



Math And Science Education for the California Workforce: It Starts with K-12

TOMORROW'S WORKFORCE IS IN CALIFORNIA'S

public schools now. How well these students are educated in math and science will help determine the quality of not only their lives, but also the state's future.

Jobs in math and science fields that require postsecondary degrees are prominent among the state's fastest-growing occupations. Some fields, such as computer software engineering, are also expected to offer large numbers of job openings.

Occupations in computer science fields tend to require at least a bachelor's degree and sometimes work experience. More secondary school teachers, who hold a degree and a credential, are also needed, particularly in math and science. A 2007 study found that about 10% of California's high school math and science teachers are underprepared (do not hold the proper credentials), especially in low-performing schools.

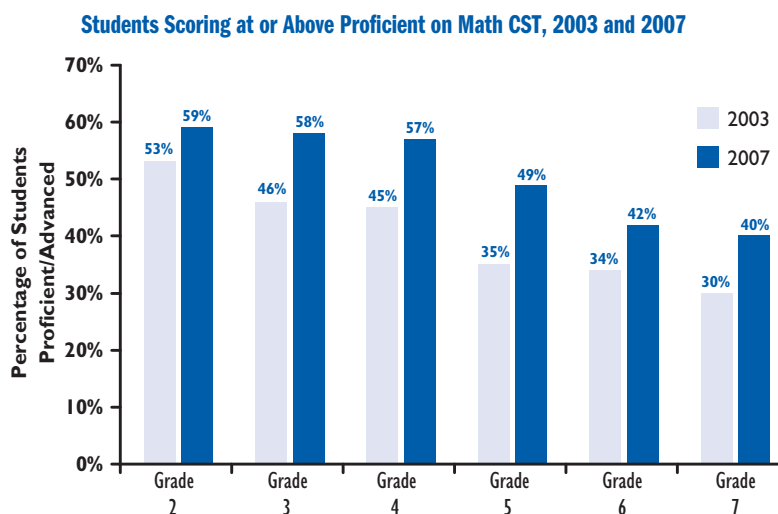
In addition, some fast-growing jobs that require math and science backgrounds—such as computer support specialists, health information technicians, and registered nurses—require at least an associate's degree from a community college. Projections also show that many California jobs will require less education—and pay lower wages—including retail salespersons, cashiers, waiters, and office clerks.

These projections make clear that education—including a strong background in math and science—plays an important role in determining students' future opportunities and earnings. That reality was one impetus for California's adoption in the late 1990s of rigorous academic content standards in both math and science.

More students are prepared for high school math, though challenges remain

In 2000 California policymakers made the completion of Algebra I a mandatory requirement for a high school diploma. The move followed the adoption of a new set of K-12 academic content standards in math that recommended students take the course in 8th grade, a path previously reserved for only the highest-achieving students.

figure 1 Proficiency on math CSTs before high school tends to decline across grades but has improved at each grade level



Although the percentage of students who score proficient or above in math each year tends to decline from 2nd to 7th grade, all grades show steady improvement between 2002-03 and 2006-07.

DATA: CALIFORNIA DEPARTMENT OF EDUCATION (CDE)

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Achievement data from the California Standards Tests (CSTs) for grades 2-7 indicate the extent to which students are prepared to take Algebra I in 8th grade. As Figure 1 shows, as students get older, they are progressively less likely to score proficient or above. But the percentage of students scoring at least proficient on these CSTs has been increasing steadily across all grades since 2002-03.

CSTs for grades 2-8 and 10th grade scores on the California High School Exit Exam (scores that are reported to the federal government) also show that math proficiency has increased for all student subgroups. However, large differences in proficiency exist among them. At the extremes, almost 77% of Asian students demonstrated proficiency in math compared with about 31% of African American students.

More students are taking Algebra I

The number of California 8th graders taking Algebra I has increased greatly since the state explicitly recommended the course be

completed in 8th grade—from 16% in 1999 to nearly half in 2006-07. However, the rates of participation vary based on ethnicity. In 2006-07, the following percentages of students took Algebra I in 8th grade:

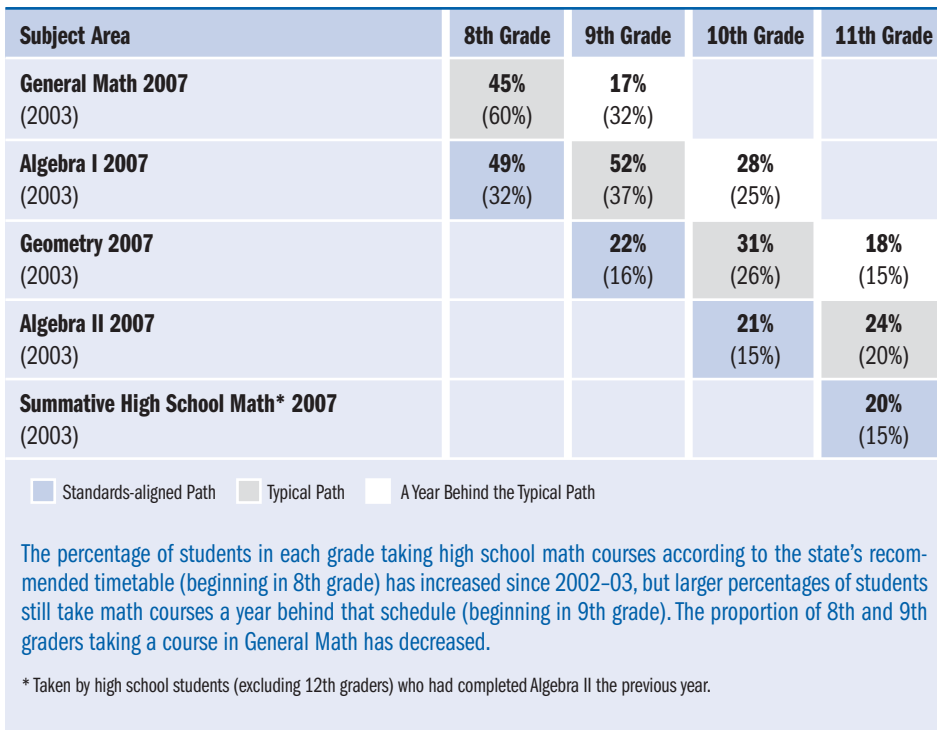
- 61% of Asian and Filipino students;
- 52% of white students;
- 46% of both African American and Hispanic/Latino students (but their rates of participation greatly increased);
- 43% of Native American students.

Although more 8th grade students are taking Algebra I than before, students still more often take Algebra I and subsequent math courses one year behind the state guidelines. These students, if successful, may complete Algebra II in 11th grade. (See Figure 2 on page 2.)

Students on the standards-aligned path tend to score proficient at higher rates

Students who take Algebra I in 8th grade tend to score proficient or advanced at higher rates than their peers on other paths. Of students

figure 2 Overall, high school math course-taking has increased and accelerated, but the most common schedule includes Algebra I in 9th grade



DATA: CALIFORNIA DEPARTMENT OF EDUCATION (CDE)

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who took Algebra I in 2006–07, 38% of 8th graders scored advanced or proficient on the CST, compared with 17% of 9th graders and 8% of 10th graders.

Overall, more students are now taking Algebra I in 8th grade, more are scoring proficient and advanced, and more students have the opportunity to take advanced math courses. But many California students still struggle with the subject.

Science course-taking and achievement have improved, but the data are more difficult to analyze

Unlike with math, the state does not recommend a particular science course sequence for high school students. More California students are enrolling in biology, chemistry, and earth science, and student achievement in these courses generally improved between 2002–03 and 2006–07:

- **Biology:** Enrollments increased from 334,000 in 2002–03 to 507,000 in 2006–07, and proficiency increased slightly

among 9th and 11th graders (but fell slightly among 10th graders).

- **Chemistry:** Enrollments increased from 153,000 to 228,000; proficiency was the same for 10th graders and increased slightly for 11th graders.
- **Earth Science:** Enrollments increased from 90,000 to 207,000 with most students taking the course in 9th grade; proficiency increased slightly in all grades that were tested.
- **Physics:** The proportion of students who study physics (usually in 11th grade) has not changed much since 2002–03. Proficiency tends to be highest among 11th graders who take the course.

Data offer a partial picture of the state's highest-achieving students in math and science

Many high-achieving students pursue upper-level math and science courses in high school. In math, 14% of students enrolled in an advanced course such as

Student-level data show a relationship between science and math course-taking

An analysis of 2005–06 student records by the California Department of Education (CDE) reveals that students who had completed Algebra I in 8th grade and were taking geometry in 9th grade were more likely to also take “college prep” science (i.e., biology) than their peers who took Algebra I in 9th grade. And science courses were less likely to be “college prep” among those students who were not yet taking Algebra I by 9th grade. Because many higher-level science courses require a certain level of math proficiency, these data demonstrate how Algebra I may serve as a gateway to a more rigorous high school science education.

trigonometry, statistics, or calculus in 2006–07. In addition:

- Nearly 109,000 students (primarily 11th graders) took the Summative High School Math CST in 2006–07 (compared with almost 77,000 in 2002–03), and the percentage who scored proficient or above increased slightly. This test is taken the year following completion of Algebra II.
- In 2007 California students took 129,661 AP exams in math, science, and technology subjects, and about 60% received a passing score.

Math and science education are key to the state's future

In a society that is increasingly technological and in a state with an economy that depends so heavily on math and science, these two subjects should represent opportunities for California students rather than the barriers that they often have been. This is particularly true when these barriers contribute to inequalities based on students' racial, socio-economic, or gender backgrounds. Every student who leaves a California high school with a strong foundation in math and science will be better prepared to participate in California's changing economy. ■■■

To see the full EdSource report that this brief summarizes, go to: www.edsource.org/pub_abs_mathscience0108.cfm

