

Highlights

Mathematics and Science Achievement

- ♦ **Although mathematics and science achievement, as measured by the National Assessment of Educational Progress (NAEP), have improved since the 1970s, few students are attaining levels deemed Proficient or Advanced by a national panel of experts.** For example, only 17 percent of 12th-grade students scored at the proficient level on the NAEP mathematics assessment in 2000.
- ♦ **At each grade level, white and Asian/Pacific Islander students are far more likely than their black, Hispanic, and American Indian/Alaskan Native counterparts to score at or above the Basic, Proficient, and Advanced levels set by the National Assessment Governing Board (NAGB).** For example, although 33 percent of Asian/Pacific Islander and 20 percent of white 12th graders scored at the Proficient level in 2000, only 4 percent of Hispanic, 3 percent of black, and 10 percent of American Indian/Alaskan Native 12th graders scored at that level. Furthermore, there was no evidence in the 2000 assessment of any narrowing of the racial/ethnic group score gaps since 1990.
- ♦ **There is a wide gap between the NAEP mathematics scores of high- and low-income students, as measured by eligibility for the National School Lunch Program.** For example, low-income 12th-grade students (those who were eligible for the Free/Reduced Price Lunch Program) had scale scores similar to high-income 8th-grade students (those who were not eligible for this program). Furthermore, at each grade level, low-income students were twice as likely or more to score below the Basic level of achievement than were high-income students.
- ♦ **Internationally, U.S. student relative performance becomes increasingly weaker at higher grade levels.** On the Third International Mathematics and Science Study (TIMSS), 9-year-olds tended to score above the international average, 13-year-olds near the average, and 17-year-olds below it. Even the most advanced students performed poorly compared with students in other countries taking advanced mathematics and science courses. On advanced mathematics and science assessments, U.S. students who had taken advanced coursework in these subjects performed poorly compared with their counterparts in other countries.

Coursetaking

- ♦ **Since the publication of *A Nation At Risk* nearly 20 years ago, most states have increased the number of mathematics and science courses required for high school graduation.** As of 2000, 25 states required at least 2.5 years of math and 20 states required 2.5 years of science; in 1987, only 12 states required that many courses in math and only 6 required that many courses in science. Opinions differ, however, on the quality of the added courses, especially those taken by students who are low achievers.
- ♦ **In 1998, more graduating students had taken advanced mathematics and science courses than did their counterparts in the early 1980s.** For example, almost all graduating seniors (93 percent) in the class of 1998 had taken biology, more than one-half (60 percent) had taken chemistry, and more than one-quarter (29 percent) had completed physics. Participation rates in advanced placement or honors science courses are considerably lower: 16 percent for biology, 5 percent for chemistry, and 4 percent for physics.
- ♦ **Female and male students have broadly similar course-taking patterns, although there are some differences.** In high school, girls are as likely as boys to take advanced mathematics classes and are more likely to take biology and chemistry; they remain less likely to take physics.
- ♦ **Students in all racial and ethnic groups are taking more advanced mathematics and science courses, although black, Hispanic, and American Indian/Alaskan Native graduates still lag behind their Asian/Pacific Islander and white counterparts in advanced mathematics and science coursetaking.** For example, graduates in the class of 1998 who had taken algebra II ranged from 47 percent of American Indians/Alaskan Natives to 70 percent of Asians/Pacific Islanders. Percentages for white, black, and Hispanic graduates were 65, 56, and 48, respectively. Furthermore, Asians/Pacific Islanders were a third more likely than whites to take calculus (18 versus 12 percent) and three times more likely than blacks, Hispanics, and American Indians/Alaskan Natives (about 6 percent each).

Content Standards and Statewide Assessments

- ♦ **In the 1980s, most states approved policies aimed at improving the quality of K–12 education by implementing statewide curriculum guidelines and frameworks as well as assessments.** By 2000, 49 states had established content standards in mathematics and 46 states had established science standards. Teachers remain concerned, however, that standards do not always provide clear guidance regarding the goals of instruction and that schools do not yet have access to top-quality curriculum materials aligned with the standards.
- ♦ **Although some states have recently delayed the introduction of high-stakes tests (i.e., tests that students must pass to either graduate or advance a grade), public support for standards-based reform appears to be strong.** For example, in a 2000 survey, relatively few parents said that their child's school requires them to take too many standardized tests to the detriment of other important learning (11 percent), that teachers in their child's school "focus so much on preparing for standardized tests that real learning is neglected" (18 percent), or that their child receives too much homework (10 percent).

- ◆ **Employers and professors are far more disapproving than parents or teachers of how well young people are prepared for college and work, and very large majorities continue to voice significant dissatisfaction about students' basic skills.** For example, in a 2000 survey, about two-thirds of professors found the basic math skills of recent freshmen and sophomores to be only “fair” or “poor.” More than 80 percent stated that student ability to write clearly was only “fair” or “poor.” These results point to the continuing gap between student skill level and preparation for college and college professors' views of the adequacy of that preparation. Results were similar for employers regarding recent job applicants.
- ◆ **Public school teachers generally support the movement to raise standards, but they are less supportive than the general public.** The vast majority of public school teachers feel that the curriculum is becoming more demanding of students, although they also feel that new statewide standards have led to teaching that focuses too much on state tests and that a significant amount of “teaching to the test” occurs.

Curriculum and Instruction

- ◆ **Students in the United States receive at least as much classroom time in mathematics and science instruction as students in other nations:** for 8th graders, close to 140 hours per year in mathematics and 140 hours per year in science. Students in Germany, Japan, and the United States spent about the same amount of time on a typical homework assignment, although American students were assigned homework more often.
- ◆ **According to a curriculum analysis conducted as a part of TIMSS, curriculums and textbooks used in U.S. schools are highly repetitive, contain too many topics, and provide inadequate coverage of important topics.** Independent judges determined that only 6 of the 13 U.S. mathematics texts and none of the 9 U.S. science texts that were evaluated were satisfactory based on 24 instructional criteria. These findings are supported by math and science textbook analyses undertaken by the American Association for the Advancement of Science.
- ◆ **Instruction in U.S. 8th-grade classrooms focuses on development of low-level skills rather than on understanding and provides few opportunities for students to engage in high-level mathematical thinking.** A team of mathematicians found that 13 percent of Japanese lessons in 1995 were judged to be of low quality, whereas 87 percent of lessons from U.S. classrooms were judged to be of low quality.

Teacher Quality

- ◆ **Research suggests that the following factors are associated with teacher quality: having a high level of academic skills, teaching in the field in which the teacher was trained, having more than a few years of experience (to be most effective), and participating in high-quality induction and professional development programs.**

Teacher Working Conditions

- ◆ **The difference between the annual median salaries of all bachelor's degree recipients and teachers has declined over the past 20 years, mainly due to increases in the relative size of the older teaching workforce and in salaries of older teachers.** The average annual median salary of full-time teachers grew slowly during the 1990s, reaching \$35,099 in 1998.
- ◆ **Teacher pay scales in the United States tend to be lower than those in a number of other countries, including Germany, Japan, South Korea, and the Netherlands.** In addition, teaching hours tend to be longer in American schools. The gaps are particularly wide at the upper secondary (high school) level because a number of countries require higher educational qualifications and pay teachers significantly more at this level than at the primary (elementary) level.

Information Technology in Schools

- ◆ **Computers and Internet access are becoming increasingly available in schools, although the distribution of these resources is not uniform.** In 2000, the ratio of students to instructional computers in public schools was 5:1, down from 6:1 in 1999 and a dramatic change from 125:1 in 1983. The ratio of students per instructional computer with Internet access in public schools declined from 12:1 in 1998 to 9:1 in 1999 and then to 7:1 in 2000.
- ◆ **Although gaps in access to computers and the Internet have narrowed between high- and low-poverty schools, differences remain.** For high-poverty schools (those with 75 percent or more students eligible for free or reduced-price lunch), 60 percent of all instructional rooms had Internet access in 2000, up from 5 percent in 1996. Schools with less poverty tended to have a larger percentage of rooms with Internet access—77 percent or higher in 2000, up from 11–17 percent in 1996.
- ◆ **In 1999, approximately half of the public school teachers who had computers or the Internet available in their schools used them for classroom instruction.** Teachers assigned students to use these technologies for word processing or creating spreadsheets most frequently (61 percent), followed by Internet research (51 percent), problem solving and data analysis (50 percent), and drills (50 percent).
- ◆ **Many teachers feel unprepared to integrate technology into the subjects they teach, and relatively few teachers find the current training activities in information technology very useful.** In 1999, only one-third of teachers reported feeling well prepared or very well prepared to use computers and the Internet for classroom instruction, with less experienced teachers indicating they felt better prepared to use technology than their more experienced colleagues. For many instructional activities, teachers who reported feeling better prepared to use technology were generally more likely to use it than were teachers who indicated that they felt unprepared.

Transition to Higher Education

- ◆ **Expectations for college attendance have increased dramatically over the past 20 years, even among low-performing students.** Overall, immediate college enrollment rates for high school completers increased from 49 to 63 percent between 1972 and 1999. Much of the growth in these rates between 1984 and 1999 was due to increases in the immediate enrollment rates for females at four-year institutions.
- ◆ **Since 1984, college transition rates for black graduates have increased faster than those for whites, thus closing much of the gap between the two groups. The enrollment rates for Hispanic graduates are lower and have been relatively stable over the past 20 years.** In 1994, white graduates were twice as likely to enroll in a four-year college as a two-year college after high school, black graduates were about 1.5 times as likely, and Hispanic graduates were equally likely to enroll in a four-year college as a two-year college.
- ◆ **High school graduates from low-income families enter four-year institutions at lower rates than those from high-income families.** Although financial barriers to college attendance exist for many low-income students, another reason for their lower enrollment rate is that they are less qualified academically.
- ◆ **Remedial work is widespread at the college level, particularly in two-year colleges.** In 1995, the latest year for which data are available, all public two-year and 81 percent of public four-year institutions offered remedial reading, writing, or mathematics courses. Moreover, freshmen at public two-year institutions were almost twice as likely as their peers at public four-year institutions to enroll in remedial courses in these subjects (41 percent versus 22 percent).