THE NATIONAL EDUCATION GOALS REPORT

SUMMARY

1997

Mathematics and Science Achievement for the 21st Century

National Education Goals Panel

Governors

James B. Hunt, Jr., North Carolina (Chair, 1997)
John Engler, Michigan
William Graves, Kansas
Paul E. Patton, Kentucky
Roy Romer, Colorado
Tommy G. Thompson, Wisconsin
Cecil Underwood, West Virginia
Christine Todd Whitman, New Jersey

Members of the Administration

Carol H. Rasco, Senior Advisor to the Secretary of Education
Richard W. Riley, Secretary of Education

Members of Congress

U.S. Senator Jeff Bingaman, New Mexico
U.S. Senator Jim Jeffords, Vermont
U.S. Representative William F. Goodling, Pennsylvania
U.S. Representative Dale E. Kildee, Michigan

State Legislators

Representative G. Spencer Coggs, Wisconsin
Representative Ronald Cowell, Pennsylvania
Representative Mary Lou Cowlishaw, Illinois
Representative Douglas R. Jones, Idaho

National Education Goals Panel Staff

Ken Nelson, Executive Director
Leslie A. Lawrence, Senior Education Associate
Cynthia D. Prince, Associate Director for Analysis and Reporting
Emily O. Wurtz, Senior Education Associate
Cynthia M. Dixon, Program Assistant
John Masaitis, Executive Officer

FOREWORD

On behalf of the National Education Goals Panel, I am pleased to present this *Summary* of the *1997 National Education Goals Report*. This report is the seventh in a series designed to measure the amount of progress made by the nation and the states toward the eight National Education Goals. The idea of an annual report to the nation originated at the first Education Summit held in Charlottesville, Virginia, in September 1989. There the President and the nation's Governors agreed that establishing National Education Goals would capture the attention of Americans in order to better our schools and increase our expectations for student performance. In July 1990, the National Education Goals Panel was created to monitor education progress and report to the American public.

More than two dozen national core indicators are presented in this *Summary* on pages 6-11, which convey how much progress we have made in each Goal area. In addition, this year's *Summary* highlights student achievement in mathematics and science, two of the core academic subjects in which we expect all students to demonstrate competency. The promising news is that more of our students in Grades 4, 8, and 12 are considered proficient or advanced in mathematics than students were six years earlier. In addition, more of our college graduates are receiving degrees in mathematics and science. We attribute much of this success to the work that states and professional organizations have done to set rigorous academic standards for students.

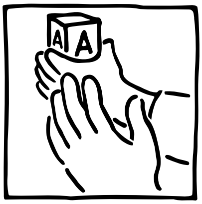
But as gratifying as these improvements are, we know that more must be done if we hope to raise the mathematics and science skills of all our students to world-class levels. Although our 4th graders were outperformed in science only by Korea in a recent international assessment, the U.S. was slightly above the international average in 4th grade mathematics and 8th grade science, and below the international average in 8th grade mathematics. In fact, the mathematics scores of our very best 8th grade students were similar to the scores of only average students in Singapore. That is why the National Education Goals Panel proposes three steps in this year's report to raise the achievement levels of our young people: set tougher standards that are comparable to the best in the world; align all components of the education system with the standards; and strengthen our teachers' subject-matter knowledge and teaching skills.

The National Education Goals Panel has always advocated challenging academic standards as a means of measuring and improving student achievement. As important as this is, more must be done if schools are to help students reach challenging standards. It is our belief that this *Summary* brings us closer to understanding how to get there.

Sincerely,

James B. Hunt, Jr., Chair (1997)
National Education Goals Panel, and
Governor of North Carolina

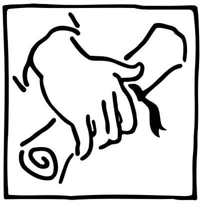
THE NATIONAL EDUCATION GOALS



Goal 1: Ready to Learn

By the year 2000, all children in America will start school ready to learn.

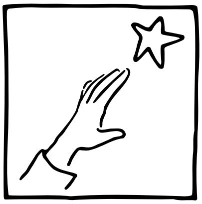
Did you know...that between 1993 and 1996, the percentage of 3- to 5-year-olds whose parents read to them or told them stories regularly increased from 66% to 72%?



Goal 2: School Completion

By the year 2000, the high school graduation rate will increase to at least 90 percent.

Did you know...that 3,356 students drop out of school each day, and that within two years high school graduates can expect to earn 25% more than dropouts?



Goal 3: Student Achievement and Citizenship

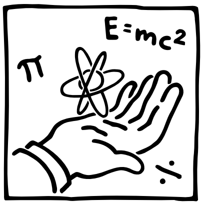
By the year 2000, all students will leave grades 4, 8, and 12 having demonstrated competency over challenging subject matter including English, mathematics, science, foreign languages, civics and government, economics, arts, history, and geography, and every school in America will ensure that all students learn to use their minds well, so they may be prepared for responsible citizenship, further learning, and productive employment in our Nation's modern economy.

Did you know...that in 27 states the percentage of 8th graders who scored at the Proficient or Advanced levels on the National Assessment of Educational Progress (NAEP) mathematics assessment increased?

Goal 4: Teacher Education and Professional Development

By the year 2000, the Nation's teaching force will have access to programs for the continued improvement of their professional skills and the opportunity to acquire the knowledge and skills needed to instruct and prepare all American students for the next century.

Did you know...that between 1991 and 1994, the percentage of secondary school teachers who held an undergraduate or graduate degree in their main teaching assignment decreased from 66% to 63%?

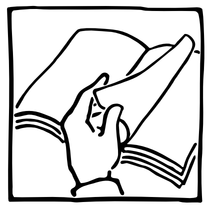


Goal 5: Mathematics and Science

By the year 2000, United States students will be first in the world in mathematics and science achievement.

Did you know...that only Korea outperformed the U.S. in 4th grade science in a recent international assessment?

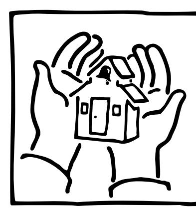
Goal 6: Adult Literacy and Lifelong Learning



By the year 2000, every adult American will be literate and will possess the knowledge and skills necessary to compete in a global economy and exercise the rights and responsibilities of citizenship.

Did you know...that fewer adults with a high school diploma or less are participating in adult education, compared to those who have postsecondary education?

Goal 7: Safe, Disciplined, and Alcohol- and Drug-free Schools



By the year 2000, every school in the United States will be free of drugs, violence, and the unauthorized presence of firearms and alcohol and will offer a disciplined environment conducive to learning.

Did you know...that threats and injuries to students at school decreased over a 5-year period?

Goal 8: Parental Participation

By the year 2000, every school will promote partnerships that will increase parental involvement and participation in promoting the social, emotional, and academic growth of children.

Did you know...that parental involvement in school declines as children get older?

HOW ARE WE DOING AT THE NATIONAL LEVEL?

National progress on 26 core indicators selected to measure progress toward the eight National Education Goals is slightly better than the progress that was characterized in the *1996 Executive Summary.* In six areas, there have been improvements. More infants are born with a healthier start in life. More 2-year-olds are fully immunized. More families are reading and telling stories to their children on a regular basis. Mathematics achievement has improved among students in Grades 4, 8, and 12. More students are receiving degrees in mathematics and science. And incidents of threats and injuries to students at school have decreased.

In seven areas, the news is not as encouraging. Reading achievement at Grade 12 has declined. Fewer secondary school teachers hold a degree in their main teaching assignment. Fewer adults with a high school diploma or less are participating in adult education, compared to those who have postsecondary education. Student drug use and attempted sales of drugs at school have increased. Threats and injuries to teachers have increased. More teachers are reporting that disruptions in their classrooms interfere with their teaching.

The 1997 U.S. Scorecard (pp. 6-11) indicates that national performance has improved in six areas and declined in seven.

In seven areas, conditions simply have not changed. For example, the gap in preschool participation rates between high- and low-income families has not decreased. The high school completion rate has remained the same. The percentage of students who report using alcohol has not decreased. And the nation has not reduced the gap in college enrollment rates and college completion rates between White and minority students.

The following pages summarize the nation's progress toward each of the Goals. Baseline measures of progress, which appear in the first column, were established as close as possible to 1990, the year that the National Education Goals were adopted. The most recent measures of performance for each indicator appear in the second column. The arrows in the third column show our overall progress on each indicator:

↑ Arrows which point upward indicate where we have made progress.

↓ Arrows which point downward indicate where we have fallen further behind.

↔ Horizontal arrows indicate where we have seen no discernible change in our performance.

Additional information about the nation's and individual states' progress can be found in the *1997 National Education Goals Report.* Copies can be obtained free of charge by contacting the National Education Goals Panel (see back cover).

UNITED STATES

GOAL 1 Ready to Learn

	Baseline	Update	Progress?
1. **Children's Health Index:** Has the U.S. reduced the percentage of infants born with 1 or more health risks? (1990, 1995)	37%	34%	↑
2. **Immunizations:** Has the U.S. increased the percentage of 2-year-olds who have been fully immunized against preventable childhood diseases? (1994, 1996)	75%	78%	↑
3. **Family-Child Reading and Storytelling:** Has the U.S. increased the percentage of 3- to 5-year-olds whose parents read to them or tell them stories regularly? (1993, 1996)	66%	72%	↑
4. **Preschool Participation:** Has the U.S. reduced the gap in preschool participation between 3- to 5-year-olds from high- and low-income families? (1991, 1996)	28 points	29 points[ns]	↔

1. Late or no prenatal care, low maternal weight gain, smoking during pregnancy, and drinking alcohol during pregnancy—the four health risks that are measured by the Children's Health Index—can directly affect newborns' physical health.

2. One of the most important preventive actions parents can take to see that their children receive the health care needed to arrive at school with healthy minds and bodies is to make certain that they are fully immunized against preventable childhood diseases.

3. Early, regular reading to children is one of the most important activities parents can do with their children to improve their readiness for school, serve as their child's first teachers, and instill a love of books and reading.

4. High-quality preschool programs can accelerate the development of all children, and poor children in particular. However, children from low-income families are the least likely to attend early care and education programs.

[ns] Interpret with caution. Change was not statistically significant.

UNITED STATES

	Baseline	Update	Progress?

GOAL 2 School Completion

	Baseline	Update	Progress?
5. High School Completion: Has the U.S. increased the percentage of 18- to 24-year-olds who have a high school credential? (1990, 1996)	86%	86%	↔

While possession of a high school diploma no longer guarantees easy access to jobs, lack of a diploma or its equivalent almost certainly means that an individual will experience difficulty entering the labor market and will be at pronounced educational, social, and economic disadvantages throughout his or her life.

GOAL 3 Student Achievement and Citizenship

Although all of the National Education Goals are important, increasing student achievement in the core subject areas will be the ultimate test of successful education reform.

	Baseline	Update	Progress?
6. Reading Achievement: Has the U.S. increased the percentage of students who meet the Goals Panel's performance standard in reading? (1992, 1994)			
• Grade 4	29%	30%[ns]	↔
• Grade 8	29%	30%[ns]	↔
• Grade 12	40%	36%	↓
7. Writing Achievement: Has the U.S. increased the percentage of students who can produce basic, extended, developed, or elaborated responses to narrative writing tasks? (1992)			
• Grade 4	55%	—	
• Grade 8	78%	—	
• Grade 12	—	—	
8. Mathematics Achievement: Has the U.S. increased the percentage of students who meet the Goals Panel's performance standard in mathematics? (1990, 1996)			
• Grade 4	13%	21%	↑
• Grade 8	15%	24%	↑
• Grade 12	12%	16%	↑

— Data not available.

[ns] Interpret with caution. Change was not statistically significant.

UNITED STATES

Student Achievement and Citizenship (continued)

	Baseline	Update	Progress?
9. Science Achievement: Has the U.S. increased the percentage of students who meet the Goals Panel's performance standard in science? (1996)			
• Grade 4	29%	—	
• Grade 8	29%	—	
• Grade 12	21%	—	
10. History Achievement: Has the U.S. increased the percentage of students who meet the Goals Panel's performance standard in U.S. history? (1994)			
• Grade 4	17%	—	
• Grade 8	14%	—	
• Grade 12	11%	—	
11. Geography Achievement: Has the U.S. increased the percentage of students who meet the Goals Panel's performance standard in geography? (1994)			
• Grade 4	22%	—	
• Grade 8	28%	—	
• Grade 12	27%	—	

GOAL 4 Teacher Education and Professional Development

	Baseline	Update	Progress?
12. Teacher Preparation: Has the U.S. increased the percentage of secondary school teachers who hold an undergraduate or graduate degree in their main teaching assignment? (1991, 1994)	66%	63%	↓

Teachers who are trained in both their subject area and in teaching skills and who are fully certified are more successful at raising student achievement than teachers with inadequate preparation.

	Baseline	Update	Progress?
13. Teacher Professional Development: Has the U.S. increased the percentage of teachers reporting that they participated in professional development programs on 1 or more topics since the end of the previous school year? (1994)	85%	—	

Investing in professional development is one of the most cost-effective ways to raise student achievement. Professional development is most effective when it is connected to what teachers do in their classrooms, and when it focuses on instructional content, how students learn, and how best to teach.

— Data not available.

UNITED STATES

GOAL 5 Mathematics and Science

If the United States is to ensure a competitive workforce which possesses the necessary scientific and technological skills to fill the jobs of the future and compete in a global economy, we must develop the mathematics and science skills of all of our students, not simply the very best.

	Baseline	Update	Progress?
14. International Mathematics Achievement: Has the U.S. improved its standing on international mathematics assessments? (1995)			
• Grade 4	7 out of 25 countries scored above the U.S.		
• Grade 8	20 out of 40 countries scored above the U.S.		
• Grade 12	—	—	
15. International Science Achievement: Has the U.S. improved its standing on international science assessments? (1995)			
• Grade 4	1 out of 25 countries scored above the U.S.		
• Grade 8	9 out of 40 countries scored above the U.S.		
• Grade 12	—	—	
16. Mathematics and Science Degrees: Has the U.S. increased mathematics and science degrees as a percentage of all degrees awarded to: (1991, 1995)			
• all students?	39%	42%	↑
• minorities (Blacks, Hispanics, American Indians/ Alaskan Natives)?	39%	40%	↑
• females?	35%	37%	↑

GOAL 6 Adult Literacy and Lifelong Learning

	Baseline	Update	Progress?
17. Adult Literacy: Has the U.S. increased the percentage of adults who score at or above Level 3 in prose literacy? (1992)	52%	—	

Individuals demonstrating higher levels of literacy are more likely to be employed, work more weeks in a year, and earn higher wages than individuals demonstrating low levels of literacy.

— Data not available.

Adult Literacy and Lifelong Learning (continued)

	Baseline	Update	Progress?
18. Participation in Adult Education: Has the U.S. reduced the gap in adult education participation between adults who have a high school diploma or less, and those who have additional postsecondary education or technical training? (1991, 1995)	27 points	32 points	↓

Adults with a high school diploma or less need additional training the most in order to upgrade their current levels of skills and qualify for better jobs, but they tend to be among those least likely to participate in adult education.

	Baseline	Update	Progress?
19. Participation in Higher Education: Has the U.S. reduced the gap between White and Black high school graduates who:			
• enroll in college? (1990, 1995)	14 points	13 points[ns]	↔
• complete a college degree? (1992, 1996)	16 points	19 points[ns]	↔
Has the U.S. reduced the gap between White and Hispanic high school graduates who:			
• enroll in college? (1990, 1995)	11 points	14 points[ns]	↔
• complete a college degree? (1992, 1996)	15 points	20 points[ns]	↔

Adults who complete college degrees can expect substantially higher lifetime earnings than those who do not attend college or those who complete coursework without eventually earning a degree.

GOAL 7 Safe, Disciplined, and Alcohol- and Drug-free Schools

If the nation's schools and communities cannot guarantee a safe haven free from violence, drugs and alcohol, and other disciplinary problems that interfere with teaching and learning, it is unlikely that any other attempts at education reform will lead to the higher levels of student performance that are addressed in the other Goals.

	Baseline	Update	Progress?
20. Overall Student Drug and Alcohol Use: Has the U.S. reduced the percentage of 10th graders reporting doing the following during the previous year:			
• using any illicit drug? (1991, 1996)	24%	40%	↓
• using alcohol? (1993, 1996)	63%	65%[ns]	↔

[ns] Interpret with caution. Change was not statistically significant.

UNITED STATES

	Baseline	Update	Progress?
21. Sale of Drugs at School: Has the U.S. reduced the percentage of 10th graders reporting that someone offered to sell or give them an illegal drug at school during the previous year? (1992, 1996)	18%	32%	↓
22. Student and Teacher Victimization: Has the U.S. reduced the percentage of students and teachers reporting that they were threatened or injured at school during the previous year?			
• 10th grade students (1991, 1996)	40%	36%	↑
• public school teachers (1991, 1994)	10%	15%	↓
23. Disruptions in Class by Students: Has the U.S. reduced the percentage of students and teachers reporting that disruptions often interfere with teaching and learning?			
• 10th grade students (1992, 1996)	17%	16%[ns]	↔
• secondary school teachers (1991, 1994)	37%	46%	↓

GOAL 8 Parental Participation

Successful partnerships between schools, families, and communities depend on schools to create effective programs to inform and involve all families in activities such as parent-teacher conferences, school meetings or events, volunteering in the classroom, and decision-making regarding school policy.

	Baseline	Update	Progress?
24. Schools' Reports of Parent Attendance at Parent-Teacher Conferences: Has the U.S. increased the percentage of K-8 public schools which reported that more than half of their parents attended parent-teacher conferences during the school year? (1996)	78%	—	
25. Schools' Reports of Parent Involvement in School Policy Decisions: Has the U.S. increased the percentage of K-8 public schools which reported that parent input is considered when making policy decisions in three or more areas? (1996)	41%	—	
26. Parents' Reports of Their Involvement in School Activities: Has the U.S. increased the percentage of students in Grades 3-12 whose parents reported that they participated in two or more activities in their child's school during the current school year? (1993, 1996)	63%	62%[ns]	↔

— Data not available.

[ns] Interpret with caution. Change was not statistically significant.

MATHEMATICS AND SCIENCE ACHIEVEMENT FOR THE 21ST CENTURY

This summer marked one of the most miraculous scientific achievements in the history of the United States. On July 4, 1997, a team of U.S. engineers and scientists succeeded in landing a spacecraft on the surface of Mars for the first mobile exploration of another planet. The team members at mission control nervously held their breath to see whether 17-foot airbags would provide sufficient cushion for the spacecraft during an innovative landing that had never before been attempted. The airbags worked. The landing was precise. And out rolled a robot named Sojourner, the size of a microwave oven, designed to explore and transmit images of the Martian surface to scientists in California, 119 million miles away.

In the early 1980's, experts cautioned that unless students' mathematics and science skills quickly improved, the nation could expect a rapid decline in the pool of workers who had the technological skills necessary to keep the U.S. globally competitive.

The success of the Pathfinder expedition has captured the American public's interest in science in a way that has not been seen since the 1969 Apollo moon landing. Some say that the Pathfinder scientists themselves deserve much of the credit for generating public interest by wearing 3-D glasses during news conferences and giving the Martian rocks names like Yogi, Barnacle Bill, and Scooby-Doo.[1] They made science fun, and their excitement was apparently contagious. Twenty-five World Wide Web sites set up by NASA to broadcast the images relayed from Mars recorded 220 million hits the first five days.[2] During the weekend following Pathfinder's landing, 7,000 people a day were reported to have visited the Planetary Society's "Planetfest" about Mars in downtown Pasadena.[3] And Mattel sold out 1,500 toy models of the Pathfinder spacecraft and its Sojourner rover in less than an hour at a stand set up at NASA's Pasadena campus.[4]

With the success of the Pathfinder mission, the American public can rest assured that our position as a world leader in aeronautics remains secure. But how does the United States compare in other scientific, mathematical, and technological fields? Are we a leader? And will we still be a leader fifty years from now, given our students' current levels of skill and training?

In the early 1980's, business leaders warned that U.S. students' mathematics and science skills were so low in comparison to other nations that the very economic stability of the U.S. was in question. In 1983, the United States was dubbed "a nation at risk."[5] Experts cautioned that unless students' mathematics and science skills quickly improved, the nation could expect a rapid decline in the pool of workers who had the technological skills necessary to keep the U.S. globally competitive. Singapore had become a world leader in the microchip industry. Japan and Korea were building cheaper, more energy-efficient automobiles. Germany and Taiwan were approaching the United States in total exports. Increasing the strength of U.S. students' mathematics and science skills was considered so vital to our national interest that the President and the nation's Governors agreed in 1990 that one of the nation's top education goals should be to increase mathematics and science skills dramatically by the end of the century. The goal was to be more than competitive — the goal was to be first in the world:

Goal 5: Mathematics and Science

By the year 2000, United States students will be first in the world in mathematics and science achievement.

Since then, voluntary nationwide standards have been developed by subject area experts to identify what all students should know and be able to do in mathematics and science.[6] Scores of states and local school districts have followed suit. As we approach the year 2000, the American public is eager to know what progress is being made. How far *is* the U.S. from being a world leader in mathematics and science? What will it take to get us where we want to be?

International comparisons of mathematics and science achievement

Assessments conducted over the past thirty years have shown U.S. performance to be extremely weak in both mathematics and science. In 1990, only 12-15% of 4th, 8th, and 12th graders were considered proficient in mathematics on a nationally administered U.S. achievement test, the National Assessment of Educational Progress (NAEP).[7] The following year, U.S. students also fared poorly on the International Assessment of Educational Progress (IAEP), which assessed mathematics and science abilities of 13-year-olds in 20 countries and 9-year-olds in 14 countries. U.S. 13-year-olds' average mathematics *and* science scores were significantly lower than those of students in Korea, Taiwan, the Soviet Union, Hungary, France, Canada, Switzerland, Israel, and Slovenia.[8]

Even when comparisons were limited to a subset of nations that compared only comprehensive student populations, the results were not much better. Results based on 10 countries for 9-year-olds and 14 countries for 13-year-olds revealed that although U.S. 9-year-olds ranked third in science, 13-year-olds were second to last. In mathematics, U.S. 9-year-olds were also second to last, while U.S. 13-year-olds were rock-bottom.[9]

Has our lackluster performance improved over time? Results from a recent international study are just beginning to answer that question. In 1995, the most comprehensive international study of mathematics and science achievement to date

Figure 1
Mathematics Content Areas Tested by TIMSS

	Grade 4	Grade 8
Data representation, analysis, and probability	X	X
Geometry	X	X
Whole numbers	X	
Fractions and proportionality	X	
Patterns, relations, and functions	X	
Measurement, estimation, and number sense	X	
Fractions and number sense		X
Algebra		X
Measurement		X
Proportionality		X

See pp. 41-43 for definitions, sources, and technical notes.

was conducted, the Third International Mathematics and Science Study, or TIMSS.[10] TIMSS tested half a million students in 41 countries in 30 different languages. Participating countries included some of the United States' chief economic competitors and trading partners, such as Japan, Germany, Canada, Korea, Singapore, and Hong Kong.

Three age groups were tested in the participating countries, corresponding roughly to Grades 4, 8, and 12 in the United States. Twenty-six nations took part in the mathematics and science assessments at Grade 4, while all 41 participated at Grade 8. Both public and private schools participated, and the same students were tested in both mathematics and science. TIMSS drew random samples of virtually all students in the participating countries, not just those enrolled in mathematics and science courses. Nearly all countries in TIMSS accomplished high participation rates, and did not exempt large portions of their student bodies from testing.*

An international curriculum analysis was conducted prior to test development in order to ensure that the test items reflected what was covered in the mathematics and science courses taught in the participating countries and did not overemphasize what was taught in only a few. In mathematics, six content areas were tested at Grades 4 and 8 (see Figure 1). In science, four content areas were tested at Grade 4, and five content areas were tested at Grade 8 (see Figure 2). The assessments required one and one-half hours to complete, and included both multiple-choice and open-ended questions at each grade (see examples in Figure 3).

* A small number of countries deviated from strict international quality control requirements regarding random selection, participation rates, etc. Their results are marked in the TIMSS findings as a caution to the reader.

Figure 2
Science Content Areas Tested by TIMSS

	Grade 4	Grade 8
Earth science	X	X
Life science	X	X
Environment and the nature of science	X	X
Physical science	X	
Chemistry		X
Physics		X

See pp. 41-43 for definitions, sources, and technical notes.

TIMSS used multiple approaches to provide a context for the assessment results, since education policies, practices, and attitudes were likely to differ among the participating countries. In addition to the student assessments, TIMSS collected information through questionnaires administered to teachers, students, and school administrators; comparisons of mathematics and science curriculum guides and textbooks; videotapes of mathematics instruction in 8th grade classrooms in the United States, Japan, and Germany; and detailed case studies of education policies in the same three countries. To date, results have been released for 4th graders and 8th graders, with 12th graders' results scheduled for release in 1998. A linking study designed to compare the mathematics and science performance of individual states on NAEP with participating TIMSS countries is also under way.

How did we do?

Overall, the international standing of U.S. 4th graders was stronger than that of U.S. 8th graders in both mathematics and science. And at both grade levels, the international standing of U.S. students was better in science than it was in mathematics. At both grades, there was a mixture of good and bad news about U.S. student performance.

Figures 4-7 show how the U.S. performed in relation to each of the other TIMSS participants. The authors of the TIMSS studies caution that it would not be accurate to rank the countries strictly by their average scores. (It would be erroneous, for example, to conclude that the U.S. ranked 12th out of 26 in 4th grade mathematics.) This is because the scores represent samples of students, and not entire student populations. All samples contain a small amount of measurement error and are only estimates of the range within which a nation's true score would fall. The estimates would be slightly higher or slightly lower if a different sample of students were chosen for testing. Therefore, it is more appropriate to talk about TIMSS participants' performance in terms of clusters of countries which performed significantly higher than, significantly lower than, or not significantly different from a particular country.**

** In this report, "significance" refers to statistical significance and indicates that the observed differences are not likely to have occurred by chance.

Figure 3
Sample TIMSS Items – Grade 4

Mathematics — Grade 4
Measurement, Estimation, and Number Sense

A thin wire 20 centimeters long is formed into a rectangle. If the width of this rectangle is 4 centimeters, what is its length?

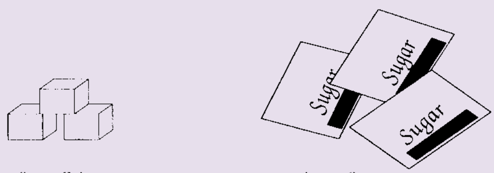
A. 5 centimeters
✔ B. 6 centimeters
C. 12 centimeters
D. 16 centimeters

Percentage of 4th graders who answered this item correctly							
International Average	*U.S.*	*Canada*	*England*	*Germany**	*Japan*	*Korea*	*Singapore*
23%	23%	23%	29%	—	32%	38%	46%

**Germany did not participate in TIMSS at Grade 4.*

Science — Grade 4
Physical Science

The picture shows two forms of sugar solid cubes and packets of loose crystals. One cube has the same mass of sugar as one packet.



Sugar Cubes Loose Sugar

Which of the two forms of sugar will dissolve faster in water? loose sugar
Give a reason for your answer.

The loose sugar is smaller so it will dissolve faster.

Percentage of 4th graders who answered this item correctly							
International Average	*U.S.*	*Canada*	*England*	*Germany**	*Japan*	*Korea*	*Singapore*
37%	43%	46%	42%	—	72%	75%	45%

**Germany did not participate in TIMSS at Grade 4.*

See pp. 41-43 for definitions, sources, and technical notes.

Figure 3 (continued)
Sample TIMSS Items – Grade 8

Mathematics — Grade 8
Data Representation, Analysis, and Probability

Price of renting office space

The following two advertisements appeared in a newspaper in a country where the units of currency are *zeds*.

BUILDING A	BUILDING B
Office space available	Office space available
85 - 95 square meters 475 *zeds* per month	35 - 260 square meters 90 *zeds* per square meter per year
100 - 120 square meters 800 *zeds* per month	

If a company is interested in renting an office of 110 square meters in that country for a year, at which office building, A or B, should they rent the office in order to get the lower price? Show your work.

Price of Renting ~~a~~ in Building A in a year = 800×12
= 9600 (zeds)

Price of Renting in Building B in a year = 110×90
= 9900 (zeds)

∴ 9600 < 9900

∴ They should rent the office at Building A in order to get the lower price.

Percentage of 8th graders who answered this item correctly

International Average	U.S.	Canada	England	Germany*	Japan	Korea	Singapore
19%	18%	24%	20%	14%	47%	50%	55%

Germany did not meet international age/grade specifications.

Science — Grade 8
Chemistry

Which is NOT an example of a chemical change?

✔ A. Boiling water
B. Rusting iron
C. Burning wood
D. Baking bread

Percentage of 8th graders who answered this item correctly

International Average	U.S.	Canada	England	Germany*	Japan	Korea	Singapore
31%	43%	38%	41%	25%	54%	48%	62%

Germany did not meet international age/grade specifications.

See pp. 41-43 for definitions, sources, and technical notes.

Figure 4
Grade 4 - Mathematics
Average Scores of Nations Participating In TIMSS

Singapore	625	
Korea	611	
Japan	597	
Hong Kong	587	
(Netherlands)	577	
Czech Republic	567	
(Austria)	559	
	552	(Slovenia)
	550	Ireland
	548	(Hungary)
	546	(Australia)
	545	**United States**
	532	Canada
	531	(Israel)
	529	**← International average**
(Latvia [LSS])	525	
Scotland°	520	
England*°	513	
Cyprus, Norway	502	
New Zealand	499	
Greece	492	
(Thailand)	490	
Portugal	475	
Iceland	474	
Iran, Islamic Republic	429	
(Kuwait)	400	

Countries higher than the U.S.

Countries similar to the U.S.

Countries lower than the U.S.

See pp. 41-43 for definitions, sources, and technical notes.

Figure 5
Grade 4 - Science
Average Scores of Nations Participating In TIMSS

Korea	597	
	574	Japan
	565	**United States,** (Austria)
	562	(Australia)
	557	(Netherlands), Czech Republic
England*°	551	
Canada	549	
Singapore	547	
(Slovenia)	546	
Ireland	539	
Scotland°	536	
Hong Kong	533	
(Hungary)	532	
New Zealand	531	
Norway	530	
International Average ➜	**524**	
(Latvia [LSS])	512	
(Israel), Iceland	505	
Greece	497	
Portugal	480	
Cyprus	475	
(Thailand)	473	
Iran, Islamic Republic	416	
(Kuwait)	401	

Countries higher than the U.S.

Countries similar to the U.S.

Countries lower than the U.S.

See pp. 41-43 for definitions, sources, and technical notes.

Figure 6
Grade 8 - Mathematics
Average Scores of Nations Participating In TIMSS

Singapore	643	
Korea	607	
Japan	605	
Hong Kong	588	
Belgium-Flemish°	565	
Czech Republic	564	
Slovak Republic	547	
Switzerland°	545	
(Netherlands), (Slovenia)	541	
(Bulgaria)	540	
(Austria)	539	
France	538	
Hungary	537	
Russian Federation	535	
(Australia)	530	
Ireland, Canada	527	
(Belgium-French)	526	
	522	(Thailand), (Israel)*
Sweden	519	
	513	← **International Average**
	509	(Germany)*°
	508	New Zealand
	506	England*°
	503	Norway
	502	(Denmark)
	500	**United States°**
	498	(Scotland)
	493	Latvia [LSS]°
	487	Spain, Iceland
	484	(Greece)
	482	(Romania)
Lithuania*	477	
Cyprus	474	
Portugal	454	
Iran, Islamic Republic	428	
(Kuwait)	392	
(Colombia)	385	
(South Africa)	354	

Countries higher than the U.S.

Countries similar to the U.S.

Countries lower than the U.S.

See pp. 41-43 for definitions, sources, and technical notes.

Figure 7
Grade 8 - Science
Average Scores of Nations Participating In TIMSS

Singapore	607	
Czech Republic	574	
Japan	571	
Korea, (Bulgaria)	565	
(Netherlands), (Slovenia)	560	
(Austria)	558	
Hungary	554	
	552	England*°
	550	Belgium-Flemish°
	545	(Australia)
	544	Slovak Republic
	538	Russian Federation, Ireland
	535	Sweden
	534	**United States°**
	531	(Germany),*° Canada
	527	Norway
	525	New Zealand, (Thailand)
	524	(Israel)*
	522	Hong Kong, Switzerland°
	517	(Scotland)
Spain	517	
International Average ➜	**516**	
France	498	
(Greece)	497	
Iceland	494	
(Romania)	486	
Latvia [LSS]°	485	
Portugal	480	
(Denmark)	478	
Lithuania*	476	
(Belgium-French)	471	
Iran, Islamic Republic	470	
Cyprus	463	
(Kuwait)	430	
(Colombia)	411	
(South Africa)	326	

Countries higher than the U.S.

Countries similar to the U.S.

Countries lower than the U.S.

See pp. 41-43 for definitions, sources, and technical notes.

Highlights
Grade 4

- Only one country, Korea, outperformed U.S. 4th graders in science.
- U.S. scores were above the international average in both mathematics and science.
- U.S. 4th graders outperformed their peers in 12 out of 25 countries in mathematics, and in 19 out of 25 countries in science.
- If an international talent search were conducted in science to select the top 10% of all students in the participating countries combined, 16% of U.S. 4th graders would be included. No country had a significantly greater percentage of students who met this target.
- If a similar talent search were conducted in mathematics, 9% of U.S. 4th graders would be included among the top 10% worldwide. However, this share is substantially lower than the 39% of students from Singapore, 26% of students from Korea, and 23% of students from Japan who would be selected.

Summary of Grade 4 results

Only one country, Korea, outperformed the U.S. in science at Grade 4. In both mathematics and science, U.S. 4th graders' scores were above the international average. In mathematics, they scored higher than 12 countries, lower than 7, and not significantly different from 6. In science, they scored higher than 19 countries, lower than 1, and not significantly different from 5. With the exception of Japanese scores in mathematics, U.S. students' performance was comparable to or higher than that of students in other Group of Seven, or G-7 nations, which are our major trading partners (i.e., Canada, England, Japan).

U.S. 4th graders outperformed their peers in both subjects in 9 of the other 25 participating countries (Cyprus, England, Greece, Iceland, Islamic Republic of Iran, New Zealand, Norway, Portugal, and Scotland). Only Korea outperformed the U.S. in both mathematics and science at Grade 4.

The U.S. scored above the international average in 5 out of 6 mathematics content areas (whole numbers; fractions and proportionality; data representation, analysis, and probability; geometry; and patterns, relations, and functions) and below the international average in one content area (measurement, estimation, and number sense). The U.S. scored above the international average in all four science content areas at Grade 4 (earth science; life science; environment and the nature of science; and physical science).

If an international talent search were conducted in science to select the top 10% of all students in the participating countries combined, 16% of U.S. 4th

Highlights
Grade 8

- The United States scored above the international average in science at Grade 8, but below the international average in mathematics.
- U.S. 8th graders outperformed their peers in 7 out of 40 countries in mathematics, and in 15 out of 40 countries in science.
- Half of the participating countries (20 out of 40) outperformed the United States in mathematics at Grade 8.
- If an international talent search were conducted in science to select the top 10% of all students in the participating countries combined, 13% of U.S. 8th graders would be included. However, only 5% of U.S. 8th graders would be included among the top 10% worldwide in mathematics. This compares to 45% of students from Singapore and 32% of students from Japan.
- When compared to our chief economic partners, the United States is in the bottom half in mathematics and around the middle in science.
- At Grade 8, the mathematics scores of the very best U.S. students were similar to the scores of average students in Singapore.

graders would be included. No country had a significantly greater percentage of students who met this target. In mathematics, 9% of U.S. 4th graders would be included. However, this share is substantially lower than the 39% of students from Singapore, 26% of students from Korea, and 23% of students from Japan who would rank among the top 10% worldwide.

U.S. boys and girls performed similarly in mathematics at Grade 4, but girls scored significantly lower in science. This was true for the content areas of earth science and physical science, as well as the overall science score.

Summary of Grade 8 results

U.S. 8th graders scored above the international average in science, but below the international average in mathematics. At Grade 8, the mathematics scores of the very best U.S. students were similar to the scores of only average students in Singapore.

In mathematics, U.S. 8th graders scored higher than 7 countries, lower than 20, and not significantly different from 13. In science, they scored higher than 15 countries, lower than 9, and not significantly different from 16. When compared to our chief economic partners, the U.S. is in the bottom half in mathematics and around the middle in science. There was no significant difference in mathematics or science scores between U.S. boys and girls at Grade 8.

U.S. 8th graders outperformed their peers in both mathematics and science in 4 of the other 40 participating countries (Cyprus, Iran, Lithuania, and Portugal). However, 5 nations outperformed the U.S. in both subjects (Singapore, Korea, Japan, Czech Republic, and Hungary).

The U.S. scored at about the international average in 3 out of 6 mathematics content areas (algebra; data representation, analysis, and probability; and fractions and number sense), and below the international average in the remaining 3 areas (geometry; measurement; and proportionality).

The U.S. scored above the international average in 3 out of 5 science content areas (earth science, life science, and environment and the nature of science) and at about the international average in the remaining two (chemistry and physics).

If an international talent search were conducted in science to select the top 10% of all students in the participating countries combined, 13% of U.S. 8th graders would be included. However, only 5% of U.S. 8th graders would be included among the top 10% worldwide who were tested in mathematics. This compares to 45% of students from Singapore and 32% of students from Japan.

What explains the international differences in student achievement?

Two puzzling patterns emerge from the TIMSS findings:

1. U.S. students perform better in science than in mathematics.
2. Our international standing declines between Grades 4 and 8 in both mathematics and science.

How do we explain these findings? What causes our students to score higher in science than in mathematics? And what happens in U.S. schools between Grades 4 and 8 that accounts for our slip in performance? What are the highest-performing countries doing to prepare their students that we are not? Preliminary evidence from TIMSS suggests that although the answers to these questions are not simple, two factors that we can do something about are very important in helping explain these findings: what is taught, and how it is taught.

At the 4th grade level, TIMSS researchers have not yet found strong evidence of any particular factors that contribute heavily to differences in performance among the participating countries. However, at the 8th grade level, we can draw stronger conclusions about differences in performance, since sources of data included videotapes of selected mathematics classrooms and case studies of education policies, as well as background questionnaires. The multiple sources of information revealed several key differences among countries in terms of curriculum, instruction, and teacher training:

Curriculum

- What is taught in U.S. mathematics classes at Grade 8 — the curriculum — is less advanced and less focused than the curricula of other TIMSS countries.

International Differences in Curriculum, Instruction, and Teacher Training

- The content covered in 8th grade mathematics classes in the United States is generally covered in the 7th grade in other countries. What is most likely to be taught to U.S. 8th graders is “general mathematics,” or arithmetic (fractions, decimals, computational skills, etc.). Only one in four U.S. 8th graders takes algebra.
- The topics covered in 8th grade mathematics classes in the United States are less focused than the topics covered in Germany and Japan.
- Mathematics classes in U.S. 8th grade classrooms require less high-level thought than classes in Germany and Japan.
- While most U.S. mathematics teachers are aware of education reforms that have been recommended by mathematics experts, they exhibit many of these teaching behaviors less frequently than Japanese teachers.
- U.S. mathematics and science teachers have more college education than teachers in nearly all other participating TIMSS countries. However, U.S. teachers are less likely than German and Japanese teachers to receive beneficial training and support at the beginning of their teaching careers through apprenticeship programs.

Instruction

- While most U.S. mathematics teachers are aware of education reforms that have been recommended by mathematics experts, they exhibit many of these teaching behaviors less frequently than Japanese teachers.

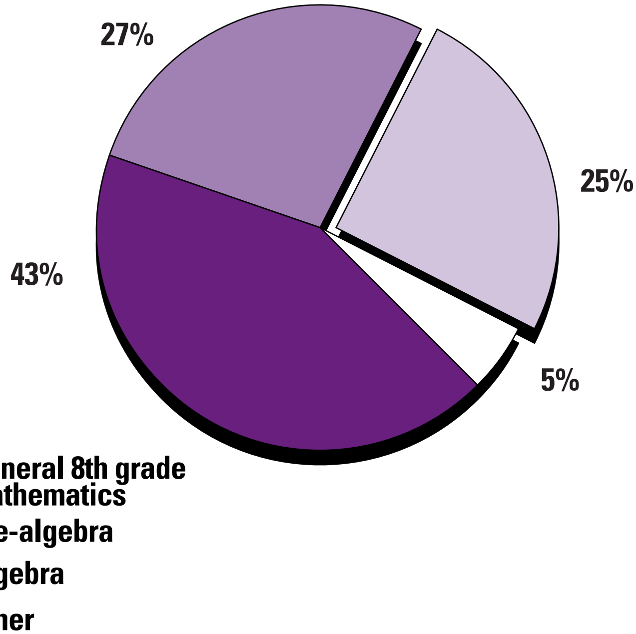
Teacher training

- Beginning teachers in the U.S. are less likely than those in Germany and Japan to receive regular support and practical training through apprenticeships and other kinds of opportunities to interact with, and learn from, more experienced teachers.

Curriculum

TIMSS findings are consistent with what we already know about curriculum and assessment. That is, students do not perform well if they are tested on subject matter that they have not been taught. Nowhere is this more clearly demonstrated than in 8th grade mathematics. In both Germany and Japan, all 8th graders enroll in mathematics classes with a heavy emphasis on algebra and geometry. In the U.S., 8th graders are generally grouped by ability into different levels of mathematics classes.[11] What is most likely to be taught to U.S. 8th graders is “general mathematics,” or arithmetic (fractions, decimals, computational skills, etc.). Only one in

Figure 8
Percentage of U.S. 8th graders enrolled in various mathematics courses, 1996



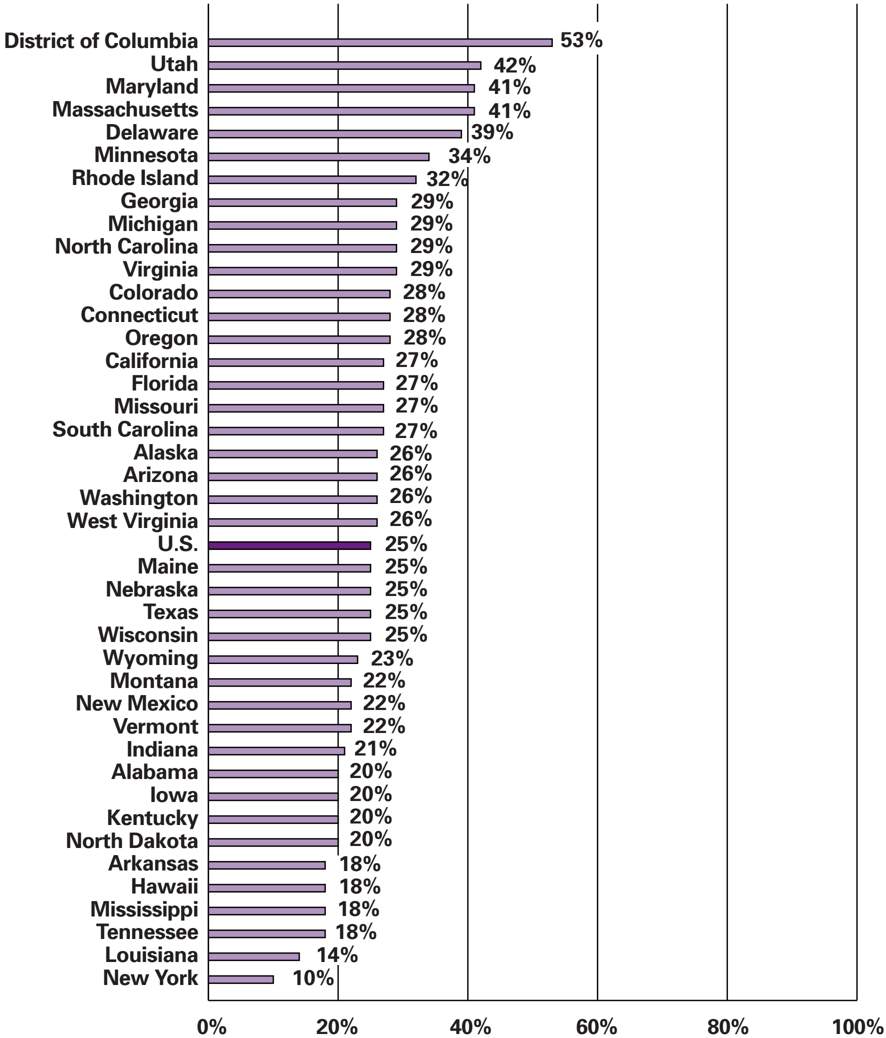
See pp. 41-43 for definitions, sources, and technical notes.

four U.S. 8th graders takes algebra (see Figure 8).[12] The percentage ranges from 10% in the lowest states to 53% in the highest states (see Figure 9).[13] Geometry is almost never taught at Grade 8. In fact, the content covered in 8th grade mathematics classes in the U.S. is generally covered in the 7th grade in other countries. Accordingly, U.S. mathematics textbooks cover less demanding content than German and Japanese textbooks, which devote more space to algebra and geometry.[14]

In addition to being less challenging, the U.S. curriculum sacrifices depth for breadth. TIMSS researchers have characterized the U.S. curriculum as "a mile wide and an inch deep."[15] After carefully reviewing the most common mathematics and science textbooks used in different countries, researchers concluded that the U.S. curriculum covers too many topics superficially, and does not allow students sufficient time to develop in-depth understanding of mathematics and science concepts. This weakness is reflected in classroom practice. Videotapes of mathematics classrooms revealed that U.S. mathematics lessons typically attempt to cover more topics and include more activities than lessons in Germany and Japan.[16]

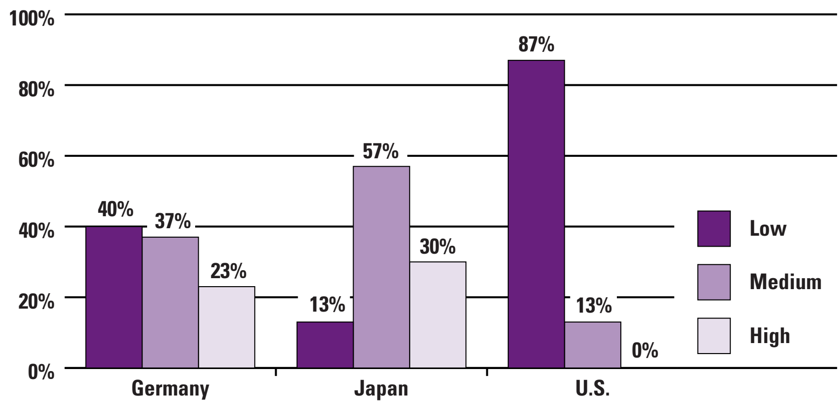
Figure 9

Percentage of public school 8th graders enrolled in algebra, 1996



See pp. 41-43 for definitions, sources, and technical notes.

Figure 10
Percentage of 8th grade mathematics lessons rated by experts as low-, medium-, and high-quality



See pp. 41-43 for definitions, sources, and technical notes.

Instruction

For years, U.S. mathematics experts have argued that teachers must change the way they teach mathematics if we expect student achievement to improve. In 1989, the National Council of Teachers of Mathematics (NCTM) became the first group of education experts in the U.S. to develop new voluntary nationwide standards which challenge conventional wisdom about what is taught in mathematics and how it is taught.[17] The NCTM standards call for far more rigorous content so that all students will achieve at higher levels in mathematics. They also place heavy emphasis on developing problem-solving, communication, and reasoning skills.

When TIMSS researchers asked U.S. mathematics teachers whether they were aware of current ideas about mathematics teaching and learning, 95% said that they were. And when TIMSS researchers asked teachers whose mathematics lessons were videotaped whether their lessons reflected current thinking about mathematics teaching and learning, almost 75% said that they did.[18]

Yet the U.S. teachers seldom focused on mathematical thinking and problem-solving during their videotaped lessons. Experts who analyzed the sequencing of material and the complexity of reasoning required of students in a random sample of lesson transcripts from the United States, Germany, and Japan concluded that U.S. lessons required less high-level mathematical thought than those in the other two countries (see Figure 10).[19] Nearly one-third of the Japanese lessons and nearly one-fourth of the German lessons were judged to be of high quality, compared to

Who is Teaching Mathematics and Science to Your Child?

- During 1993-1994, nearly one in three public high school mathematics teachers (32%) did not have even a minor in mathematics. The percentage ranged from 12% to 57% in individual states.[20]
- During 1993-1994, nearly one in four public high school science teachers (22%) did not have even a minor in science. The percentage ranged from 6% to 39% in individual states.[20]
- Chances were even greater that a student would be assigned an out-of-field teacher in mathematics and science courses if he or she attended a high-poverty school.[21]

none of the U.S. lessons. In fact, the lowest rating for lesson quality was given to 87% of U.S. lessons, 40% of German lessons, and only 13% of Japanese lessons.

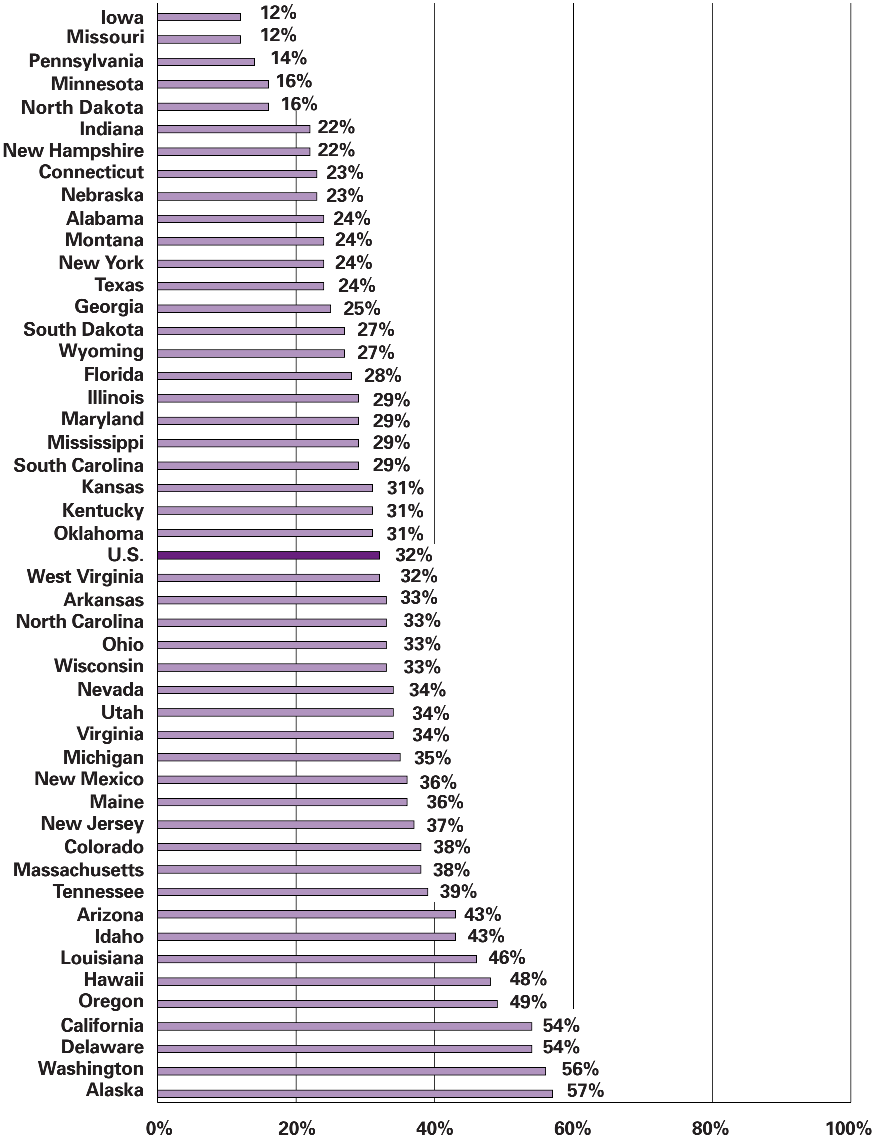
Teacher training

Encouraging news from TIMSS is that U.S. mathematics and science teachers have more years of university training than teachers in nearly all other participating TIMSS countries. However, U.S. teachers differ from their colleagues in Germany and Japan in the amount of formal and informal training and support that they receive once they finish their university degrees. Compared to teachers in these two countries, beginning U.S. teachers are less likely to participate in formal apprenticeship programs as they enter the teaching profession. Such apprenticeships typically pair new teachers with expert mentor teachers who can assist and support them during a structured initial period of on-the-job training, in which their teaching load is reduced. While this practice does occur in some U.S. school districts, it is not universal. In addition, TIMSS found that U.S. teachers teach more classes per week and have fewer informal opportunities to learn from other teachers than teachers in Japan do.

Although U.S. teachers have spent more time in college than teachers in most other participating TIMSS countries, this does not ensure that teachers have adequate subject-matter knowledge in the field which they are actually assigned to teach. Out-of-field teaching, a practice in which teachers are assigned to teach courses outside their area of specialization, is not uncommon in the United States. It is particularly prevalent at the secondary level and in the fields of mathematics and science. During 1993-1994, nearly one in three public high school mathematics teachers (32%) did not have even a minor in mathematics; nearly one in four science teachers (22%) did not have even a minor in science.[20] In mathematics, the percentage ranged from 12% to 57% in individual states (see Figure 11). In science, the percentage ranged from 6% to 39% in individual states (see Figure 12). Chances were even greater that a student would be assigned an out-of-field teacher if he or she attended a high-poverty school.[21]

Figure 11

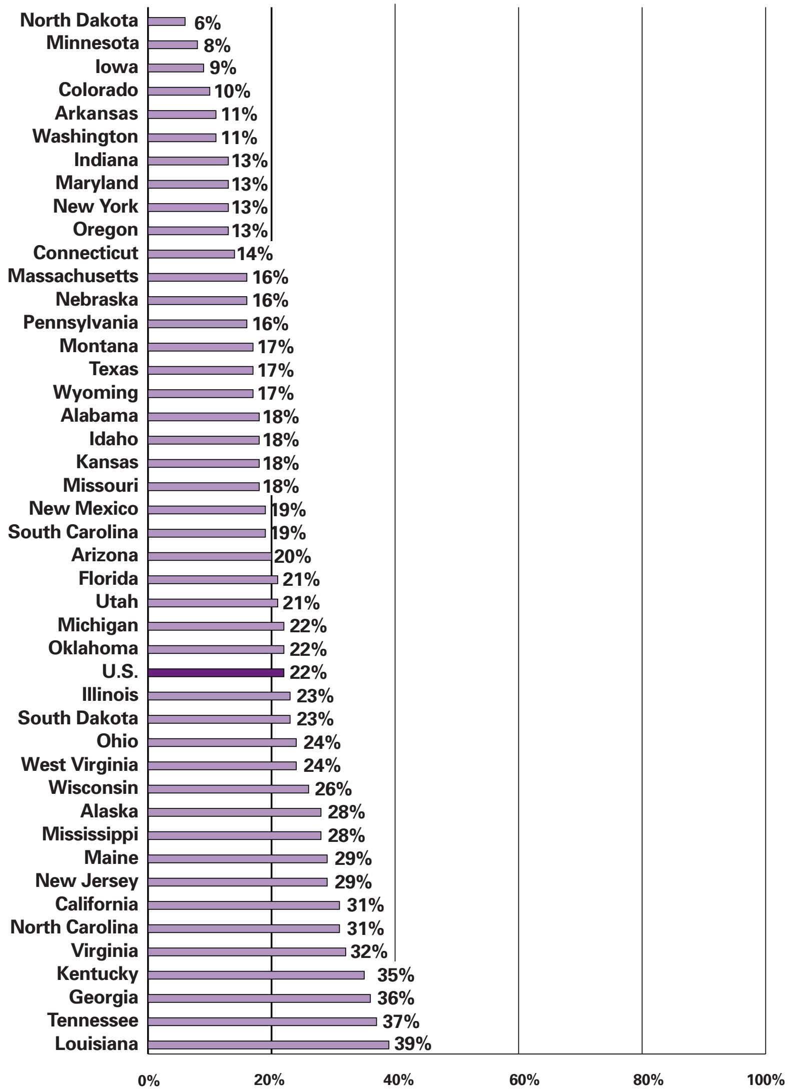
Percentage of public secondary teachers who taught one or more mathematics classes without at least a minor in mathematics, 1993-1994



See pp. 41-43 for definitions, sources, and technical notes.

Figure 12

Percentage of public secondary teachers who taught one or more science classes without at least a minor in science, 1993-1994



See pp. 41-43 for definitions, sources, and technical notes.

The bottom line

We can draw three important conclusions from the recent TIMSS findings:

1. *While our performance in 4th grade science shows that the Goal of being first in the world in mathematics and science is attainable, other areas show that we are far from being a world leader.*

U.S. students scored above the international average in science at Grades 4 and 8, and in mathematics at Grade 4. But is this good enough? Do we want our children to be merely above average, or do we want them to excel?

2. *We will not reach the Goal if we do not expect more from our students.*

Preliminary evidence suggests that neither our textbooks nor the content of our mathematics and science classes is sufficiently challenging. We demand less high-level thought from our students than other countries do, and our instruction is less focused. Instead of a central set of knowledge and skills that we expect all students to know and be able to do, our teachers are trying to cover too many topics, which results in only superficial understanding.

3. *We will not reach the Goal if we do not create the conditions that will enable our teachers to teach well.*

We permit untrained teachers in our children's classrooms through a variety of policies, such as granting waivers, issuing emergency credentials, and allowing out-of-field teaching. We do not provide the kinds of practical training and support for our teachers that other countries provide. Despite the fact that most U.S. teachers are aware of current education reforms, too few are translating them into practice. It should come as no surprise that lesson quality and student achievement are both lower than desirable.

What should we do about it?

The National Education Goals Panel firmly believes that we can and must address these deficiencies. But policymakers, educators, business leaders, parents, and the public must work together to do three things if we want to raise mathematics and science achievement to world-class levels.

Step 1. Set tougher standards for students in mathematics and science that are comparable to the best in the world.

By now all states but one have been actively engaged in the process of setting more challenging standards for their students.[22] Twenty-eight of the nation's largest urban districts also recently reported that they were in the process of developing or adopting their own standards.[23]

Researchers caution, however, that "although it is clear that most states have been actively working on their standards, it should not yet be taken for granted that the standards are uniformly of high quality across the states... in some states the standards are clear and readable, but in others they lack internal coherence, are poorly formatted, are susceptible to misinterpretation, or are otherwise of lower quality."[24]

How Can We Raise Mathematics and Science Achievement to World-Class Levels?

1. Set tougher standards for students in mathematics and science that are comparable to the best in the world.
2. Align other components of the education system with the standards, including curricula, instruction, textbooks, assessments, and school policies.
3. Strengthen teachers' subject-matter knowledge and teaching skills in mathematics and science, and move state teacher policies more in line with instructional goals embedded in state standards.

It should also not be taken for granted that current state and local standards are as challenging as those set in other countries. While it is fairly common to find that states have reviewed standards and assessments developed by other states to see how theirs compare, few states have attempted any type of international comparisons. Only 12 states report that they actually examined standards, tests, or curricular materials from other countries when designing their own standards.[25] And those states that did attempt to review materials from other countries were generally limited to information from English-speaking countries, since translated materials were not readily available.

By now all states but one have been actively engaged in the process of setting more challenging standards for their students.

Until recently, there was no single place where states and local communities could turn for help to see whether they had set their standards high enough, what they could learn from the experience of others, or how their standards compared to the best in the world. This year an independent, nongovernmental organization, "Achieve," was created by Governors and business leaders to provide this type of assistance to states and communities.

Achieve is in the process of establishing a benchmarking service to help state leaders evaluate their standards against those of high-performing states and nations. For further information about this and other services of Achieve, see its web site (www.achieve.org) or write to Achieve, 1280 Massachusetts Avenue, Suite 410, Cambridge, MA 02138, telephone (617) 496-6300.

Step 2. Align other components of the education system with the standards, including curricula, instruction, textbooks, assessments, and school policies.

Setting higher expectations is a necessary, but not sufficient, step to increase student achievement. Once a state or a community has agreed upon its standards, other components of the education system will very likely need some fine-tuning so that they are not working at cross-purposes.

For example, courses that require minimal student effort will need to be replaced with higher-level mathematics and science courses that prepare all students to meet the standards. New curriculum frameworks may need to be written to translate the essential concepts that all students are expected to know into sample lessons and practical classroom activities that teachers can use in their classrooms. States may need to review teacher licensure policies, and teachers already in the workforce may require additional training to learn new content, use new technology, or implement a wider variety of effective instructional approaches. Textbooks may need to be replaced with other instructional materials that help teachers focus lessons on a limited number of topics, develop them in depth, and link them in coherent ways to other disciplines. Assessment systems may need to be revised so that tests actually measure whether or not students have mastered the skills and knowledge specified in the standards. And graduation requirements may have to be changed to make standards count, so that diplomas are awarded on the basis of what students have learned, not simply the number of hours spent in school.

Will these kinds of reforms actually lead to world-class levels of mathematics and science achievement? Evidence from Minnesota suggests that they will. Minnesota participated as a "mini-nation" in the 1995 TIMSS assessment, testing nearly 5,000 students with the same mathematics and science assessments administered in the participating TIMSS countries.[26] By drawing a large, state-representative sample of students for testing, Minnesotans can now compare their students' performance directly to the average mathematics and science scores of students in the United States and in the other participating TIMSS countries.

What they found is very instructive. Only one country, Singapore, outperformed Minnesota 8th graders in science. And in earth science, Minnesota tied Singapore for the highest score. Mathematics was a different story, however. Although Minnesota is consistently one of the highest-performing states in mathematics on NAEP, Minnesotans found that best in the U.S. is not the same as best in the world. Although Minnesota 8th graders scored above the U.S. average and above the international average in mathematics, their performance placed them in the middle of the participating TIMSS countries. As was the case for the U.S. as a whole, "eighth grade mathematics in Minnesota is seventh grade mathematics by international standards."[27]

Why was the relative standing of Minnesota's 8th graders so markedly different in mathematics and science? The answer can be traced to differences in standards for what students should know and be able to do and the alignment of other education components with them. In Minnesota, there is statewide agreement that 8th grade science instruction should focus on earth science. Tracking is seldom used in science to separate students of different abilities. Eighth grade science teachers receive special training in earth science, limit the number of topics covered during the school year to four, and cover each topic in depth. Most teachers use the same or similar textbooks, supplemented with inquiry-oriented science kits and other appropriate materials.

In mathematics, however, there is no corresponding statewide consensus on what students should know and be able to do by the end of 8th grade in mathematics. More than half of the schools in Minnesota sort students by ability into three to five levels of mathematics classes. Algebra and pre-algebra are reserved for the highest achievers, while the rest are enrolled in general mathematics courses that limit their opportunities to learn rigorous content. Compared to science courses in Minnesota, mathematics courses attempt to cover far more topics than would seem desirable (an average of 3.5 per lesson). And although Minnesota mathematics teachers are better trained in their field than their colleagues in other countries and most are familiar with current mathematics reforms, they rarely engage students in activities recommended by mathematics experts, such as conducting investigations and working on projects. Like U.S. teachers in general, Minnesota mathematics teachers have limited opportunities to observe other teachers and meet with them to plan lessons or discuss mathematics.

The resulting differences in international standing in 8th grade mathematics and science show that "U.S. students can be the best in the world when we give them a curriculum that is focused and coherent and that is delivered by teachers well trained in the content being offered at that level. [But] even the same students who performed as the world's best in earth science do not do well in mathematics when they are given a mathematics curriculum that is a 'mile wide and an inch deep.'"[28]

U.S. students can be the best in the world when we give them a curriculum that is focused and coherent and that is delivered by teachers well trained in the content being offered at that level.

Step 3. Strengthen teachers' subject-matter knowledge and teaching skills in mathematics and science, and move state teacher policies more in line with instructional goals embedded in state standards.

The highest standards, the most rigorous courses, the most focused curricula and textbooks, and the most challenging assessments will still fail to raise U.S. mathematics and science achievement to world-class levels unless we also strengthen the preparation and ongoing professional development of our teachers. Research consistently shows that teacher expertise is one of the most important factors in raising student achievement.[29] One of the most extensive analyses of data on teachers found that differences in expertise (as measured by college degrees, years of teaching experience, and scores on teacher licensing examinations) accounted for nearly 40% of the differences in student test scores — more than any other factor, including parent education, family income, and other socioeconomic characteristics.[30] Moreover, a review of 60 studies found that investing in support for teacher expertise was found to be the most cost-effective way to increase student achievement.[31]

Research also consistently shows that the quality of teacher training matters enormously. It comes as no surprise that teachers who are trained in both their subject area and in teaching skills and who are fully certified are rated more highly and are more successful at raising student achievement than teachers with inadequate preparation.[32]

Yet alarming numbers of individuals are hired and assigned to teach in our schools without the credentials, training, and in-depth subject-matter knowledge required to be an expert teacher. This situation is allowed to occur because there is enormous variation in state policies on teacher licensing and standards for accreditation of teacher training institutions, as well as requirements for hiring and assigning teachers to classrooms.[33] Some states require a bachelor's degree in the subject to be taught, while others require less than a minor. Some states require extensive assessments of teachers' subject-matter knowledge and teaching skills, while others test only basic reading, writing, and mathematics. Most states do not require their teacher training institutions to be professionally accredited by the National Council for Accreditation of Teacher Education. And four out of five states allow temporary or emergency teaching licenses to be granted to individuals who have not fully met state standards. As pointed out by the National Commission on Teaching & America's Future,

> *Although no state will allow a person to fix plumbing, guard swimming pools, style hair, write wills, design a building, or practice medicine without completing training and passing an examination, more than 40 states allow school districts to hire teachers on emergency licenses who have not met these basic requirements. States pay more attention to the qualifications of veterinarians treating the nation's cats and dogs than to those of teachers educating the nation's children and youth.*[34]

The National Commission on Teaching & America's Future has proposed five recommendations to improve and professionalize teaching:[35]

1. **Get serious about standards, for both students and teachers.** There must be agreement on what *teachers* should know and be able to do in order to help students meet higher academic standards. To that end, the Commission proposes strategies such as requiring that all teacher training institutions be professionally accredited, and that teacher licensing be based on demonstrated performance, including tests of subject-matter knowledge and teaching knowledge and skill.

2. **Reinvent teacher preparation and professional development.** Among the proposed strategies are organizing teacher education and professional development around standards, and creating and funding mentoring programs for all beginning teachers.

3. **Fix teacher recruitment and put qualified teachers in every classroom.** To ensure that students in all districts, not just wealthy ones, are taught by well-trained teachers, the Commission urges states and local school districts to implement strategies that will increase the ability of low-wealth districts to pay for qualified teachers, insist that districts hire only qualified teachers, and aggressively recruit high-need teachers and provide incentives for teaching in shortage areas.

4. **Encourage and reward teacher knowledge and skill.** The Commission encourages states and districts to develop strategies to reward teachers for

strengthening their skills at every stage of their careers, including setting goals and enacting incentives for experienced teachers to seek advanced certification through the National Board for Professional Teaching Standards.

5. **Create schools that are organized for student and teacher success.** Ways in which this can be done include investing more in teachers and technology and less in nonteaching personnel, and providing grants to schools for teacher learning linked to school improvement.

Some states have already implemented these kinds of education reforms as part of their efforts to raise student achievement. Connecticut and North Carolina have developed some of the most comprehensive approaches. Connecticut raised minimum salaries for beginning teachers, set tougher standards for teacher licensing, created new performance-based examinations, implemented a mentoring program for beginning teachers, invested in training for the mentor teachers, and required teachers to earn a master's degree in education to obtain a continuing license.[36] Connecticut also provided grants to universities to redesign teacher education programs and eliminated permanent teaching licenses, requiring instead that teachers continue to earn credits for coursework or other forms of professional development for relicensure.[37]

North Carolina's approach included raising minimum salaries, requiring all schools of education to be accredited, implementing a mentoring program for beginning teachers, recruiting prospective teachers to enter teacher preparation programs by offering financial support for their training, creating professional development academies, and offering veteran teachers an array of incentives to encourage them to seek advanced certification from the National Board for Professional Teaching Standards.[38]

Did these investments yield tangible results? The evidence suggests that they did. There are more teachers in North Carolina who are Board-certified than in any other state. And North Carolina students have made some of the largest gains in the nation in reading and mathematics since teacher reforms were implemented. Connecticut students also made substantial gains and continue to score among the top states in the U.S. in reading and mathematics, despite an increase in poverty in the state. And Connecticut now has teacher surpluses instead of teacher shortages.[39]

Is the United States first in the world in mathematics and science achievement? Not yet. But we have reason to believe that we can be.

Conclusions

Is the United States first in the world in mathematics and science achievement? Not yet. But we have reason to believe that we can be. Although we are not where we need to be in mathematics, or in science at the later grades, the U.S. was among the top nations in the world in 4th grade science, outperformed only by Korea. Moreover, the TIMSS results for Minnesota show that when 8th graders were presented a focused, coherent science curriculum taught by well-trained teachers, they were outperformed only by Singapore in science. These results suggest that with concentrated effort, the U.S. could dramatically improve students' mathematics and science skills. But it will require increased attention to the academic standards to which we hold ourselves; the alignment of those standards with curriculum, instruction, textbooks, assessments, and school policies; and the preparation, ongoing training, and support that we provide to our nation's mathematics and science teachers.

The students we train now will be the doctors, engineers, mathematicians, chemists, and computer scientists of the 21st century. Some may very well be the rocket scientists who are in charge of future missions to Mars. While there is no doubt that America needs students who are entering these professions to have excellent mathematics and science skills, increasing evidence suggests that the vast majority of jobs in the 21st century will require higher levels of mathematical and technical skills in order for workers to be successful. This means that we must expect more of all of our students, not just those planning to attend college or major in mathematics or science. Only then can we be assured that the technological expertise and the mathematics and science skills of the students we train now will be sufficient to meet the challenges of the 21st century.

ENDNOTES

1 Turner, R. *Newsweek*. Who needs astronauts? July 21, 1997, p. 33, Volume CXXX, No. 3.

2 Begley, S. *Newsweek*. The stars of Mars. July 21, 1997, pp. 26-32, Volume CXXX, No. 3.

3 Sawyer, K. *Washington Post*. Martian rover makes detailed rock analysis. July 8, 1997, p. A6.

4 *Ibid.*

5 National Commission on Excellence in Education. (1983). *A nation at risk: The imperative for educational reform*. Washington, DC: U.S. Government Printing Office.

6 National Council of Teachers of Mathematics. (1989, March). *Curriculum and evaluation standards for school mathematics*. Reston, VA: author.

National Council of Teachers of Mathematics. (1991, March). *Professional standards for teaching mathematics*. Reston, VA: author.

American Association for the Advancement of Science. (1993). *Benchmarks for science literacy*. New York: Oxford University Press.

National Research Council. (1996). *National science education standards*. Washington, DC: National Academy Press.

7 Reese, C.M., Miller, K.E., Mazzeo, J., & Dossey, J.A. (1997). *NAEP 1996 mathematics report card for the nation and the states*. Washington, DC: National Center for Education Statistics.

8 LaPointe, A.E., Askew, J.M., & Mead, N.A. (1992). *Learning mathematics*. Princeton, NJ: Educational Testing Service, Center for the Assessment of Educational Progress.

LaPointe, A.E., Askew, J.M., & Mead, N.A. (1992). *Learning science*. Princeton, NJ: Educational Testing Service, Center for the Assessment of Educational Progress.

9 Bybee, R.W., et al. (1994). *Science: Measuring U.S. students' success*. Princeton, NJ: Educational Testing Service. (as reported in National Science Foundation. (1996, January). *Indicators of science & mathematics education:* 1995. Arlington, VA: author.)

Dossey, J.A., et al. (1994). *Mathematics: How do U.S. students measure up?* Princeton, NJ: Educational Testing Service. (as reported in National Science Foundation. (1996, January). *Indicators of science & mathematics education:* 1995. Arlington, VA: author.)

10 U.S. Department of Education, National Center for Education Statistics. (1997). *Pursuing excellence: A study of U.S. fourth-grade mathematics and science achievement in international context,* NCES 97-255. Washington, DC: U.S. Government Printing Office.

11 U.S. Department of Education, National Center for Education Statistics. (1996). *Pursuing excellence: A study of U.S. eighth-grade mathematics and science teaching, learning, curriculum, and achievement in international context,* NCES 97-198. Washington, DC: U.S. Government Printing Office.

12 Reese, C.M., Miller, K.E., Mazzeo, J., & Dossey, J.A. (1997). *NAEP 1996 mathematics report card for the nation and the states*. Washington, DC: National Center for Education Statistics.

13 *Ibid.*

14 Schmidt, W.H., McKnight, C.C., & Raizen, S.A. (1997). *A splintered vision: An investigation of U.S. science and mathematics education*. Dordrecht, the Netherlands: Kluwer Academic Publishers.

15 *Ibid.*

16 Third International Mathematics and Science Study; unpublished tabulations, Videotape Classroom Study, UCLA, 1996. (as reported in U.S. Department of Education, National Center for Education Statistics. (1996). *Pursuing excellence: A study of U.S. eighth-grade mathematics and science teaching, learning, curriculum, and achievement in international context,* NCES 97-198. Washington, DC: U.S. Government Printing Office.)

17 National Council of Teachers of Mathematics. (1989, March). *Curriculum and evaluation standards for school mathematics*. Reston, VA: author.

18 U.S. Department of Education, National Center for Education Statistics. (1996). *Pursuing excellence: A study of U.S. eighth-grade mathematics and science teaching, learning, curriculum, and achievement in international context*, NCES 97-198. Washington, DC: U.S. Government Printing Office.

19 Third International Mathematics and Science Study; unpublished tabulations, Videotape Classroom Study, UCLA, 1996. (as reported in U.S. Department of Education, National Center for Education Statistics. (1996). *Pursuing excellence: A study of U.S. eighth-grade mathematics and science teaching, learning, curriculum, and achievement in international context,* NCES 97-198. Washington, DC: U.S. Government Printing Office.

20 U.S. Department of Education, National Center for Education Statistics, Public School Teacher Surveys of the Schools and Staffing Survey, 1993-94, unpublished tabulations prepared by Westat, August 1997.

21 U.S. Department of Education, National Center for Education Statistics. (1996). *The condition of education, 1996.* Washington, DC: U.S. Government Printing Office.

22 American Federation of Teachers. (1997). *Making standards matter, 1997.* Washington, DC: author.

23 Council of the Great City Schools. (1996, June). *Becoming the best: Standards and assessment development in the Great City Schools.* Washington, DC: author.

24 Zucker, A.A. (1997, July). *Reflections on state efforts to improve mathematics and science education in light of findings from TIMSS,* pp. 12-13. Paper prepared for the National Education Goals Panel, Washington, DC.

25 American Federation of Teachers. (1996). *Making standards matter, 1996.* Washington, DC: author.

26 SciMath[MN]. (1997). *Minnesota TIMSS report: A preliminary summary of results for the Third International Mathematics and Science Study.* St. Paul, MN: author.

27 *Ibid,* p. 1.

28 Schmidt, W.H. (1997, March 10). Press statement upon release of *Minnesota TIMSS report: A preliminary summary of results for the Third International Mathematics and Science Study,* p. 2.

29 See Darling Hammond, L., & Loewenberg Ball, D. (1997, July). *Teaching for high standards: What policymakers need to know and be able to do.* Paper prepared for the National Education Goals Panel, Washington, DC.

30 Ferguson, R.F. (1991, Summer). Paying for public education: New evidence of how and why money matters. *Harvard Journal on Legislation* 28:465-498.

31 Greenwald, R., Hedges, L.V., & Laine, R.D. (1996, Fall). The effect of school resources in student achievement. *Review of Educational Research* 66: 361-396.

32 Darling Hammond, L., & Loewenberg Ball, D. (1997, July). *Teaching for high standards: What policymakers need to know and be able to do.* Paper prepared for the National Education Goals Panel, Washington, DC.

33 *Ibid.*

34 National Commission on Teaching & America's Future. (1996, September). *What matters most: Teaching for America's future,* pp. 14-15. New York: Teachers College, Columbia University.

35 *Ibid.*

36 Darling Hammond, L., & Loewenberg Ball, D. (1997, July). *Teaching for high standards: What policymakers need to know and be able to do.* Paper prepared for the National Education Goals Panel, Washington, DC.

37 Massell, D. (1997, July). *Clarifying questions about persistence and change: Standards-based reform in nine states.* Paper prepared for the National Education Goals Panel, Washington, DC.

38 Darling Hammond, L., & Loewenberg Ball, D. (1997, July). *Teaching for high standards: What policymakers need to know and be able to do.* Paper prepared for the National Education Goals Panel, Washington, DC.

39 *Ibid.*

NOTES AND SOURCES FOR FIGURES

Figure 1

Sources: U.S. Department of Education, National Center for Education Statistics. (1997). *Pursuing excellence: A study of U.S. fourth-grade mathematics and science achievement in international context,* NCES 97-255. Washington, DC: U.S. Government Printing Office.

U.S. Department of Education, National Center for Education Statistics. (1996). *Pursuing excellence: A study of U.S. eighth-grade mathematics and science teaching, learning, curriculum, and achievement in international context,* NCES 97-198. Washington, DC: U.S. Government Printing Office.

Figure 2

Sources: U.S. Department of Education, National Center for Education Statistics. (1997). *Pursuing excellence: A study of U.S. fourth-grade mathematics and science achievement in international context,* NCES 97-255. Washington, DC: U.S. Government Printing Office.

U.S. Department of Education, National Center for Education Statistics. (1996). *Pursuing excellence: A study of U.S. eighth-grade mathematics and science teaching, learning, curriculum, and achievement in international context,* NCES 97-198. Washington, DC: U.S. Government Printing Office.

Figure 3

Sources: Martin, M.O., et al. (1997, June). *Science achievement in the primary school years: IEA's third international mathematics and science study (TIMSS).* Chestnut Hill, MA: Boston College.

Mullis, I.V.S., et al. (1997, June). *Mathematics achievement in the primary school years: IEA's third international mathematics and science study (TIMSS).* Chestnut Hill, MA: Boston College.

Beaton, A.E., et al. (1996, November). *Science achievement in the middle school years: IEA's third international mathematics and science study (TIMSS).* Chestnut Hill, MA: Boston College.

Beaton, A.E., et al. (1996, November). *Mathematics achievement in the middle school years: IEA's third international mathematics and science study (TIMSS).* Chestnut Hill, MA: Boston College.

Figure 4

Notes:

1. Nations not meeting international guidelines are shown in parentheses.
2. Nations in which more than 10% of the population was excluded from testing are shown with a *. Latvia is designated LSS because only Latvian-speaking schools were tested, which represents less than 65% of the population.
3. Nations in which a participation rate of 75% of the schools and students combined was achieved only after replacements for refusals were substituted, are shown with a °.
4. The international average is the average of the national averages of the 26 nations.

Source: Mullis, I.V.S., et al. (1997, June). *Mathematics achievement in the primary school years: IEA's third international mathematics and science study (TIMSS),* Table 1.1. Chestnut Hill, MA: Boston College. (as reported in U.S. Department of Education, National Center for Education Statistics. (1997). *Pursuing excellence: A study of U.S. fourth-grade mathematics and science achievement in international context,* NCES 97-255. Washington, DC: U.S. Government Printing Office.)

Figure 5

Notes:

1. Nations not meeting international guidelines are shown in parentheses.
2. Nations in which more than 10% of the population was excluded from testing are shown with a *. Latvia is designated LSS because only Latvian-speaking schools were tested, which represents less than 65% of the population.
3. Nations in which a participation rate of 75% of the schools and students combined was achieved only after replacements for refusals were substituted, are shown with a °.
4. The international average is the average of the national averages of the 26 nations.

Source: Martin, M.O., et al. (1997, June). *Science achievement in the primary school years: IEA's third international mathematics and science study (TIMSS).* Chestnut Hill, MA: Boston College. (as reported in U.S. Department of Education, National Center for Education Statistics. (1997). *Pursuing excellence: A study of U.S. fourth-grade mathematics and science achievement in international context,* NCES 97-255. Washington, DC: U.S. Government Printing Office.)

Figure 6

Notes:

1. Nations not meeting international guidelines are shown in parentheses.
2. Nations in which more than 10% of the population was excluded from testing are shown with a *. Latvia is designated LSS because only Latvian-speaking schools were tested, which represents less than 65% of the population.
3. Nations in which a participation rate of 75% of the schools and students combined was achieved only after replacements for refusals were substituted, are shown with a °.
4. The international average is the average of the national averages of the 41 nations.
5. The country average for Sweden may appear to be out of place; however, statistically, its placement is correct.

Source: Beaton, A.E., et al. (1996, November). *Mathematics achievement in the middle school years: IEA's third international mathematics and science study (TIMSS).* Chestnut Hill, MA: Boston College. (as reported in U.S. Department of Education, National Center for Education Statistics. (1996). *Pursuing excellence: A study of U.S. eighth-grade mathematics and science teaching, learning, curriculum, and achievement in international context,* NCES 97-198. Washington, DC: U.S. Government Printing Office.)

Figure 7

Notes:

1. Nations not meeting international guidelines are shown in parentheses.
2. Nations in which more than 10% of the population was excluded from testing are shown with a *. Latvia is designated LSS because only Latvian-speaking schools were tested, which represents less than 65% of the population.
3. Nations in which a participation rate of 75% of the schools and students combined was achieved only after replacements for refusals were substituted, are shown with a °.
4. The international average is the average of the national averages of the 41 nations.
5. The country average for Scotland (or Spain) may appear to be out of place; however, statistically, its placement is correct.

Source: Beaton, A.E., et al. (1996, November). *Science achievement in the middle school years: IEA's third international mathematics and science study (TIMSS).* Chestnut Hill, MA: Boston College. (as reported in U.S. Department of Education, National Center for Education Statistics. (1996). *Pursuing excellence: A study of U.S. eighth-grade mathematics and science teaching, learning, curriculum, and achievement in international context,* NCES 97-198. Washington, DC: U.S. Government Printing Office.)

Figure 8

Source: U.S. Department of Education, National Center for Education Statistics. (in press). *NAEP 1996 mathematics cross-state data compendium for the grade 4 and grade 8 assessment. Findings from the state assessment in mathematics of the National Assessment of Educational Progress,* NCES 97-495. Washington, DC: U.S. Government Printing Office.

Figure 9

The following states either did not participate in the 1996 NAEP mathematics assessment or they did not meet guidelines for public school participation in Grade 8: Idaho, Illinois, Kansas, Nevada, New Hampshire, New Jersey, Ohio, Oklahoma, Pennsylvania, and South Dakota.

Source: U.S. Department of Education, National Center for Education Statistics. (in press). *NAEP 1996 mathematics cross-state data compendium for the grade 4 and grade 8 assessment. Findings from the state assessment in mathematics of the National Assessment of Educational Progress,* NCES 97-495. Washington, DC: U.S. Government Printing Office.

Figure 10

Source: Third International Mathematics and Science Study; unpublished tabulations, Videotape Classroom Study, UCLA, 1996. (as reported in National Center for Education Statistics. (1996). *Pursuing excellence: A study of U.S. eighth-grade mathematics and science teaching, learning, curriculum, and achievement in international context,* NCES 97-198. Washington, DC: U.S. Government Printing Office.)

Figure 11

Too few cases for a reliable estimate for the District of Columbia, Rhode Island, and Vermont.

Source: U.S. Department of Education, National Center for Education Statistics, Public School Teacher Surveys of the Schools and Staffing Survey, 1993-1994, unpublished tabulations prepared by Westat, August 1997.

Figure 12

Too few cases for a reliable estimate for Delaware, the District of Columbia, Hawaii, Nevada, New Hampshire, Rhode Island, and Vermont.

Source: U.S. Department of Education, National Center for Education Statistics, Public School Teacher Surveys of the Schools and Staffing Survey, 1993-1994, unpublished tabulations prepared by Westat, August 1997.

RESOURCES AVAILABLE FROM THE NATIONAL EDUCATION GOALS PANEL

Goals Reports

1997 National Education Goals Report. In addition to the information provided in this *Summary*, the *1997 Goals Report* includes exhibits on the national indicators and four pages of data for each state.

1996 National Education Goals Report: Executive Summary. The *1996 Executive Summary* addresses standards and assessments to help parents understand how higher standards and new forms of assessment will affect their own children.

1995 National Education Goals Report: Executive Summary. The *1995 Executive Summary* describes the essential role that families play in helping to achieve the National Education Goals, and suggests ways in which schools can involve them in partnerships to increase our chances of reaching the Goals.

Commissioned Papers on the Implementation of Academic Standards

Implementing Academic Standards: Papers Commissioned by the National Education Goals Panel

This volume includes:

Benchmarks and Standards as Tools for Science Education Reform (George Nelson, American Association for the Advancement of Science)

Clarifying Questions About Persistence and Change: Standards-Based Reform in Nine States (Diane Massell, Consortium for Policy Research in Education)

Improving Student Learning in Mathematics and Science: The Role of National Standards in State Policy (National Council of Teachers of Mathematics and the National Research Council)

Overcoming Structural Barriers to Good Textbooks (Harriet Tyson)

Reflections on State Efforts to Improve Mathematics and Science Education in Light of Findings from TIMSS (Andrew Zucker, SRI International)

Teaching for High Standards: What Policymakers Need to Know and Be Able to Do (Linda Darling Hammond and D. Loewenberg Ball, Teachers College, Columbia University)

Recent Goal 1 Publications

Getting a Good Start in School. Provides a summary of five dimensions of early development and learning that contribute to children's success in school: health and physical development, emotional well-being and social competence, approaches to learning, communicative skills, and cognition and general knowledge. Also includes a list of additional publications for parents, educators, and policymakers on the first National Education Goal, that all children in America will start school ready to learn.

Special Early Childhood Report. This report was developed in support of the 3-year public engagement campaign, *I Am Your Child,* to support state, local, and private efforts to improve conditions for young children from birth to age 3. Presented in the report are data indicating the status of young children at the start of the 3-year *I Am Your Child* campaign and the progress of the nation and states at meeting the health, family, and preschool objectives associated with Goal 1.

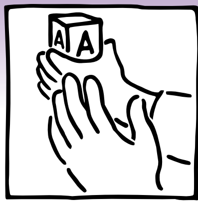
Electronic Resources

World Wide Web. The NEGP web site, http://www.negp.gov, allows users to view and download the Goals Reports, other Goals Panel publications, and commissioned papers. Users may search by indicator, identify the "top" performing states, and choose the states they wish to compare on various indicators. The *NEGP Weekly* and *NEGP Monthly* also are available on the Goals Panel's web site. Both publications track and highlight developments in state and local education reform. In early 1998, the *NEGP Monthly* will explore Goal-related policies and programs of top achieving states on several Panel indicators.

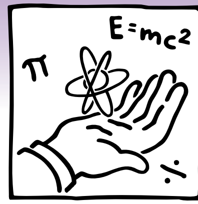
Goal Line. Through the Coalition for Goals 2000, Inc., the Goals Panel has created a customized area on Goal Line, the Coalition's education reform online network that is available via the Internet. Facts and information about the Panel are available online, as well as many of the Panel's more popular publications. Also available are selected state standards and assessment frameworks and soon, new tools to help schools and communities implement standards. For more information, send an e-mail to: connect@goalline.org. or visit the web site at: http://www.goalline.org.

U.S. Department of Education's Web Site. Selected Goals Panel publications, as well as a variety of other resources, are available through the U.S. Department of Education's web site. To access the Department's web site and the Goals Panel's publications, use the World Wide Web: http://www.ed.gov/G2K/ or Gopher: gopher://gopher.ed.gov:10001/11/initiatives/goals/national.

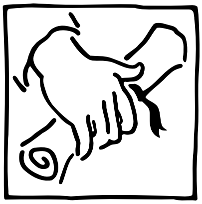
THE NATIONAL EDUCATION GOALS



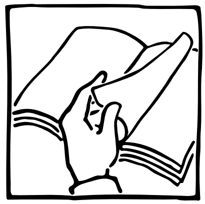
READY TO LEARN



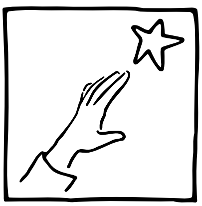
MATHEMATICS
AND SCIENCE



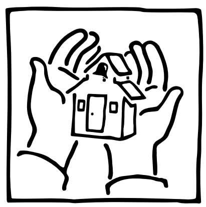
SCHOOL COMPLETION



ADULT LITERACY AND
LIFELONG LEARNING

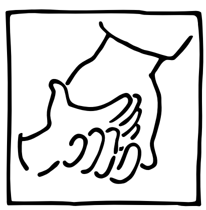


STUDENT ACHIEVEMENT
AND CITIZENSHIP



SAFE, DISCIPLINED, AND
ALCOHOL- AND
DRUG-FREE SCHOOLS

TEACHER EDUCATION
AND PROFESSIONAL
DEVELOPMENT



PARENTAL
PARTICIPATION

NATIONAL EDUCATION GOALS PANEL
1255 22nd Street, N.W., Suite 502
Washington, DC 20037
202–724-0015 • FAX 202–632–0957
http://www.negp.gov
E-mail: NEGP@goalline.org