Objective 2.3: Every eighth-grader masters challenging mathematics, including the foundations of algebra and geometry.

Our Role. The Education Department's Federal resources are used to help states, local school districts, and schools improve teaching, upgrade curriculum, integrate technology and high-quality instructional materials into the classroom, and motivate students to help them understand how mathematical concepts are applied in today's global workplace.

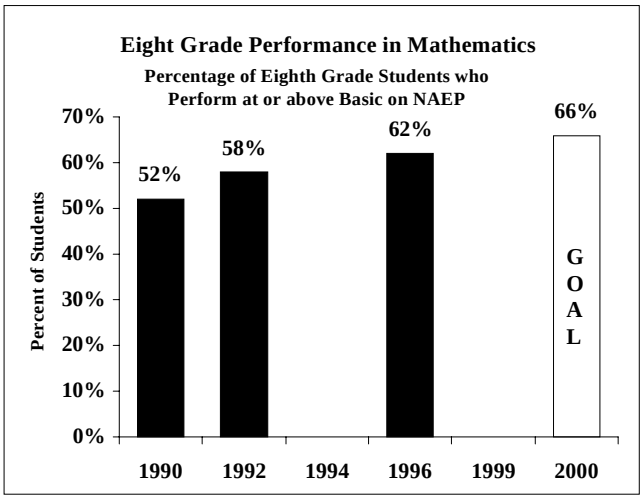
Our Performance

How We Measure. The Education Department is assessing progress toward this objective by monitoring national trends in student achievement in mathematics, teacher preparation, ongoing professional development, and schools' access to and use of information on best practices for mathematics instruction.

Indicator 2.3.a. Increasing percentages of eighth-graders reach the basic, proficient, and advanced levels in math on the National Assessment of Educational Progress (NAEP). On international assessments (TIMSS-R), at least 50 percent will score at the international average by 1999.

Assessment of Progress. Sources show a positive trend toward the 2000 goals. If current trends continue, it is expected that 66 percent of eighth-graders will have performed at or above basic on the 2000 main NAEP. The 1996 goal was met. U.S. students have shown progress in their mathematics achievement on the NAEP since 1990, yet many still fail to achieve the high standards needed for future success in both education and work. The most recent data from the main NAEP, in 1996, show that 62 percent of students scored at or above the basic level on NAEP compared with 52 percent in 1990. Much smaller percentages of students perform at the proficient or advanced levels. The data for 2000 are not available until 2001.

Figure 2.3.a.1



Source*:* NAEP, 1990, 1992, 1996 Mathematics Assessment**.** *Frequency:* Every 4 years for NAEP. *Next Update:* The 2000 main NAEP assessment will be available in 2001. **Validation procedure:** Data validated by NCES review procedures and *NCES Statistical Standards*. **Limitations of data and planned improvements:** None.

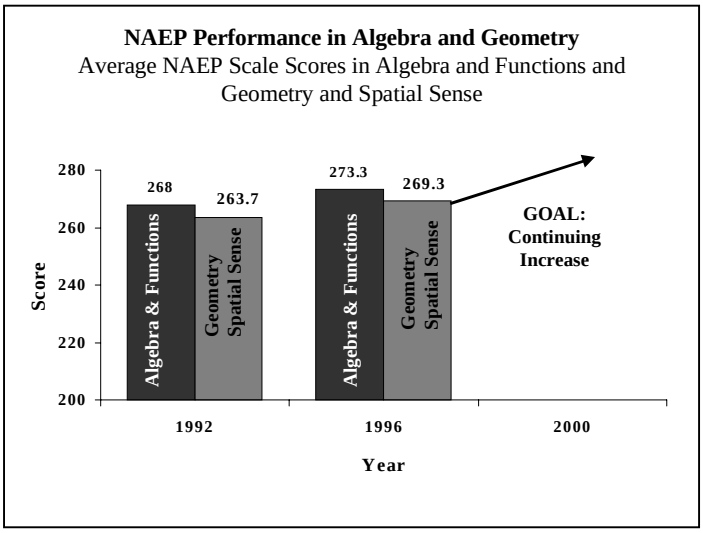
For TIMSS-R, there was no change in eighth-grade mathematics achievement in the United States. There was no change in mathematics achievement for 18 of the 22 other participating nations. In 1999, 61 percent of 8th graders in the United States scored at or above the median. The international average was 69 percent in both years among those nations that participated in both data collections.

Average Mathematics Achievement of Eighth-Grade Students, by Nation ,1999				
Average is significantly higher than the US average	Singapore	604	Hungary	532
	Korea	587	Canada	531
	Chinese Taipei	585	Slovenia	530
	Hong Kong	582	Russian Federation	526
	Japan	579	Australia	525
	Belgium-Flemish	558	Finland	520
	Netherlands	540		
	Slovak Republic	534		
Average score does not differ significantly from US average	Czech Republic	520	**United States**	**502**
	Malaysia	519	England	496
	Bulgaria	511	New Zealand	491
	Latvia	505		
Average score is significantly lower than the US average	Lithuania	482	Turkey	429
	Italy	479	Jordan	428
	Cyprus	476	Iran	422
	Romania	472	Indonesia	403
	Moldavia	469	Chile	392
	Thailand	467	Philippines	345
	Israel	466	Morocco	337
	Tunisia	448	South Africa	275
	Macedonia	447		

Indicator 2.3.b. Each year more students will have a solid foundation in algebra and geometry by the end of eighth grade.

Assessment of Progress. There is a positive trend toward the goal. The goal for 1996 was met. Understanding basic concepts in algebra and geometry is a prerequisite for most high-level mathematics courses. Many states and districts have realized the importance of early exposure to these topics and have increased their mathematics requirements for middle and high school students. An increasing number of students are taking algebra, geometry, or other courses that include a focus on the fundamentals of algebra and geometry. For instance, NAEP data show that 25 percent of eighth graders in 1996 took an algebra course, compared with 20 percent in 1992. The data for 2000 are not available.

Figure 2.3.b.1

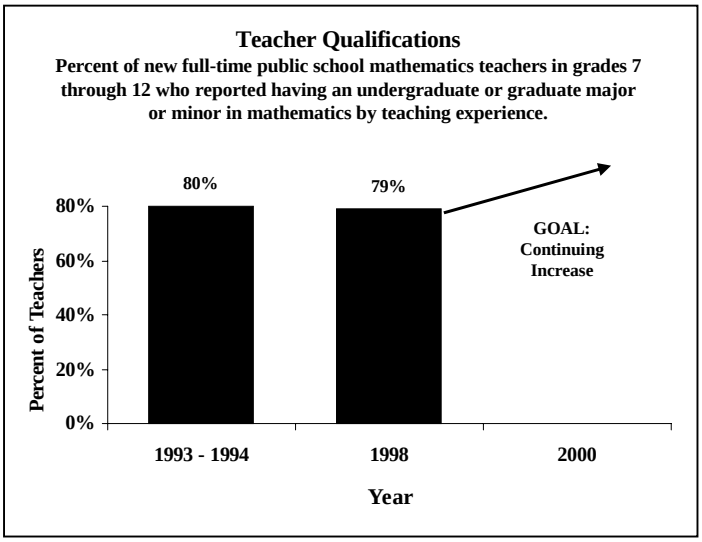


Source: ***National Assessment of Educational Progress (NAEP), 1992, 1996 Mathematics Assessment.*** *Frequency:* Every 4 years. *Next Update*: The NAEP assessment was administered in 2000, and the data will be available in 2001. **Validation procedure*:*** Data validated by NCES review procedures and NCES Statistical Standards**. Limitations of data and planned improvements:** These data represent performance on NAEP's subset of questions in algebra and geometry.

Indicator 2.3.c. Each year, more new teachers will enter the workforce with adequate preparation to teach challenging mathematics to students in kindergarten through 12th grade.

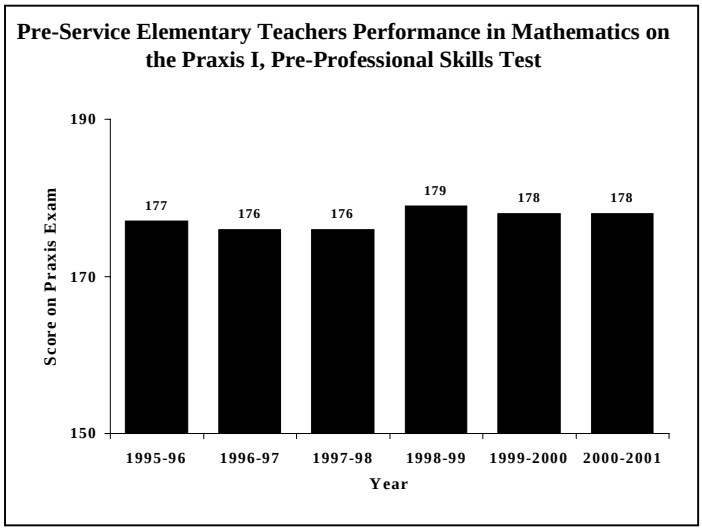
Assessment of Progress. Data from earlier years suggest no change in progress towards goal. The goal for 1998 was not met. One hypothesis is that it is difficult for states and districts to increase requirements for new teachers at a time when many face teacher shortages. Still, there is reason for guarded optimism that these data measures may improve, because more national and state policies are starting to focus on increasing requirements for new teachers (e.g., more stringent degree requirements, higher scores on standardized tests). The data for 2000 are not available.

Figure 2.3.c.1



Source: ***Schools and Staffing Survey*** (SASS), 1993-94; *Teacher Quality: A Report on Teacher Preparation and Qualifications of Public School Teachers*, 1999. *Frequency:* Biennial. *Next Update:* 2000, reported 2001. **Validation procedures:** Data validated by NCES review procedures and *NCES Statistical Standards*. **Limitations of data and planned improvements:** The SASS data are only for current teachers of grades 7-12 and are only one measure of teachers' content knowledge. There are no SASS data on kindergarten-sixth grade teachers or on teachers' pedagogical knowledge.

Figure 2.3.c.2

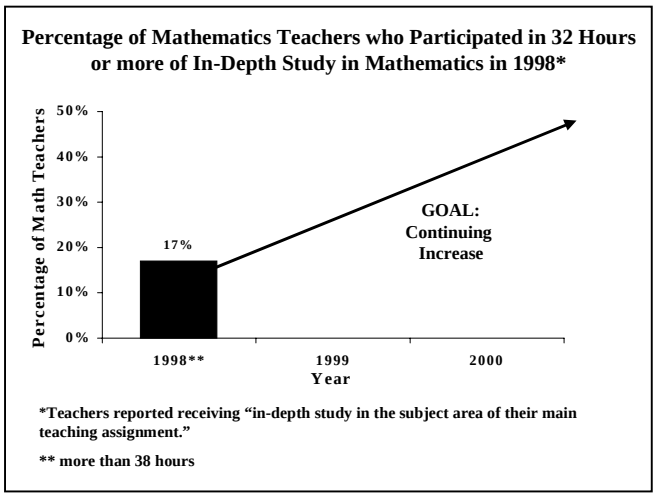


Source: Educational Testing Service (ETS), 1999, Praxis I Pre Professional Skills Test (PPST). Test scores range from 150 to 190. *Frequency:* Annual. *Next Update:* fall 2000, reported in 2001. **Validation procedures:** Data validated by ETS quality control procedures. **Limitations of data and planned improvements:** Based on data from those 29 states that require the PPST. The PPST measures knowledge in mathematics content and pedagogy for prospective elementary school teachers in states that require this exam. The data are only for those two-thirds of preservice teachers who took the paper and pencil test and do not represent teachers who took the computer test.

Indicator 2.3.d. Each year, more teachers of mathematics will complete intensive professional development to enable them to teach challenging mathematics.

Assessment of Progress. Unable to judge progress, as 1998 data were a baseline measure and more recent data are not available. Only 17 percent of mathematics teachers participated in more than 32 hours of in-depth study in their main assignment field in 1998. Future data will report on elementary school teachers' participation in professional development and will report more specifically on the content of professional development.

Figure 2.3.d.1

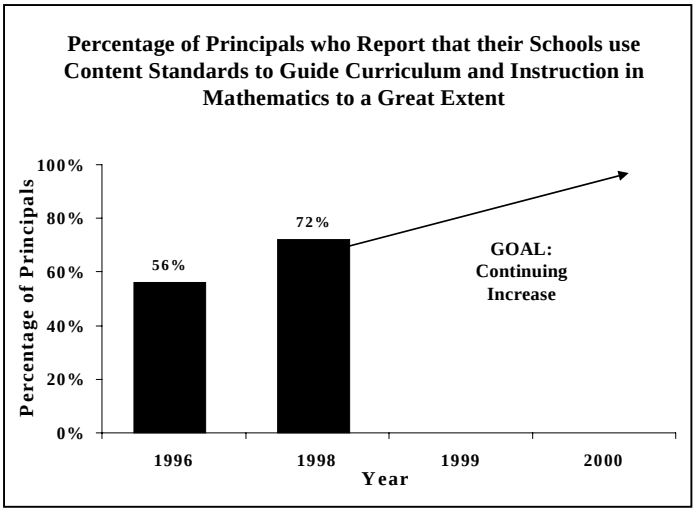


Source: *Teacher Quality: A Report on the Preparation and Qualifications of Public School Teachers, 1999. Frequency:* Every 2 years. *Next Update:* 2000, reported in 2001. **Validation procedures:** Data validated by NCES review procedures and *NCES Statistical Standards.* **Limitations of data and planned improvements:** This is the first year for which the Schools and Staffing Survey (SASS) data are available, and therefore there is no trend. Data are only available for teachers whose main assignment is math, which includes few elementary school teachers. In addition, although length of professional development experience often correlates with quality, it does not measure change in teacher practice nor subsequent impact on student achievement. The next NCES Teacher Quality survey will collect data about mathematics professional development from all elementary school teachers.

Indicator 2.3.e. Each year, increasing numbers of schools will have access to, and use, information on best practices for math content and instruction.

Assessment of Progress. Significant progress toward the goal was made between 1996 and 1998, making further progress in 1999 and 2000 likely. The goal for 1998 was met. A key component of educational reform in states, districts, and schools is the implementation of challenging standards in the content areas. It is expected that as challenging mathematics content standards are implemented in schools, instruction and achievement will improve. This indicator shows improvement in the number of principals reporting the use of standards, a prerequisite for the effective implementation of standards at the classroom level. The data for 2000 are not available.

Figure 2.3.e.1



Source: 1996 data: Status of Education Reform in Public Elementary and Secondary Schools, Principals' Perspective, NCES 1998 data: School-Level Implementation of Standards-Based Reform: Findings from the Follow-up Public School Survey on Education Reform. *Frequency:* No regular schedule. *Next Update:* Late spring 2001. **Validation procedures:** Data validated by NCES review procedures and *NCES Statistical Standards*. **Limitations of data and planned improvements:** This indicator relies on self–reported data, which may not be a completely accurate measure of teacher practice. It is also an incomplete measure of schools' use of best practices.