DOCUMENT RESUME

ED 372 581 EC 303 214

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TITLE	The Performance of High Ability Students in the United States on National and International Tests.
SPONS AGENCY	Office of Educational Research and Improvement (ED), Washington, DC.
PUB DATE	Jun 94
NOTE	23p.; In: Ross, Patricia O' Connell, Ed. National Excellence: A Case for Developing America's Talent. An Anthology of Readings; see EC 303 213.
PUB TYPE	Information Analyses (070) -- Viewpoints (Opinion/Position Papers, Essays, etc.) (120)
EDRS PRICE	MF01/PC01 Plus Postage.
DESCRIPTORS	*Academic Achievement; College Entrance Examinations; *Comparative Education; Degrees (Academic); *Educational Assessment; Educational Objectives; Educational Trends; Elementary Secondary Education; Excellence in Education; *Gifted; Higher Education; Mathematics; *Outcomes of Education; Sciences; *Talent; Trend Analysis; Underachievement
IDENTIFIERS	*National Assessment of Educational Progress; National Education Goals 1990

ABSTRACT

This paper, commissioned for the development of the national report, "National Excellence: A Case for Developing America's Talent," presents data which suggest that America's top students do poorly in comparison with top students in comparable nations and that few strides have been made in significantly improving American students' performance. Specific sections of the paper address: (1) data on trends in achievement of this population; (2) trends in performance on college entrance examinations; (3) short-term measures in mathematics and science and long-term trends in the pursuit of advanced degrees and productivity; (4) the National Assessment of Educational Progress (NAEP); (5) limitations of the NAEP for evaluating high ability students; (6) international comparisons; (7) studies of the International Association for the Evaluation of Education Achievement (IEA); (8) other studies supporting the IEA studies in mathematics; and (9) school-related factors which may influence the achievement of highly able American students. The author urges that current trends must be reversed if the United States is to meet the National Education Goals set for the year 2000. An appendix provides definitions of high achievement on the NAEP scales in reading, mathematics, science, and history. Contains 35 references. (DB)

The Performance of High Ability Students in the United States on National and International Tests

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Highly able students in the United States have received little attention in the wide-ranging discussions of poor performance in the American educational system. Unfortunately, ignoring the results of international and national assessments of this group of students has led to the misconception that they are sufficiently challenged by the educational system. Reviews of national assessments of aptitude and achievement reveal that few strides have been made in significantly improving the performance of the most able students in the United States, and the findings from international studies provide devastating evidence that the achievements of the most able students in the United States are far behind those of other industrialized nations. In addition, among students who score highest on assessments used for college admission, fewer and fewer are electing careers in mathematics or science—leaving fields essential for progress to languish in this country. Current trends must be reversed if we are to hope to meet the National Education Goals set by the President and Governors for the Year 2000.

Introduction

Callahan documents that the current status of the highest achievers in the United States is far below the international standard and that it will require an effort of major proportions to achieve the National Education Goals by the year 2000. Discouraging evidence abounds in data on achievement, aptitude and even career goals, that America's top students lag behind the top students of comparable nations. The most recent studies of the International Association for the Evaluation of Educational Achievement, data from the Educational Testing Service, the National Assessment of Educational Progress, and the National Science Foundation, and other international achievement comparisons yield telling data.

- The average Japanese student exhibits higher levels of achievement in calculus than the top 5 percent of American students enrolled in college preparatory courses.
- The most able U.S. students (the top 1 percent) scored lowest in algebra among the analogous cohorts of 13 other countries in an international study.
- The most able (the top 1 percent) of U.S. high school seniors scored among the lowest in geometry and calculus (12th out of 13 nations assessed).
- The algebra achievement of the top 5 percent of U.S. students is lower than that of the corresponding cohorts from all but one country of 13 countries studied in an international comparison.
- The top 1 percent of science students in the United States were outscored by 8 of 12 other nations participating in international science assessments in 1976. By 1988 students in advanced placement programs in the United States were outscored by 12 other nations participating in assessments in biology, by all but 2 in chemistry, and all but 4 in physics.

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- Although the number of high scorers on the quantitative (mathematical) section of the Scholastic Aptitude Test (SAT-M) has been increasing, the number of high scorers on the verbal portion (SAT-V) of that test has been steadily declining.
- Even though there are more high scorers on the SAT-M, among the students receiving these high scores the proportion of the top scorers electing careers in math, science and engineering has been steadily declining since 1982.
- In mathematics graduate programs, the number of U.S. graduate students has declined by 1,400 while the number of foreign nationals in those programs has increased by 3,100.
- Since the National Assessment of Educational Progress (NAEP) began in 1971 with reading assessments, there has not been a single increase in the proportion of students scoring at the top levels in reading (between 1971 and 1984), mathematics (between 1973 and 1986), or science (between 1969 and 1986). In mathematics, the number of 13-year-olds scoring at the top level has significantly decreased.
- When items from the NAEP assessments in mathematics and science were used in a comparison by the International Assessment of Educational Progress with five other countries and four Canadian provinces, the children in the United States earned mathematics scores lower than all but one other group (French-speaking students in Ontario).
- In one international comparison of mathematics achievement among young children in three countries, only 15 Americans were among the 100 top scorers in first grade and only 1 American was among the top 100 in fifth grade. In a second study, only three American children were among the top 5 percent in a mathematics comparison across cities in Japan, China and the United States. If achievement had been equally distributed in the sample, 40 American children would have been in the top 5 percent.

Concerns about the achievement level of students in the United States have generated considerable interest in the media and among education professionals. Expressions of concern about the poor achievement of students in the United States have covered nearly every discipline—from math, science, and foreign languages to geography, reading, and writing. But most of the focus of concern has been on the poor achievement of the average student or the at-risk student. The data presented on these populations raised grave concerns and calls for substantial reform in the schools. Unfortunately, the discussions of the results of most of these assessments fail to bring forth information on the achievement levels of the most able students. Thus, a dangerous misconception has prevailed that the United States need not worry about the bright and capable students because they are achieving well in school. Further, this erroneous assumption has influenced discussions of educational priorities.

The synthesis provided by this paper began as an attempt to ascertain just how well the students in the gifted population in the United States have fared on both international achievement tests and on national tests of academic achievement and aptitude. The students who participated in these studies were not classified according to their intellectual ability, and the students singled out for closer scrutiny in this report were, therefore, not formally identified as "gifted" students among the populations studied. However, in each case the students selected for study represent the highest scoring students among the groups sampled and thus can be considered the "academically elite" or the "highest achieving" students in the U.S. population.

The basic question to be answered in this study was whether the achievement pattern of the most able population followed the pattern of decreased achievement characterizing the general population, or whether the gifted group had received an education that had resulted in distinguished performance. Declines in achievement levels across many disciplines and in the general student population on national standardized tests have been documented in numerous sources. Thus, it is important to determine first whether the data on the achievement levels of the most able students indicate a similar trend of lower level of performance than that of prior, comparable groups, or whether these students are now achieving as well as or better than past classes. A corollary question is whether the current school setting and curriculum serve the most able students well.

In times of increased international competition and a shrinking globe, it is insufficient to maintain a parochial view of achievement and to be satisfied with internal, longitudinal comparisons. It is increasingly necessary that the United States examine the achievement of its students in relation to the achievements of students in other nations. "No longer can society view education and competitiveness in the international marketplace as disconnected happenings" (Cooney, 1988, p. 352). Thus the nation must ask if its schools provide the most able students with the background, the knowledge, and the problem-solving strategies that will allow them to be competitive internationally.

To provide answers to these questions, this document includes a review of the available data on select populations from a wide variety of sources. First, the longitudinal data available from performance on standardized tests administered in this country are examined. These tests are generally regarded as indicators of the quality of the performance of U.S. students and schools over time. Second, studies comparing the achievement of the highest scoring U.S. students and the achievement of the highest scoring students in other nations are scrutinized for evidence of the relative achievements of U.S. students. The studies included in this analysis include those of the International Association for the Evaluation of Educational Achievement (IEA) and the Center for the Study of Human Growth and Development at the University of Michigan. These data provide a reading of the global competitiveness of the most able U.S. students across both elementary and secondary levels of achievement. Because questions have been raised about the degree to which these international assessments may not match national goals, data which compare performance of U.S. students to students from other nations on measures developed as a part of the U.S. National Assessment of Educational Progress program (NAEP) are also examined.

There is a focus on mathematics and science in this paper which evolved from the characteristics of the available data which are, in turn, a reflection of the interests of contemporary society. The United States has become a technological society in which developments in many fields are dependent on the "basic science" work of scientists, mathematicians, and engineers with the capabilities of solving complex and sophisticated problems in those disciplines. The importance of science to every aspect of society, from basic health care to nutrition to improving the quality of life in general, is well understood. The importance of mathematics has been succinctly and clearly stated by Travers, Oldham, and Livingston (1982):

> At the most basic level, a knowledge of mathematical concepts and techniques is indispensable in commerce, engineering and the sciences. From the individual pupil's point of view, the mastery of school mathematics provides both a basic preparation for adult life and a broad entree into a vast area of career choices. From a societal perspective, mathematical competence is . . . needed to ensure the continued production of the highly-skilled personnel required by industry, technology and science (1).

The importance of mathematics and science to the general welfare of the nation warrants the general concern over achievement across all ability levels and the consequent investment in extensive assessments in those areas. Further, it justifies the expectation that the most able of students in the United States achieve at a level which matches their capabilities and which is competitive with the youth of other nations. This focus on mathematics and science is reflected in the priorities given to assessments in these areas and the resulting data available for consideration in this paper.

Although much of the data presented in this paper are from achievement and aptitude indicators in the areas of science and mathematics, data from other disciplines have been introduced wherever they were available. Further, related findings from studies focusing on variables other than performance were also considered as they added to a complete discussion of the issue of high ability students. For example, a focus on the outcomes of measures of achievement and aptitude may reveal the capabilities of students, but if other data indicate that U.S. students are not electing to capitalize on their capabilities by pursuing majors, professional careers, or graduate programs in the areas in which they have greatest talent, the nation stands to lose great resources. Achievement and aptitude data on highly able students were accompanied by career interest data which indicated that those students scoring highest in certain areas of critical shortage express little interest in pursuing related careers in mathematics and science.

College Entrance Examinations

Without question, the issue of rising and falling Scholastic Aptitude Test (SAT) scores generates great interest and news each year when the latest results are published. At times, there has been great consternation over the decline in the number of high scoring students—the most recent occasion being the mid-1980s. This resulted in a publication by the College Entrance Examination Board (CEEB) (Turnbull, 1985) which included a special section entitled "Fewer High Scores," in which the drop in the number of high scores on both the verbal and mathematical portions of the test between 1970 and 1976 was attributed to a reduction in the number of students taking the SAT and the influence on high scorers of the same variables affecting the scores of the total test population. In 1985, The Educational Testing Service (ETS) reported, "The Panel, although a little troubled, did not pursue the matter further, but the decline in high scores has continued and remains a source of concern" (7). Although ETS acknowledged the problem, no further explanation has been offered or investigation undertaken.

As figures 1 through 12 indicate, the pattern of numbers and percentage of high performers since 1984 is quite different across the sub-tests of the SAT. Student performance on the verbal section of the test shows a fairly consistent pattern of decline between the years 1972 and 1989, with the 1989-1990 difference negligible. An examination of the most recent six years reveals a few years where the number of high scorers increased slightly, but overall, the declining pattern holds true, with 1989 yielding the fewest students scoring between 700 and 800 since 1984.

The pattern for mathematics, however, is quite different. The numbers of high scorers declined steadily in much the same way as for the verbal

Figure 1.—Number of students scoring ≥ 750 on scholastic aptitude test-verbal

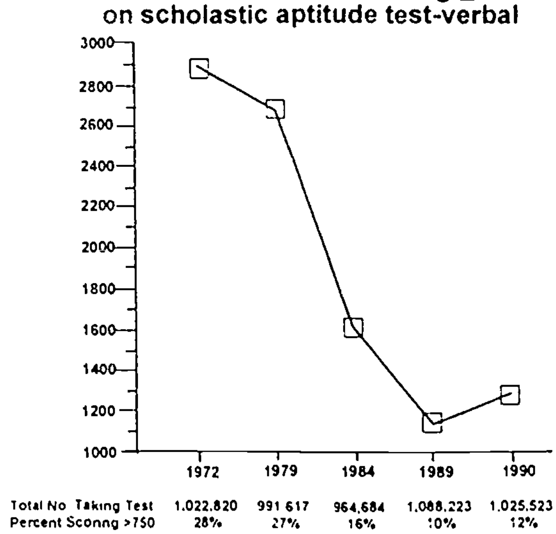
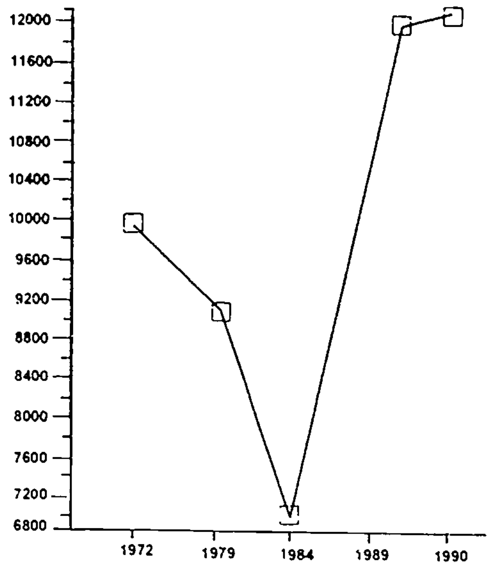


Figure 2.—Number of students scoring ≥ 750 on scholastic aptitude test-quantitative



	1972	1979	1984	1989	1990
Total No. Taking Test	1.022.680	991.617	964.685	1.088.223	1.025.523
Percent Sconng >750	97%	91%	73%	1 1%	1 2%

Figure 3.—Number of students scoring ≥ 750 on scholastic aptitude test-verbal

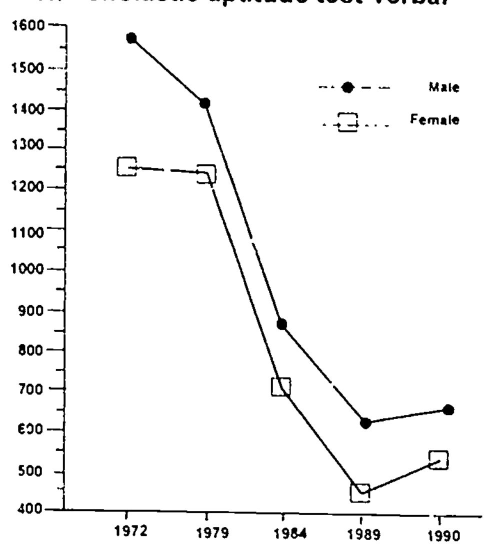


Figure 4.—Number of male and female students scoring ≥ 750 on scholastic aptitude test-quantitative

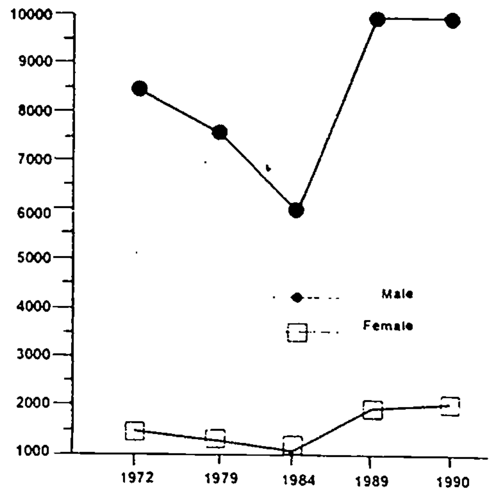
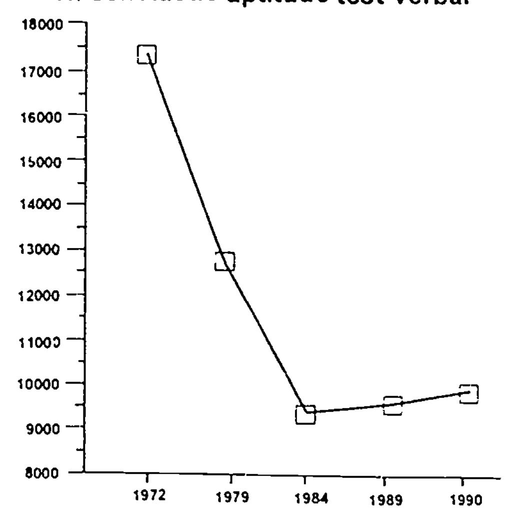


Figure 5.—Number of students scoring ≥ 700 on scholastic aptitude test-verbal



	1972	1979	1984	1989	1990
Total No Taking Test	1.022,820	991.617	964 684	1 088.223	1 025 523
Percent Sconng >700	1 7%	1 3%	1 0%	9%	1 0%

sub-test until 1982 when a consistent pattern of increasing numbers of high scorers began. This pattern has been consistent, with 1990 yielding the greatest number of high scorers (between 700

Figure 6.—Percent of students scoring ≥ 700 on scholastic aptitude test-verbal

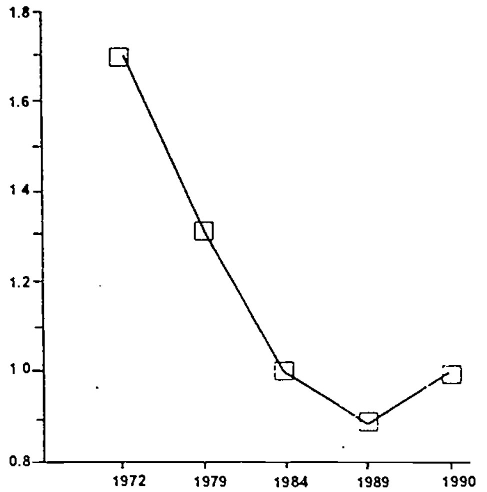


Figure 8.—Percent of students scoring ≥ 700 on scholastic aptitude test-quantitative

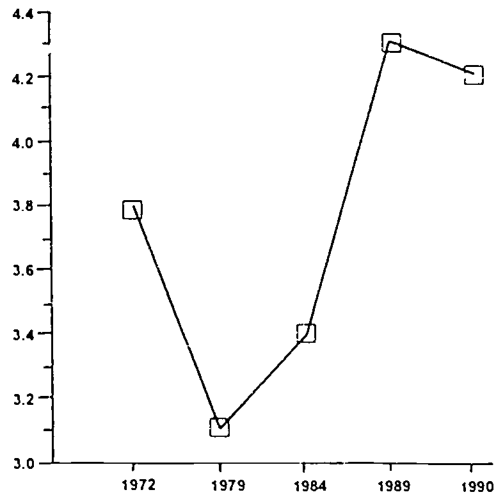
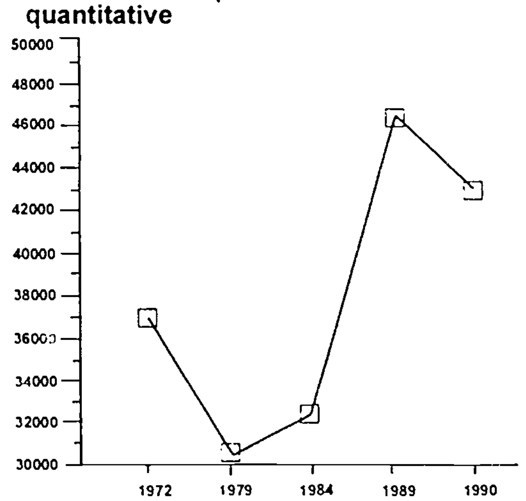
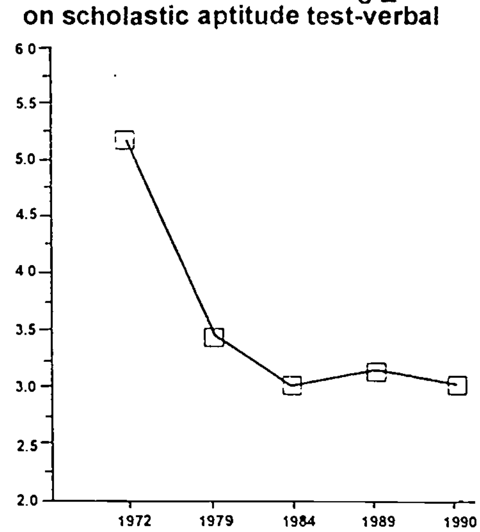


Figure 7.—Number of students scoring ≥ 700 on scholastic aptitude test-quantitative



	1972	1979	1984	1989	1990
Total No Taking Test	1.022.680	991 617	964 685	1.088.223	1 025 523
Percent Scoring >700	3 6%	3 1%	3 4%	4 3%	4 2%

Figure 9.—Percent of students scoring ≥ 650 on scholastic aptitude test-verbal



and 800) in the history of the testing program. These data patterns are consistent, whether one defines high scorer as those scoring greater than 750, greater than 700, greater than 650 or greater than 600. All of these data are taken from the College Board reports entitled "College Bound Seniors." The pattern of continued decline in SAT-V scores and the increase in SAT-M scores has not been addressed or interpreted in any publications of the CEEB.

Figure 10.—Percent of students scoring ≥ 650 on scholastic aptitude test-quantitative

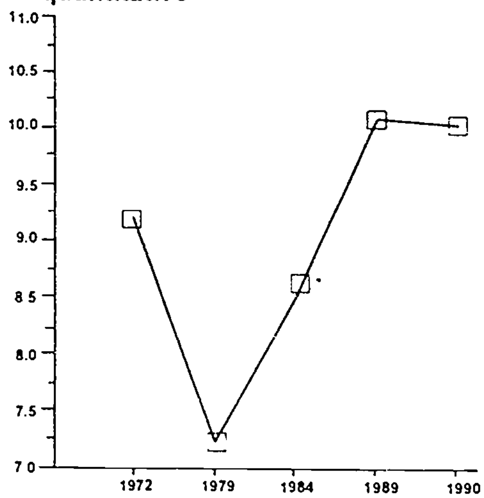


Figure 12.—Number of students scoring ≥ 700 on scholastic aptitude test-quantitative 1985–90

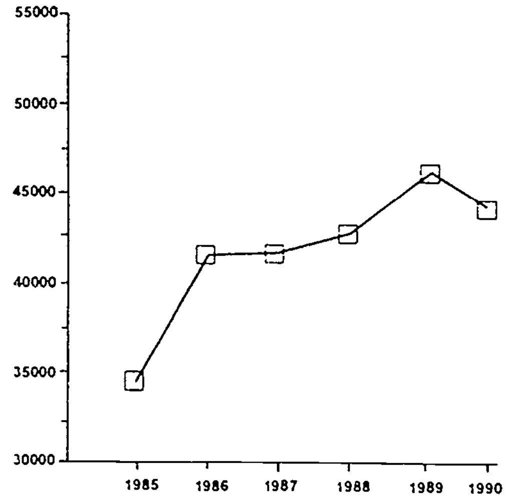
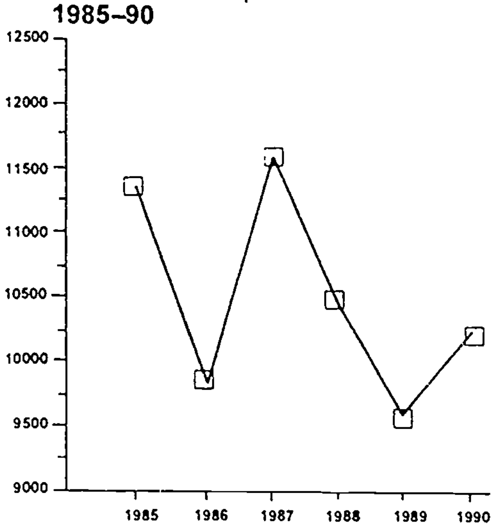


Figure 11.—Number of students scoring ≥ 700 on scholastic aptitude test-verbal 1985–90



Speculations

The interpretation of the patterns of performance on SAT sub-tests is very difficult for several reasons. It is very difficult to define the construct measured by the Scholastic Aptitude Test. On the one hand, the title clearly suggests that it is an aptitude measure, and the researchers and administrators at the ETS have spoken "strongly and consistently against attempts to use SAT scores to measure American education" (Turnbull, 1985, 1). On the other hand, ETS publications include discussions of general test score decline and suggest a strong achievement component related to schools: "A decline as sweeping as the one we have seen in a generation presents educators with an obligation to explore the educational lessons that we may be able to learn from it" (Turnbull, 1985, 2). The current data in publications which report trends in course taking among college students suggest a very close relationship between the patterns noted above (increases in numbers of high scorers in mathematics and decreases in the number of high scorers in verbal areas) and achievement. For example, in a recent publication, *What Americans Study*, ETS reports that the percentage of students meeting the curricular recommendations of four years of high school English (recommended by the National Commission on Excellence in Education in *A Nation at Risk*) has decreased since 1972, while the percentage of students taking three years of science and the percentage of students taking three years of mathematics has increased. This course-taking pattern may explain some of the decrease in high scorers on the SAT-V and the increase in high scorers on the SAT-M.

Eckland (1982) also notes that interpretation of changes in SAT sub-test scores is difficult because the items are changed each year, opening the possibility that the test actually becomes easier over time. Two technical studies comparing the 1963 and 1973 versions of the tests verified that the tests had become easier. Similar data are not available comparing the current versions of the test to earlier versions. However, if that trend has continued over time, the longitudinal data on verbal declines would be underestimated and increases in mathematics scores would be overestimated in terms of actual performance.

Another possible explanation can be offered for the increase in the number of high scoring students in mathematics on the SAT without a similar increase in verbal scores. The influx of Asian immigrants into the United States beginning in 1965 and rapidly growing over the past two and one-half decades may be associated with these patterns. For example, a study by the San Diego schools found that "Southeast Asian immigrants earn higher grades as high school juniors and seniors than virtually all other groups, significantly out-performing white students. The most academically successful among the refugees were students from Vietnam, who represented more than 23% of the valedictorians and salutatorians in the class of 1986" (Divorky, 1988, 220). The CEEB reports that between the years 1972 and 1990, the percentage of Asian Americans taking the SAT increased from 1 percent to 7 percent (from 25,158 to 71,792). Between 1987 and 1990, the average mathematics score for this group increased steadily from 521 to 528 and exceeded the average score of whites (the next highest scoring group) by 32 to 37 (in 1990) points each of those years. Average scores for the Asian-American population were not reported before that time. Unfortunately, it is not possible to separate American-born from immigrant children in the data base in order to verify the hypothesis that the increased scores may result from prior instruction in other countries, and it is not possible to separate the influence of instruction from the strong commitment to educational values within the Asian family.

A final hypothesis which may explain increases in SAT-M scores is the influence of the early identification of mathematics talent and subsequent educational programs (primarily acceleration opportunities) which have evolved through the administration of the SAT to more than 100,000 12-year-olds each year. Opportunities for these students to attend special programs, or the opportunity for them to begin study of algebra early, and the increased offering of algebra in eighth grade by many school districts as a means of addressing the needs of the mathematically talented may account for the increased number of high scores on the quantitative scale of the SAT. In other words, the increase in scores on the SAT-M sub-test may be evidence of the influence of direct intervention in a specific discipline with highly able students through programs specifically designed for gifted students.

Short-term Measures of Interest in Mathematics and Science and Long-term Trends in the Pursuit of Advanced Degrees and Productivity

Sadly, even the satisfaction felt with the increasing number of high scorers on the quantitative portion of the SAT is quickly squelched when the future plans of these students are examined. Clearly, the best minds in the quantitative fields are not interested in pursuing associated careers in the numbers needed to meet the growing demand for mathematicians and scientists. Students who take the SAT examinations asked to complete a survey which includes questions relating to their anticipated college majors. An analysis of trends in the choices these students are making indicates that although the proportion of top-scoring examinees planning to major in math, science, and engineering (defined as in the top 10 percent according to ethnic group and sex) is greater than that of the general examinee population, that proportion has declined steadily since 1982. "The decline reflects an overall decline in interest in mathematics and the physical sciences" (Grandy, 1987, 1). In the last year reported, 1986, only about 15 percent of the white females who scored above the 90th percentile in mathematics planned to major in a "highly quantitative field, namely, mathematics, physical sciences, or engineering" (Grandy, 1987, 1). In 1982, half of the students scoring in the top 10 percent planned to major in math, science, or engineering. Only 44 percent expressed such intentions in 1986. Moreover, interest in engineering rose steadily between 1977 and 1982 but has now leveled off; the same pattern is true for computer science, with 1983 as the year of greatest interest. Interest in the study of mathematics and the physical sciences has steadily declined over the past decade among high scoring students.

Not only has there been a decline in the selection of mathematics and science careers at the bachelor's level among highly able students, but there has also been a decline in the percentage of students entering the graduate level of study, and ultimately, in the level of productivity. For example, even though the total number of graduate students enrolled in graduate programs in mathematics in the United States increased by about 1,700 students from 1975 to 1986, this number actually reflects a decline of 1,400 U.S. students and an increase of 3,100 non-U.S. students (Madison & Hart, 1989). The percentage of U.S. citizens earning doctorates in mathematical science in the United States declined from 72.3 percent of the total to 50.3 percent between 1974 and 1986, while the percentage of doctorates earned by students holding temporary visas increased from 18.5 percent to 37.3 percent. In addition, the total number of doctorates decreased from 1,211 to 730 (National Research Council, 1987). Further, the Committee on the Mathematical Sciences in the Year 2000 points to serious declines in the scholarly productivity of mathematical scientists and scientists in general. Although mathematicians in the United States produced 37 percent of the world's research articles in that field, this is a significant drop from the level of 1973 when they produced 48 percent of those articles. This decline does not represent a switch in productivity to math-related fields. Scholarly productivity in each of the areas of clinical medicine, earth and space sciences, engineering and technology development, biomedicine, biology, physics, and chemistry has also dropped or remained the same since 1973.

The National Assessment of Educational Progress

One indicator which can be used in assessing the relative achievements of high ability students is performance over time on the National Assessment of Educational Progress (NAEP). Although the tests used in the NAEP assessments are general proficiency tests (thus, failing to assess very complex and abstract reasoning) and are not designed to assess the specific achievement of the most able students, some of the trend data do suggest that there have been decreases in achievement among the most able students in several areas which are of concern.

Mathematics and Science Achievement

In the NAEP assessments, students' scores are standardized on a scale ranging from 0 to 500 with a median of 250. Further, students are categorized as scoring at or above a certain level of proficiency with 350 representing the highest category used. Appendix A provides descriptions of the highest categories based on the types of items which must be answered correctly for a student to score in that category. Students of ages 9, 13, and 17 are assessed in each nationwide assessment.

The percentage of 17-year-old students scoring at or above 350 in mathematics declined 1 percent (a statistically significant decline) between 1973 and 1986 while the percentage of high-scoring 13-year-olds declined 1 percent in that same time frame (Dossey, et al., 1988). Mullis et al. (1988) also report that between the years 1977 and 1986 virtually no 9-year-olds demonstrated proficiency at the 350 level. Further, only .6 percent scored at the 300 level of proficiency in 1986, and the trend, though slight, was downward in that category from 1977 through 1986. The percentage of males in the 300 level category among 9-year-olds decreased from .7 percent to .6 percent, and the percentage of females in that category decreased from .8 percent to .5 percent. The decrease in students scoring in the highest category (greater than or equal to 350) was statistically significant for 13-year-olds for the years 1978-86 (from .9 percent to .4 percent), with the larger decrease in the percentage of females from .8 percent to .2 percent. While there was a slight upturn in the trend for 17-year-olds in the 1985-86 assessment, it primarily represented greater increases for males (from 6.7 percent in 1981-82 to 8.2 percent in 1985-86) than for females (4.1 percent to 4.5 percent). Further, earlier achievement levels (of either 1973 or 1976) were not attained in the latest testing.

In science, similar decreases are noted among 17- and 13-year-olds (1 percent) between 1969-70 and in 1986 (Applebee, et al., 1989). No change was noted for 9-year-olds, but "virtually no 9-year-olds" scored in the highest category in any of the science assessments (Mullis & Jenkins, 1988). From 1975-76 to 1985-86, the percentage of students scoring in the highest category fell from .07 percent to .02 percent among 13-year-olds and from 8.5 percent to 5.5 percent among 17-year-olds (Mullis and Jenkins, 1988).

Other NAEP Assessments

In the civics assessment, the average number of "acceptable responses" on the civics proficiency score for 17-year-olds decreased from 81.4 to 79.1 between 1976 and 1988 (Anderson et al. 1990). Although the average number of items answered correctly in the test of factual knowledge of history increased between 1986 and 1988, there were still no fourth or eighth graders scoring at the 350 level of proficiency, and only 4.6 percent of the twelfth graders scored 350 or above (Hammack, et al. 1990).

Other indicators

Maeroff (1983) has also reported on the serious underachievement of the most able U.S. students using the results of a recent assessment in New Jersey as an example. In 1981, of the 30,000 students entering public colleges in New Jersey, only 7,000 had completed college preparatory algebra. That means less than 1 percent of the students entering public colleges were proficient in basic mathematics.

Limitations of the National Assessment of Educational Progress for Evaluating High Ability Students

The NAEP data is more distressing when one considers that the items on all of the NAEP assessments are constructed at a relatively low level. As Shanker (1990) has pointed out, even the questions at the highest levels of these tests "do not require knowing Dickens or Shakespeare or calculus or difficult concepts in history or science. They require the kinds of skills people who have completed high school need in order to find their way in the world" (346). Two examples from the tests of mathematics considered to be at the highest level (350) illustrate this observation:

Which of the following are equivalent equations?

$x + 2 = 9$	and	$x - 2 = 9$
$y - 3 = 7$	and	$y + 5 = 15$
$z - 6 = 3$	and	$z = 3$
$1 + 2 = w$	and	$w + 1 = 2$

The number of tomato plants (t) is twice the number of pepper plants (p). Which equation best describes the sentence above?

$t = 2p$

$2t = p$

$t = 2 + p$

$2 + t = p$

Although these items are relatively simple, only a very few fourth and eighth grade students attain proficiency at the highest level, and the numbers of students scoring at that level have decreased since the beginning of the assessment program. Furthermore, the Educational Testing Service (Applebee et al., Langer 1989) reports that "few students performed at the extreme ends of the scale—that is, from 0 to 150 and from 350 to 500" (7) for any of the assessments. So few fourth and eighth grade students score in the upper ranges (beyond the 350 level) that data are not even reported on this group and the very small numbers of students in the 350 category make trend analysis very difficult and speculative. Dossey, et al. (1988) claim that the skills at the 300 level are too advanced for 9-year-olds and that it is "expected" (11) that no 9-year-olds or 13-year-olds will achieve at the 350 level.

Compare that claim with the findings of Miwa (1987) provided in table 1 on the achievement of Japanese fifth and sixth graders on similar assessments. These items are very close in conceptual difficulty of the 350 level of proficiency on the NAEP assessment, and yet more than 60 percent of Japanese students younger than 13 can answer those questions while only .4 percent of 13-year-olds in the United States do. The United States seems to be willing to accept and justify unnecessarily low standards of achievement for its students.

Shanker also points out that when the NAEP exam for 17-year-olds is compared with school-exit tests in other countries the NAEP instruments are far less demanding. It is little wonder that students in the United States perform so poorly on international assessments.

The International Comparisons

As the data from Miwa (1987) cited above suggest, relying only on longitudinal, national comparisons alone gives a very incomplete picture of the performance of U.S. students. Unfortunately, when international assessments are made, a consistent, damning pattern of low relative achievement of the most able U.S. students is evident.

In introducing the need for international assessments, McKnight et al. (1987) point out that scores

Table 1.—Representative items used by Miwa to assess mathematics achievement among Japanese fifth and sixth grade students

Fifth Grade

Find the value of X which satisfies each

$X \times 4 - 2 = 6$ (85.8% correct)

$5/6 + 3/8 = X$ (80.8% correct)

Sixth Grade

When we substitute a positive number into ____ of the following expressions the greatest is

(63.0% correct)

a. $\_\_\_\_ \times 1\frac{1}{2}$

b. $\_\_\_\_ \times \frac{1}{2}$

c. $\_\_\_\_ - 1\frac{1}{2}$

d. $\_\_\_\_ - \frac{1}{2}$

We buy apples for A yen and oranges for B yen, and hand a 1000 yen note. How much change do we have? (61.2% correct) on standardized achievement and aptitude tests (such as the SAT) have often been used to show that U.S. achievement in mathematics, among other subjects, is not what it used to be. ("Test scores are declining. . . .") Recently these same measures have been used to announce that the crisis is past ("Test scores are rising again at last. . . .") But whether used only to accuse or excuse, such information makes use of only one standard—what we are doing now as compared with our past performance. That is, we compare ourselves with ourselves (13).

A nation should not rely solely on its own educators to identify all of what is important to know, to be able to do, and to assess in the disciplines. The success of U.S. students in the future depends on their ability to function in a world with a global perspective and an international scientific and mathematical community.

Further, reliance on longitudinal data forces comparisons with arbitrary standard years. The choice of particular years for comparison over time of national achievement provides a standard for longitudinal comparison, but educators and policy analysts must be cautious about the value attributed to the years available for comparison. Of what importance is the year 1972 for SATs or 1973 for the NAEP mathematics data (except that 1972-73 was the first year in which NAEP mathematics assessments were administered)? There is no reason to believe that the benchmark years chosen for comparison represent "good" performance. Even if U.S. students were to make consistent and positive gains in test scores, what is to inform us of their progress relative to that of others? Olympic swimmers do not simply swim "as fast as they can"; they sometimes swim against the clock with known times of accomplishments of others. And it is generally agreed that they need to swim against the competition to assess their real achievement. Similarly, one means of providing additional perspectives on the achievements of academically able students in the United States is to look at international comparisons.

Studies of the International Association for the Evaluation of Education Achievement

The International Association for the Evaluation of Educational Achievement (IEA) has conducted numerous studies comparing the achievement of students in cooperating countries in the disciplines of mathematics, science, civic education, reading comprehension and literature, and English and French as foreign languages. Over the history of this effort, the studies of this group have included students from various grade levels to allow comparisons at both elementary and secondary levels. Some nations have participated in all the studies assessing all of the disciplines, while others have opted to participate only in certain studies of particular interest. The concepts included in the assessments and the instruments used for assessments of the disciplines are determined by a distinguished panel of over 40 educators representing each of the countries involved in the project.

Although there is a plethora of data available from these studies, this paper will focus on the mathematics and science studies since the data are the most recent on these topics and some comparative data across years are also available for consideration.

The IEA Mathematics Studies

In the most recent studies of mathematics achievement, two different groups of students were studied. Population A was made up of all students in the grade (year level) where the majority of students had attained the age of 13.00 to 13.11 by the middle of the school year. The other population sampled, Population B, was composed of all students who were in the normally accepted terminal grade of the secondary education system and who were studying mathematics as a substantial part (approximately 5 hours per week) of their academic program. Population B, students studied at the end of the r secondary level educational careers, was considered the "elite" or "cream of the crop' with respect to school mathematics in the school system of each country'' (McKnight et al. 1987, 17). In other words, the American students sampled in this study represented a very small percentage of the student body (15 percent)—the best or academically elite of U.S. high schools. Only Israel and Japan had a smaller percentage of the student body enrolled in such courses (10 percent and 13 percent respectively) than did the United States, and the low enrollments in Japan may be related to the early completion of mathematics requirements by the most able students in Japanese schools. When the total age cohort is considered (i.e., all age cohorts whether in school or not), only Israel, Sweden, and Belgium were testing a more select group of students than the United States (McKnight et al. 1987).

The most able college preparatory students in each country were assessed across the topics of number systems, sets and relations, algebra, geometry, elementary functions and calculus, and probability and statistics. In each of those categories, the students in the United States failed to achieve at the international average. In the area of sets and relations, the students in the United States scored halfway between the international average and the bottom quarter. In all other areas, their scores were generally among the bottom one-fourth of the countries assessed. When an even more elite group from the United States was selected, those taking calculus. the results were more distressing.

In the United States, the achievement of the calculus classes, representing the nation's best mathematics students, was at or near the average achievement of the advanced secondary school mathematics students in other countries. (In most countries, all advanced mathematics students take calculus; in the United States, only about one-fifth do). The achievement of U.S. pre-calculus students (the majority of 12th grade college-preparatory mathematics students) was substantially below the international average. In some cases the United States ranked with the lower one-fourth of all countries in the study, and was the lowest of the advanced industrialized countries (McKnight et al., 1987, vii).

At the risk of belaboring a point, this means that the top 3 percent of American students (20 percent of the 15 percent sampled) only earned scores at the average of all students taking the same level of mathematics in other countries.

Even more telling are the data which document that ''average Japanese students achieved higher than the top 5 percent of the U.S. students in college preparatory mathematics'' (McKnight, et al, p. 26). When the researchers controlled for selectivity effects by studying the top 1 percent and 5 percent of the age group in each country,

> The U.S. came out as the *lowest* [emphasis added] of any country for which data were available. That is to say, the algebra achievement of the most able students in the United States (the top 1 percent) was lower than that of the top 1 percent of any other country. The algebra achievement of the top 5 percent

Table 2.—Rankings of the mean mathematics scores of participating nations of the top 1 percent of population B students of the IEA Study of Mathematics (Garden 1989)

Algebra and Functions	*Geometry*	*Calculus Elementary*
Japan	Japan	Japan
Hungary	Hungary	Finland
Canada (Ontario)	Canada (B.C.)	Canada (Ontario)
Canada (B.C.)	Canada (Ontario)	Sweden
Sweden	Sweden	Hungary
Finland	Belgium (Flemish)	New Zealand
Belgium (Flemish)	Finland	England and Wales
Belgium (French)	New Zealand	Belgium (Flemish)
England and Wales	England and Wales	Belgium (French)
New Zealand	Scotland	Israel
Scotland	Belgium (French)	Scotland
Israel	United States	United States
United States	Israel	Canada (B.C.)

was lower than any other country, except for Israel. In functions and calculus, the achievement of the top 1 percent of U.S. students exceeded that of Canada's (British Columbia) by only a few points even though calculus is not even included in the curriculum of Canada (McKnight, et al, 1987, 27).

Not only did the students from the United States in the groups considered "elite" in the study of mathematics score lower than the elite groups from other nations, but they also were outscored by two countries (Hungary and Scotland) that used much broader definitions of the range of students to be included in the study (Travers, et al., 1989). The inclusion in the sample of students in Hungary who were not taking courses which would truly be regarded as pre-university courses and the inclusion of two of the highest grade levels in Scotland (instead of one) were regarded by the researchers as factors which resulted in scores which "may be considerably lower" (14) for those countries than if the more strict criteria had been applied in sampling. Therefore, the United States should have had an advantage in comparisons to Hungary and Scotland. Its lower scores reflect more serious underachievement than even the comparisons to other countries reflect.

In the collection of international data presented above, the assessment committee made some assumptions which cloud interpretations when comparing the achievement of the brightest students in each culture. As noted, the sample of students in Population B consisted of students in the terminal year of secondary school who were studying mathematics as a substantial part of their academic program. This sampling procedure assumed that the most able students would be in that sample. However, in the advanced or accelerated programs in countries such as Japan, many students complete their study of formal mathematics at the secondary level before that time. If this is the case, only those who are somewhat less able would be in the classes sampled, and the differences in achievement among nations may be underestimated since students of lesser ability in those countries are being compared with the most able in the United States.

Another important statistic emanating from these international studies is the number of high-achieving students (those scoring greater than 76 percent on the test) per 1,000 students of the age cohort from each country. Based on the latest assessment scores and the numbers of students currently served in advanced mathematics classes in the countries assessed, the expected yield for Japan is 58 high-achieving students per 1,000, while for the United States it is only 3 students per 1,000. Only British Columbia has a lower yield score (Garden, 1989).

The IEA Science Studies

IEA's first science assessment in 1970 administered comprehensive or general science tests to

Table 3.—Yield of high performance students as reported by the IEA study of mathematics: Population B (Garden, 1989)

Nation	Percent of sample scores exceeding 76%	Estimated number of students per 1,000 of the age cohort exceeding 76%
Belgium (Flemish)	11	11
Belgium (French)	7	7
Canada (British Columbia)	1	2
Canada (Ontario)	9	16
England and Wales	22	13
Finland	17	21
Hong Kong	56	33
Hungary	3	17
Israel	6	4
Japan	48	58
New Zealand	12	13
Scotland	3	5
Sweden	16	19
Thailand	2	—
United States	2	3

four populations, including one group which represented students "in the terminal year of those full-time secondary education programs which were either pre-university programs or programs of the same length" (Comber and Keeves, 1973, 10). At the time of this first science assessment, the top 9 percent of students in the United States ranked 7th, the top 5 percent ranked 8th, and the top 1 percent ranked 9th out of 14 countries. French-speaking students in Belgium and Flemish-speaking students in Belgium were treated separately.

During the mid-1980s, the IEA studied three populations in its science assessments. The youngest students were 10-year-olds, the second group were 13-year-olds, and the third group consisted of students studying science in the final year of secondary school. Students at all three levels were administered a general test, and the students at the highest level were administered specific discipline tests as well. It should be noted that the 13-year-old U.S. students ranked thirteenth out of sixteen countries, but more importantly, not a single student in the United States earned a perfect score (attained in twelve of the other countries). (International Association for the Evaluation of Educational Assessment, 1988).

The other results of this study to be discussed in this report are based on those students considered the "elite group" of each country (Population 3) who were in an advanced course (second year of study) in the particular science area assessed. In the United States, these students were all enrolled in an Advanced Placement course in the discipline assessed. The United States did not administer the general test nor assess students not in advanced classes and not in science classes. That is, U.S. students were assessed only in their Advanced Placement discipline while students in other countries were assessed on the general test and on one of the discipline tests. Further, the administrators in the United States did not administer five of the items on the biology test, five of the items on the chemistry test, and four of the items on the physics test. Postlewaite (personal communication to the Second International Science Study National Representative Committee on first draft of SISS Volume 2, dated July 22, 1989) points out that he assumes that these items were eliminated because they were not relevant to the curriculum of the United States. Although comparisons discussed in this paper are those using common items on the test, he notes that if his assumption is correct, then the United States "has an advantage over other countries" (26) because other countries did not eliminate items not part of their curricula. Scores of students in the United States were based only on items matching the curriculum of the United States; scores of the students in other countries, while containing common items also included items not necessarily part of the curriculum they studied.

The importance of the achievement of Population 3 and the status of the students in this population as the most able is stressed by the IEA assessment committee in their note that "the scientific literacy of the general population is one thing. The science achievement of the elite in a technological era is another" (International Association for the Evaluation of Educational Achievement, 1988, 43).

The performance of these "academically elite" students in the United States was shockingly low. U.S. students in biology classes ranked last of the 14 nations in the report of the IEA (1988); those in chemistry classes ranked twelfth out of 14; and those in physics classes ranked tenth. The authors of the report concluded that "the United States would appear to have grounds for concern unless the situation is remedied at the university level" (73). Although a small number of the nations studied reported mean age scores one year greater than the mean age reported for the United States, data are not available at this time which explain the effect of this age difference on the scores; nor does the age difference necessarily suggest a greater number of years of science instruction for the students in the other nations.

It is also important to note that the more select the population studied, the lower the performance of U.S. students (see table 4).

Table 4.—Rankings of the mean science scores of the top 1%, top 5%, and top 9% of Population 4 of the IEA Science Study (Walker, 1976)

Top 9%	*Top 5%*	*Top 1%*
Australia	Australia	New Zealand
Sweden	New Zealand	England
New Zealand	England	Australia
England	Sweden	Scotland
Hungary	Scotland	Sweden
Scotland	Hungary	Hungary
United States	Netherlands	Netherlands
Finland	United States	Finland
Belgium (Flemish)	Finland	United States
Netherlands	Federal Republic of Germany	Federal Republic of Germany
France	France	France
Federal Republic of Germany	Belgium (Flemish)	Belgium (Flemish)
Belgium (French)	Belgium (French)	Italy
Italy	Italy	Belgium (French)

[1]Population 4 was defined as all students who were in the final year of full-time secondary courses leading to University entrance qualifications, or of full-time courses of the same length.

Table 5.—Ranking of participating nations on the basis of mean scores of science students in Population 3[1] (International Association for the Evaluation of Science Achievement, 1988)

Biology	%[a]	*Chemistry*	%	*Physics*	%
Singapore	3	Hong Kong (Form 7)	8	Hong Kong (Form 7)	8
England	4	England	5	Hong Kong (Form 6)	14
Hungary	3	Singapore	5	England	6
Poland	9	Hong Kong (Form 6)	14	Hungary	6
Hong Kong (Form 7)	4	Japan	16	Japan	11
Norway	10	Hungary	1	Singapore	7
Finland	45	Australia	12	Norway	24
Hong Kong (Form 6)	7	Poland	9	Poland	9
Sweden	15	Norway	15	Australia	11
Australia	18	Sweden	15	United States	1
Japan	12	Italy	2	Sweden	15
Canada	28	United States	1	Canada	19
Italy	14	Canada	25	Finalnd	14
United States	6	Finland	14	Italy	19

[1] Population 3 is defined as all students studying science in the final year of secondary school. In the United States the population sampled was students in advanced courses such as Advanced Placement (second year of study of that particular science).

[a] The numbers in the % column indicate the percent of the total school population enrolled in the schools of that country who are enrolled in these courses.

Educators in the United States should also be concerned that scores of U.S. students showed greater sex differences in science achievement than the international average differences in all disciplines. The science scores of male and female students reflect greater discrepancies (favoring males) in the United States than in most other countries. Only three of the fourteen other countries had greater discrepancies between male and female scores in biology and chemistry, and only five other countries had greater discrepancies in physics scores.

Other Studies Supporting the International Association for the Evaluation of Educational Achievement Studies in Mathematics

The secondary level findings presented in the IEA studies (lower achievement of the most able students in the United States) are not unique to those studies or to secondary school results. Other international studies document similar performance differences in the elementary and middle school age population and suggest that the pattern of underachievement begins early. For example, Stevenson et al. (1986) compared mathematics achievement of Japanese, Chinese, and American first and fifth graders. Only 15 Americans were among the 100 top scorers in the first grade, and at grade 5 there was only 1 American among the top 100 scorers. The poor achievement of Americans was not due to a particular area of weakness. "They were as ineffective in calculating as in solving word problems" (605). Incidently, this study examined the hypothesis that the performance differences might be attributed to the outside tutoring of special after-hours schools in Japan and China and concluded, "Attendance at afterschool classes had no relation to academic achievement in any of the three cities" (Stevenson and Lee, 1990, 45). In a second study reported by Stevenson (1987), only 3 American children scored in the top 5 percent in a mathematics assessment across 4 cities in Japan, China, and the United States. If the math achievement had been equally distributed, 40 American children would have been in that group.

Stevenson and his colleagues (1986) also studied the classrooms of the children and the attitudes of the children's mothers. They found that in grades 1 and 5 the amount of instructional time devoted to mathematics by the American children was about 3 hours per week (less than 20 percent of the school day as compared to 40 percent time on language arts and reading) and was less than half the time that either the Japanese or Chinese devoted to math instruction. In some American classrooms observed, no time was devoted to mathematics in over 40 hours of observation per classroom.

Further, in American classrooms, children known to be in school were often not in the classroom during observation times (18.3 percent of the time for American fifth grades; less than .2 percent in classes in classes in Taipei and Sendai). The absent students were found to be on errands to the school office, in another classroom, or, ironically, in the library. Stevenson, et al. also found that American mothers rated their children's achievement in mathematics very favorably and were pleased with the job the schools were doing. The Chinese and Japanese mothers did not rate their children's achievement as high nor did they believe the schools were doing as good a job in mathematics instruction. Finally, Stevenson and his colleagues found that the American mothers attributed the child's success or lack of success in mathematics to the ability of the child, while the Japanese mothers were more likely to attribute success to the effort of the child. These findings, combined with those of Miwa, suggest that the very low relative performance of the best U.S. students in mathematics begins in first grade and is consistent across grade levels and studies.

In an attempt to compare the performance of students from the United States and other nations on the concepts tested in the National Assessment of Educational Progress, the Educational Testing Service has used a sample of items from the 1986 NAEP mathematics and science tests to make international comparisons of the achievement of 13-year-olds. Six countries were included in this study, with four Canadian provinces studied as separate comparison groups. Comparisons of the percentage of students scoring in the two highest groups in mathematics (those scoring at or above 600 and those scoring at or above 700) are presented in table 6 (Lapointe et al. 1989). The scale ranges from 0 to 1000 with a mean of 500 and a standard deviation of 100. Of all the groups participating, the United States had the lowest percentage of students scoring in the upper ranges of assessment (at or above 600) of all but one other group (French-speaking students in Ontario). When the group scoring 700 or greater was considered, the United States had a lower percentage of students in that group than all other countries except French-speaking students in Ontario, Irish students, and French-speaking students in New Brunswick.

On the science assessment of this comparison using NAEP items, a greater percentage of students in British Columbia, Korea, the United Kingdom, and English-speaking Ontario scored at or above 700 than did students in the United States. Only Ireland, French-speaking Ontario, and French-speaking New Brunswick had a smaller proportion of students scoring 600 or greater.

School-Related Factors Which May Influence the Achievement of Highly Able American Students

Cross-cultural studies have not been limited to the examination of test scores alone. Curricular analyses and studies of other school factors suggest several variables which yield hypotheses for explaining the poor performance of all U.S. students, including gifted students. For example, the Second International Mathematics Study found that

Table 6.—Percent of students performing at or above 600 or 700 on the mathematics portion of the International Assessment of Educational Progress (LaPointe, 1989).

Level[a]	600	700
Korea[b]	40	5
Quebec (French)	22	2
British Columbia	24	2
Quebec (English)	20	1
New Brunswick (English)	18	1
Ontario (English)	16	1
New Brunswick (French)	12	less than 1
Spain	14	1
United Kingdom	55	2
Ireland	14	less than 1
Ontario (French)	7	0
United States	9	1

[a] Level 600 is defined as understanding concepts and level 700 is defined as interpreting data.

[b] Students in Korea, Quebec, New Brunswick, Ontario, and Spain begin school at age 6; students in British Columbia, the United Kingdom, and the United States begin school at age 5; students in Ireland begin school at age 4.

Table 7.—Percent of students performing at or above 600 or 700 on the science portion of the International Assessment of Educational Progress (LaPointe, 1989).

Level[a]	600	700
British Columbia[b]	31	4
Korea	33	2
United Kingdom	21	2
Quebec (English)	15	1
Ontario (English)	17	2
Quebec (French)	15	1
New Brunswick (English)	15	1
Spain	12	1
United States	12	1
Ireland	9	1
Ontario (French)	6	less than 1
New Brunswick (French)	7	less than 1

[a] Level 600 is defined as understanding concepts and level 700 is defined as interpreting data.

[b] Students in Korea, Quebec, New Brunswick, Ontario, and Spain begin school at age 6; students in British Columbia, the United Kingdom, and the United States begin school at age 5; students in Ireland begin school at age 4.

one likely contributor to differences in student achievement in mathematics was the curriculum presented to students. The curriculum has been identified as less challenging in the United States with more difficult addition and subtraction problems introduced later in the United States than in Japan, Taiwan, mainland China, and the former Soviet Union (Fuson et al. 1988) and with a much broader range of word problems introduced in Soviet texts than in American texts (Stigler et al. 1986). Clearly, if the most able students are not introduced to the same range of concepts, they cannot be expected to learn those concepts. The curriculum must be examined to ensure that all children in the United States are presented with the most challenging curriculum within their grasp.

Issues

A very disturbing finding of this review is the lack of information on the performance of "high ability" students—according to *anybody's* definition of high ability. Nearly all data which are reported are based on the high achievers on a given assessment instrument; however, little information is available on the cognitive abilities of these students. Further, the small number or percentage of students scoring in the upper ranges of the instruments, particularly the National Assessment of Educational Progress assessments, make analyses of trends and pattern particularly tenuous. Other comparative studies consulted for this paper simply did not include a large enough sample of high ability students to warrant their inclusion in the discussion.

The national assessment studies included in this review are often limited by their focus on the general population of students and the inclusion of high ability student analyses only as a by-product of the main purpose. This results not only in small numbers of high ability students studied but also in limited information on the effects of programs particularly suited to these students and on the achievement of the goals set for the most gifted students. For purposes of this paper, the international studies provided the most comprehensive information on the most able students.

Other Related and Anecdotal Data

An anecdotal report of non-standardized, non-test data may illustrate the real-world impact of the performance differences. The managers of a semiconductor plant recently opened in the Southeastern United States had to hire *graduate students* to perform the statistical quality control functions carried out by *high school graduates* in a comparable plant in Japan (Gilden, 1987).

The superior quality of U.S. colleges and graduate schools is often cited as evidence of the success of the U.S. educational system. However, examination of the graduate enrolments in those institutions is further evidence of serious problems in the future if the United States cannot find a way to make its students competitive in the international arena and interested in careers in mathematics and science.

Conclusions

The available data on the performance of highly able students in the United States are limited by the shortage of studies particular to the gifted student, the limited assessment range and other problems and factors discussed above. Further, there is evidence that the mathematics aptitude test score decline among the highest scoring students as measured by SAT (Scholastic Aptitude Test) scores has leveled off. However, the data on the verbal performance of the most able U.S. students, the data from the NAEP studies and from the international studies of achievement in mathematics and science are compelling evidence that the achievement levels of the most able students in the United States are declining. The scores of the highest achieving students in this country do not compare favorably with those of most other industrialized nations—especially in advanced mathematics and science. America's most capable students are not competitive academically with the best students in other nations. In fact, they barely perform as well as the average student in many of those nations. These findings are dramatic testimony to the failure of the educational system to meet the challenge of developing the nation's greatest resource—the potential of the gifted student.

In presenting the educational goals for the Year 2000, former President Bush said, "These goals are about excellence. Meeting them will require that the performance of our highest achievers be boosted to levels that equal or exceed the performance of the best students anywhere. . . . We must work to ensure that a significant number of students from all races, ethnic groups, and income levels are among our top performers." The nation has far to go.

Some Final Concerns and Comments

Although this paper has been commissioned by the U.S. Department of Education and the natural tendency is to look to schools as the source of both the problems and the solutions, it is important to remember that schools exist within a societal and cultural context as the International Association for the Evaluation of Educational Achievement and other international studies clearly document. As Torsten Husen has pointed out, "IEA findings consistently show that non-scholastic factors account for a considerable portion of the between-student, between-school, and between-country variation. Thus educational improvement is also a matter of improving the social and economic conditions under which the educational system operates. To use a modern expression—educational reforms call for systems solutions which relate to society at large" (Walker, 1976, 12). The attitudes of mothers in the study by Stevenson et al. (1986) further document that finding. Any consideration of the changes necessary in order for gifted students to fulfill their potential cannot ignore the larger context of education and society at large.

The challenge to the United States is to examine its educational system, the context of that system and the interactions between the two to determine the relevant forces which must be brought to bear if the serious trend of underachievement among the most able students in this country is to be reversed.

Appendix A: Definitions of Level 350 on the National Assessment of Educational Progress Scales

Reading Level 350: Advanced Skills and Strategies

Readers who use advanced reading skills and strategies can extend and restructure the ideas presented in specialized and complex texts. Examples include scientific materials, literary essays, historical documents, and materials similar to those found in professional and technical working environments. They are also able to understand the links between ideas even when those links are not explicitly stated, and to make appropriate generalizations even when the texts lack clear introductions or explanations. Performance at this level suggest the ability to synthesize and learn from specialized reading materials.

Mathematics Level 350: Multistep Problem-Solving and Algebra

Learners at this level can apply a range of reasoning skills to solve multistep problems. They can solve routine problems involving fractions and percentages, recognize properties of basic geometric figures, and work with exponents and square roots. They can solve a variety of two-step problems using variables, identify equivalent algebraic expressions, and solve linear equations and inequalities. They are developing an understanding of functions and coordinate systems.

Science Level 350: Integrates Specialized Scientific Information

Students at this level can infer relationships and draw conclusions using detailed scientific knowledge from the physical sciences, particularly chemistry. They also can apply basic principles of genetics and interpret societal implications of research in this field.

From: Applebee, A. N., Langer, J. A., & Mullis, I. V. S. (1989). *Crossroads in American Education: A Summary of Findings*. Princeton, N.J.: Educational Testing Service.

History Level 350: Interprets Historical Information and Ideas

Students at this level are developing a detailed understanding of historical vocabulary, facts, regions, and ideas. They are familiar with the content of a wider variety of texts such as the Articles of Confederation, the Federalist Papers, Washington's Farewell Address, and certain amendments to the Constitution. They are aware of the religious diversity of the United States and recognize the continuing tension between democratic principles and such social realities as poverty and discrimination. These students demonstrate a rudimentary understanding of the history of U.S. foreign policy. They are beginning to relate social science concepts—such as price theory, separation of powers, and essential functions of government—to historical themes and can evaluate causal relationships.

From: Hammack, et al (1990). *The U.S. History Report Card*. Princeton, N.J.: Educational Testing Service.

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