



Middle Grades: The challenge of meeting high expectations

California's new math standards are creating notable changes in course taking at schools that serve middle grade students—those in grades 6, 7, and 8. The changes began in 1997 when the State Board of Education adopted academic content standards that established mastery of Algebra I as the expectation for all 8th graders. In 2000 state lawmakers specified that, starting with the class of 2004, California public school students had to pass Algebra I to earn a high school diploma. Previously, state graduation requirements simply required two years of mathematics and did not specify course content.

This change in standards was consistent with findings about the importance of algebra instruction for all students and with the state's growing commitment to prepare all students to pursue post-secondary education if they choose.

California's algebra requirement rests on solid ground

Even if students are not college-bound, algebra is important because it helps them learn abstract reasoning skills that are not only useful in math and science, but also apply to other areas, such as essay writing in which students must alternate between abstract concepts and specific supporting evidence. Students learning these skills early on can then apply them to many other subjects.

Algebra is also widely acknowledged as a “gatekeeper” course in terms of college admissions. The SAT and ACT tests, required by most colleges for entrance, have so many algebra questions that it is difficult to score well without knowledge of the subject. In addition, algebra is a prerequisite for taking the higher level math and science courses (geometry, advanced algebra, chemistry, physics, etc.) that California state universities and many others throughout the country require for admission. If students take Algebra I early, they then have the opportunity to take more of these courses.

A 1997 white paper for former U.S. Secretary of Education Richard Riley, *Mathematics Equals Opportunity*, noted that students' course-taking patterns served as an excellent indicator of whether they would attend college and as an equalizer among income levels. The report concluded: “When low-income students take rigorous courses, income effects on college entrance rates diminish greatly, although they do not disappear.” A rigorous curriculum—including four years of math through pre-calculus and three years of science through physics—was more important

than many other background factors, such as whether a student attended public or private school.

The number of students taking algebra in 8th grade has doubled

With these findings in mind, California designed the 8th grade math standards around algebra concepts to encourage their introduction early in a student's education. Some algebra content is also included on the California High School Exit Exam (CAHSEE), which students will have to pass to graduate starting in 2006.

This was a big change in expectations for middle and high schools in California. It seems to have had a rapid and far-reaching effect statewide, most notably in terms of the proportion of 8th and 9th graders who take Algebra I. The impact on student performance is less clear.

Students who complete Algebra I are required to take the corresponding California Standards Test (CST). Based on the test-taking data, it appears that a substantial change has taken place over the last few years in the number of students taking algebra in middle school. In 1999, the first year California administered course-specific math tests to 8th graders, just 16% of them took the test for Algebra I. Since then the percentage has risen steadily and had doubled as of 2003, when 32% of 8th graders took the Algebra I CST.

These statistics appear to tell just part of the story. Many schools start some of their 8th graders in a slower-paced algebra class that breaks the course content down into a three- or four-semester curriculum. Students complete half the course in 8th grade and the other half the following year. These students would take the General Mathematics test in 8th grade and the Algebra I test in 9th grade when they finish the full course. The CST data also show that the portion of 9th grade students taking Algebra I has increased as well, from 21% in 1999 to 37% in 2003.

Data indicate modest progress toward closing a sizable gap

Based on student background, dramatic differences exist in regard to which students take algebra. The 2003 data for both 8th and 9th graders indicate that just 25% of Hispanic and African American students completed Algebra I as 8th graders. However, the percentages that did so in 9th grade were substantially higher at 35% for each group. The data for English learners show 19% of 8th graders and 33% of 9th graders taking the test.

8th grade algebra participation and performance varies by region

Statewide averages, particularly in a place as large and diverse as California, can obscure important and informative differences among areas of the state. A look at 8th grade algebra illustrates the point.

For the purpose of this comparison, EdSource gathered participation and performance data by selected geographic regions. Each region chosen represents more than 10% of the state's student population. The table below details the counties included in each region and provides a bit of information about all the students who live there.

Region	Counties included	% of California's 2003 enrollment	% of students who receive free/reduced price meals in 2002-03 (compares to 49% statewide)	% of students who are English learners in 2002-03 (compares to 27% statewide)
Bay Area	Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma	16%	32%	21%
Central Valley	Fresno, Kern, Kings, Madera, Merced, San Joaquin, and Stanislaus	11%	58%	24%
Inland Empire	Riverside and San Bernardino	12%	51%	21%
Los Angeles County (minus LAUSD)	Part of LA County	16%	52%	27%
Los Angeles Unified School District (LAUSD)	Part of LA County	12%	75%	44%

Due to its size, the huge Los Angeles Unified School District is pulled out as the equivalent of a region. It also serves a much higher percentage of low-income students and English learners than any of the regions included in this comparison or than the remainder of Los Angeles County.

As the table below shows, 8th grade participation in the Algebra 1 CST doubled statewide, increasing from 16% to 32% between 1999 and 2003. The Inland Empire is the only region in this analysis that exceeded the statewide increase, going from 17% to 38% of its students taking the test. The 2003 performance data show an even more dramatic difference by region.

Region	% of 8th graders taking Algebra 1 test in 1999	% of 8th graders taking Algebra 1 test in 2003	% of 8th grade test-takers who scored proficient and advanced on Algebra 1 test in 2003
Bay Area	20%	33%	52%
Central Valley	12%	28%	28%
Inland Empire	17%	38%	25%
Los Angeles County (minus LAUSD)	18%	31%	45%
Los Angeles Unified School District (LAUSD)	14%	23%	24%
State	16%	32%	39%

Just like with participation rates, performance in math varied by ethnicity. In both 2002 and 2003, 39% of the 8th graders who took the Algebra I CST scored proficient or above. While 49% of the white students—and an impressive 67% of the Asian students—who took the algebra CST in 8th grade scored proficient or advanced on the test, just 17% of African American and 20% of Hispanic 8th graders who took the test scored at that level. Examining performance by geographical regions in California reveals that regions scoring the lowest had the highest percentages of low-income students and English learners. (See the table at left.)

Algebra is a lynchpin for higher student performance in California

Helping all students succeed in algebra is a daunting task for California's middle school math teachers, particularly because many do not have training in math. However, the importance of this course for the ultimate success of California's diverse student body is clear, and thus the progress to date is of note. Because schools have a long way to go to meet the math standards, policymakers and other advocates who want to see improved academic achievement among California's high school students should consider including 8th grade success in algebra as a central part of their focus. [1]

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This two-page report supplements our larger report on middle schools, also published in March 2004: *California's Middle Grade Students*

EdSource thanks the **Irvine Foundation** for its support of this project and its investment in our mission.

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