative social effects. . . . The most significant aspect of my life is having skipped grades."

During his third semester Sean earned all A's on 22 credits of difficult courses. He plans to complete the B.A. degree requirements this fall, a few days after his seventeenth birthday.

Let us recapitulate here. Sean began by being "enriched" in the Academy of Science summer program for brilliant elementary-school pupils. That served as a good background for the college course in computer science, which was intended to be both enriching and accelerative. The fast-mathematics class provided radical acceleration, because it telescoped into one year of Saturday mornings four and on-half years of precalculus mathematics. Skipping grades 7, 9, 10, and 12 was also highly accelerative, as were the college courses taken and the Advanced Placement exams passed.

Sean is unusually bright, of course, and extremely well motivated, but he is by no means the ablest youth we have found. He has done the most different accelerative things, though. By contrast, another mathematically and verbally brilliant boy simply took a college course each semester or summer term from age 12 to age 15. Besides that, he skipped the second, eleventh, and twelfth grades. This combination of college courses and grade skipping enabled him to enter Johns Hopkins at age 15 years 2 months with 39 credits, that is, 30% of the way through the sophomore year. Another boy skipped grades 8, 11, and 12, took 17 credits of college courses, and earned 8 college credits in calculus via the Advanced Placement exam. He entered Johns Hopkins at barely 15 years of age with 83% of the freshman year completed.

Many students in the study, including some girls, are eager to move ahead faster than the usual age-in-grade lockstep. They do so with ease and pleasure. We find that the combination of great ability and personal eagerness to accelerate educationally virtually guaranteed success.

There are many other such examples I could use, especially about students who by age 15 have college credit well beyond differential equations, but these samples will give the flavor. Even though our study began recently at the seventh and eighth grade levels, we shall probably have five quite-young graduates from Johns Hopkins in May of 1977, three of them 17 years old, one 18, and one barely 19. All have done exceptionally well and have enjoyed their college experiences much more than they think they would have liked remaining in high school from three to five more years. Many more such students are on the way to Johns Hopkins or various other selective universities such as Harvard, M.I.T., and Cornell.

Nearly all of our 44 early entrants to college thus far have done splendidly in their studies and social and emotional development. Compared with the academic and personal record of the typical Johns Hopkins student, the early entrants have been truly outstanding. Only one has performed poorly. He was a brilliant but headstrong 14-year-old who signed up for a heavy load of extremely difficult courses and then would not study enough. By age 15, however, he had earned a year of college credit and a high-school diploma.

Perhaps our most interestingly different course has been college calculus for two hours on Saturday mornings to supplement high-school calculus so that students can do well on the higher level of the Advanced Placement calculus exam. With a class composed mainly of well-above average tenth graders, but with one student only 11 years old, this went along so well from September of 1974 until the first of February that by then everyone in the group knew more calculus than most college students learn in two semesters. By early May only 9 college students in 1000 score higher than the lowest-scoring one of the 13 students in this class--and that wasn't the 11 year old! All of these special students scored excellently on the higher level of the national Advanced Placement Program examination in calculus in May of 1975 and earned a year of college calculus credit. Nine of them earned the highest score reported--that is, 5 on a 5-point scale, meaning "extremely well qualified to enter college Calculus III." A new class began in the fall of 1975, all of its members being eleventh or twelfth graders but some of them as young as age 15. They scored well on the Advanced Placement exam last May.

In the spring of 1975 we had an extreme example of what powerful predictors of achievement their scores on difficult tests can be for intellectually gifted youths. The mathematics department at Johns Hopkins conducted a test competition for eleventh graders. We heard about it only a week before the test date and got permission to tell some of our participants. We hastily located the names and addresses of 19 persons who as eighth graders three years earlier had scored high on the SAT-M in our first talent search. These were not our very best, because most of those had moved along beyond the eleventh grade; several were already in college. Of these 19, ten came for the test. Seven of them had not been identified by their high-school mathematics teachers, and one of the three so identified was a member of our calculus class whose father teaches mathematics at Johns Hopkins.

Fifty-one students entered the contest; their scores ranged from 140 down to 2. One of our group, not nominated by his teachers, was far ahead of anyone else with 140 points. The math professor's son ranked second with 112 points. Another of our group ranked third with 91 points. The highest scorer not in our group ranked fourth, with 82 points. The other seven nominated by us ranked only down to 23.5 out of the 51. Isn't it a bit frightening that a single score from a mathematical reasoning test administered three years earlier identified high math achievers much better than did teachers who have known their students for at least seven months?

This is congruent, however, with Terman's finding long ago that teachers could not identify students with extremely high IQ's well. Apparently, the math classes simply do not tap the best abilities of mathematically brilliant students, whereas the difficult test does. There's a moral in this for those who lean too heavily on teacher's recommendations where intellectually gifted children are concerned. In selecting early entrants in our study we pay far more attention to scores on advanced tests and other evidence of marked precocity than we do to school grades or recommendations, because most of the high-school courses are not at an appropriate level of difficulty and challenge for such students.

It should be no surprise that educational acceleration works well when highly able, splendidly motivated students are given a variety of ways to accomplish it. From Terman's monumental <u>Genetic Studies of Genius</u> and Pressey's definitive 1949 monograph on <u>Educational Acceleration</u> through the experiences of the University of Chicago, Shimer College, the Ford Foundation's large early-entrance study of the 1950's, Worcester's and Hobson's work, Simon's Rock College, and the Freshman Year Program at the New School for Social Research, up to the radical accelerative techniques we are developing it is clear that acceleration can work much better than so-called academic enrichment for those students who really want it. Counter-examples are rare and likely to be atypical. For every William Sidis who renounces intellectual pursuits because of extreme, and apparently quite unwise, parental pressures there are many persons such as Norbert Wiener and Sean who benefit greatly from the time saved, frustration avoided, and stimulation gained.

We believe that concentrating efforts on preparing "teachers of the gifted" to enrich curricula is, while far better than nothing, a relatively ineffective and costly way to help the ablest. At least, such teachers should help provide the smorgasbord of accelerative opportunities and counseling in their use that many such students need.

The procedures that we propose are not expensive. Most of them actually save the school system time and money. One does not need a large appropriation in order to encourage grade skipping, identify students ready to move through mathematics courses at a faster-than-usual rate, encourage early graduation from high school, help certain students enroll for courses in nearby colleges or by correspondence study, promote advanced-placement exams, or even set up special fast-math courses. More than money they take zeal and a distinctive point of view.

Persons who hear about our study usually ask,"But what about the social and emotional development of the students who become accelerated?" We often counter with "What about the intellectual and emotional development and future success of students who yearn for acceleration but are denied it?" For more than seven years we have been studying the social and emotional development of youths accelerated in a variety of ways. If the acceleration is by their own choice, they look good indeed. Part of the problem is in the minds of those skeptics who automatically assume that one's social and emotional peers are one's agemates. Performance of gifted youngsters, including ours, on such personality measures as the California Psychological Inventory shows that emotionally they are more like bright persons several years older than themselves than they are like their own agemates. There is considerable variability, of course, but on the average they are better matched socially and emotionally with able students who are older. Thus, just as their intellectual peers are not their agemates, their social and emotional peers aren't, either. For clarity of discourse it would seem wise not to use the word "peer" in this type of argument without prefacing it with one or more adjectival modifiers.

Another question often asked us is, "Why do you start with 12 and 13 year olds who reason superbly mathematically? That is awfully narrow. Why not be broader?" Well, neither mathematics as a field nor our various procedures are "narrow." Mathematics undergirds much of man's highest endeavors. In a sense, it is probably the most generally useful subject (although, of course, some philosophers would argue about that statement). We try to approach talent in mathematics comprehensively, but we deliberately chose to specialize in this area where great precocity often occurs because one can be splendid in mathematics without yet having had many of the usual life experiences of an adolescent or adult. Also, because of this precocity, many students in school are horribly bored. Imagine having to serve time in first-year algebra for 180 50-minute periods when one knows the subject well the first day of class! That is by no means an uncommon occurrence, and it may partially explain the lack of interest in mathematics among bright persons.

With more than 2000 mathematically able boys and girls already identified, we do not have time and facilities to look for latent talent or potential achievers, worthy though that pursuit surely is. We leave it to the many persons who prefer to specialize in identification and facilitation of underachievers, "late bloomers," and the "disadvantaged gifted." Aside from some concern about sex differences in mathematical precocity, we have not tried to screen in a set percent of any group. From socioeconomic and ethnic standpoints, however, the high scorers have been a varied lot.

A well-known quotation from Thomas Gray's famous elegy sums up the case for seeking talent and nurturing it:

"Full many a gem of purest ray serene
    The dark unfathomed caves of ocean bear;
Full many a flower is born to blush unseen,
    And waste its sweetness on the desert air."

The poet/ Browning tells us that "A man's reach should exceed his grasp, or what's a heaven for?"

It is the responsibility and privilege of all of us to help prevent the potential Miltons, Einsteins, and Wieners from coming to the "mute inglorious" ends that Gray viewed in the country chuchyard long ago. The problems have changed little, but the prospects are much better now. Surely we can greatly extend both the reach and the grasp of brilliant youths, or what's an educational system for?

At this late point in the speech you may wonder what you can do to help intellectually brilliant youths improve the quality and speed of their education. I suggest applied research about how to help such students create special educational opportunites and use them well. Assistance from school personnel is virtually essential, of course, but with their present organization one cannot expect most schools to have ready-made programs that will meet the needs of intellectually brilliant or superbly talented youths well. Flexibility that makes a variety of educationally accelerative possibilities available for the student's choice all the way from kindergarten through senior high school is crucial. Early entrance to kindergarten, grade skipping, moving ahead faster than usual in certain subjects, various types of special classes pertinent to the brilliant youth's specific talents, high-level tutorial arrangements, college courses taken for credit on a part-time basis, advanced placement courses, early graduation, and entering college full-time without a high-school diploma are some of the ways that our study has helped hundreds of mathematically highly precocious youths. These and other innovative procedures need to be tried out with students talented in intellectual areas other than mathematics, such as verbal reasoning, knowledge of general vocabulary,nonverbal reasoning, mechanical comprehension, and spatial relationships, plus of course more difficult to study areas such as leadership and social sensitivity. There is enough territory to keep every person in this audience busy the rest of his or her life. I can think of no more worthwhile activity.

If you yearn for more basic research, experiment with improving the doing of homework by brilliant youths in situations where they compete with their intellectual peers. Or try to determine why girls tend to score less well on SAT-M than boys do and reject most opportunities to forge ahead in mathematics and the physical sciences. Or examine why the children of immigrants seem much more willing to seize upon special educational opportunities and use them well than the children of most old-line residents of the United States do. Compare youths of Jewish vs. Oriental background in this respect, both for taking special courses and for entering college early. Or examine the relationships between evaluative attitudes as revealed by inventories such as Allport-Vernon-Lindzey "Study of Values" and success in special courses. Or study the reliability and validity of scores on an interest inventory such as the Strong-Campbell when obtained by youths of extremely high mental age who are only 13 years old or less.

Like me, you may get a greater sense of accomplishment out of this type of research, development, and service than from conceptually neater and more rigorous research of doubtful value to mankind. And there is plenty to challenge the best minds in the country. A not unimportant fringe benefit is that many brilliant youths are fascinating to know and observe. Also, a little input into their education can yield unbelievably large outputs. Your efforts on their behalf can hardly fail to produce large effects. This takes you out of the some-signal, much-noise area of statistics into that happy place where the intraocular traumatic test is all you need: the results strike you between the eyes!

So join the groundswell of concern for the highly gifted and talented. They need your expert help, and you may discover that you gain from them at least as much as you give.

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