



# policy matters

california senate

OFFICE OF RESEARCH

## KEEPING CALIFORNIA COMPETITIVE: THE IMPACT OF MATH AND SCIENCE TEACHERS

Could California's shortage of math and science teachers impact its ability to compete with other states—and even nations—in the coming years? In California, growth in jobs requiring science, math, and technical training will greatly outpace overall job growth, yet forecasts also indicate that the state will have a shortage of educated and skilled workers to fill these jobs. Will such gaps leave California with a workforce unable to meet the needs of the new economy? And how can California address the need for a better-trained workforce?

### Teachers: An Important Part of the Solution

One strategy for keeping California economically competitive starts with its teachers. California lags behind much of the nation in math and science student test results and degrees produced in these subject areas. Research shows that the most important controllable variable in student achievement is the quality of the teacher in the classroom. Yet many students in California are taught by underprepared and beginning math and science teachers.

In low-performing schools and schools with high percentages of poor or minority students, underprepared teachers are much more likely to teach math and science than in other schools.

And in some areas, such as the state's



#### **Wanted: More Math and Science Teachers**

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inland counties, K–12 student-enrollment growth will contribute to the shortage of teachers. Moreover, many parts of the state that will experience student-enrollment growth also have some of the highest percentages of underprepared teachers.

## The Magnitude of the Teacher Shortage

California will need 33,000 math and science teachers in the next decade, according to the Center for the Future of Teaching and Learning and the California Council on Science and Technology. Many factors contribute to this demand, including the retirement wave of baby-boomer teachers, attrition, and compliance with federal requirements for “highly qualified” teachers. In addition, if the California State Board of Education’s 2008 action requiring eighth-grade students to receive algebra instruction and testing is upheld by the courts and implemented, the demand for math teachers will increase dramatically.

To put the shortage in perspective, if every student who graduates this year with a math or science degree decided to teach school instead of pursuing other professions, California still would not meet the demand for math and science teachers in the next decade. While the number of underprepared math and science teachers has been declining in recent years, there is a higher proportion of first- and second-year math and science teachers who are underprepared compared to all first- and second-year teachers.

Existing teacher preparation programs are not producing enough new math and science teachers to keep up with the demand. In

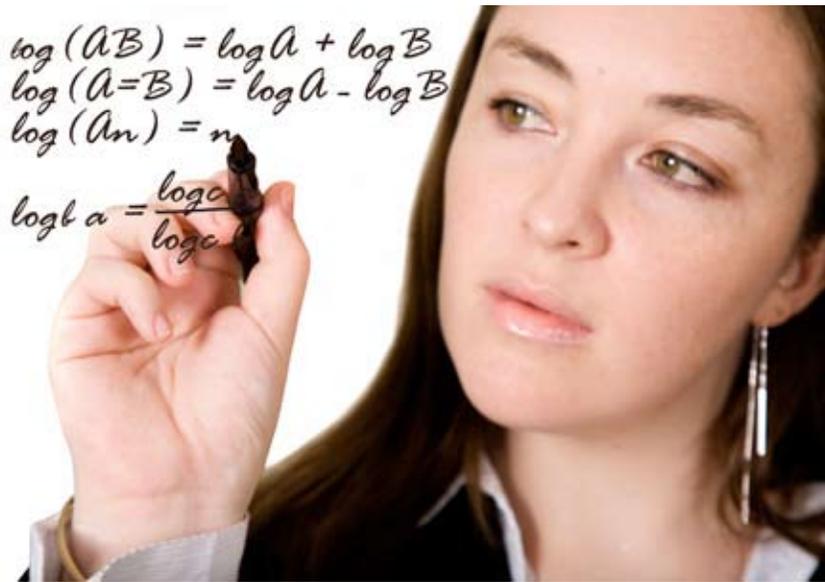
addition to program capacity constraints, enrollment in these programs is declining.

This downward enrollment trend may not improve soon in today’s uneven teacher labor market. Production of math credentials trails teacher demand by 16 percent; in science, credentials fall short by 30 percent. Currently, one-third of all middle-school algebra teachers are underprepared. If California were to offer algebra to all eighth-grade students, the state would need approximately 1,900 additional middle-school algebra teachers. Yet in 2007–08, 1,743 teachers earned a math credential for *all* grades. California also is producing fewer overall teachers, dropping from 27,150 to 20,308 in just four years.

## Student Achievement and Teacher Qualification in Math and Science

California’s proficiency test—Standardized Testing and Reporting (STAR)—results show that less than half of the state’s tested students score as proficient or above in math and science. In fact, proficiency in math declines after elementary school. The lowest-performing secondary schools are three to four times as likely to have underprepared math or science teachers compared with the highest-performing schools.

In Algebra I classes, 72 percent of California’s students score below proficiency. Students in schools that do least well on the state’s algebra tests are more likely to be taught by underprepared and novice teachers than higher scoring schools. Statewide, about one-third of middle-school algebra teachers are teaching out-of-field or do not have a math credential.



### Putting the Teacher Shortage in Perspective

Teacher preparation programs in California are not producing enough new math and science teachers to keep up with demand. In fact, if every student who graduates this year with a math or science degree decided to teach school instead of pursuing other professions, California still would not meet the demand for math and science teachers in the next 10 years.

On California's high school exit exam, one-quarter of the tenth graders failed the math section in 2006–07; schools with the lowest passing rates were nearly twice as likely to be taught by underprepared or novice teachers.

## California's Math and Science Teacher Pipeline

California's math and science teachers come from traditional university teacher preparation programs, university or district-based internship programs, or out of state.

California's "fifth-year" college and university teacher credential programs produce the largest number of math and science teachers. Alternative credentialing routes (such as university and district internships, which allow individuals to complete teacher preparation coursework concurrent with their first year or two in a paid teaching position) produce the second-largest number of credentials;

these alternative credentialing programs are chosen half of the time by math and science teachers and are favored by career-changers. Out-of-state teachers comprise 18 percent of California's new math and science credentials.

The University of California (UC) and California State University (CSU) have implemented programs to increase the number and quality of math and science teachers they produce. CSU has committed to doubling its math and science teacher production by 2010; UC wants

to quadruple its production of these teachers by 2010.

Some of the universities' program strategies include increased recruitment, improved community college transfer programs, more financial incentives, greater Internet-supported instruction, and new credential pathways. As a result of the implementation of some of these strategies, the number of credentials produced by CSU and UC already has increased substantially.

## Strategies to Attract and Retain Math and Science Teachers

California's challenging fiscal environment limits the types of programs and budgetary solutions that can be applied to the math and science teacher shortage. In recent years, state budget reductions and program flexibility have reduced funding earmarked for the math and science teacher pipeline, induction, and

professional development programs. However, 2009 federal Recovery Act funding has augmented financial aid programs for math and science teachers, encouraged innovative teacher compensation systems, and provided grant funding for teacher quality and math and science partnerships.

In the immediate future, California's distressed economy may help ease the math and science teacher shortage since some teachers are delaying their retirement and more unemployed private industry personnel are pursuing new careers as teachers.

When the state's fiscal climate improves, some long-term strategies to attract and retain math and science teachers could include the following:

- > **Provide structured support** for teachers, including induction and mentoring programs.
  - > **Address the gap** between salaries paid to math and science teachers, and salaries paid by industries that employ math and science college graduates.
  - > **Provide ongoing professional development** to teachers that is high-quality and includes more subject matter content and pedagogical skills.
  - > **Increase the math skills** of multiple-subject teachers so they are able to help students become more proficient in math and better prepare them to take algebra classes.
  - > **Improve the quality** of teacher preparation programs by providing more rigorous course content and pedagogy.
  - > **Streamline pathways** between higher education and teacher preparation programs.
  - > **Keep teachers updated** on current teaching methodologies by providing advanced training at local industries.
- > **Help retain teachers** by enhancing the working environment in schools, including improving teacher support systems and providing more administrative support.
  - > **Use data systems** to monitor the supply and demand of math and science teachers. (See the Senate Office of Research report, "Could a New Way of Collecting Data Transform Education in California?" at [www.sen.ca.gov/sor](http://www.sen.ca.gov/sor).)
  - > **Encourage individuals** retiring from private-industry careers to start a teaching career, and establish partnerships between schools, industry, and business to encourage second careers in teaching.
  - > **Fund financial aid programs** to help attract and retain teachers, such as tuition and fee assistance programs, or offer loan forgiveness terms to postbaccalaureate students seeking a teaching credential if they commit to teaching math and science in low-performing schools for a specified period of time.

Addressing California's shortage of math and science teachers is an important component that will help produce a workforce that enables California to be competitive economically in the nation and the world.

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**Written by Gail Evans.** The California Senate Office of Research is a nonpartisan office charged with serving the research needs of the California State Senate and assisting Senate members and committees with the development of public policy. It was established by the Senate Rules Committee in 1969. For more information and copies of this report, please visit [www.sen.ca.gov/sor](http://www.sen.ca.gov/sor) or call (916) 651-1500.

Sources: "California's Teaching Force: Key Issues and Trends 2008," The Center for the Future of Teaching and Learning, 2008; "Centerview: California's Approach to Math Instruction Still Doesn't Add Up," The Center for the Future of Teaching and Learning, July 2008; "Creating a Well-Prepared Science, Technology, Engineering, and Mathematics (STEM) Workforce: How Do We Get From Here to There?" Symposium Summary, California Teacher Advisory Council, February 2, 2009; "Critical Path Analysis of California's Science and Mathematics Teacher Preparation System," California Council on Science and Technology and the Center for the Future of Teaching and Learning, March 2007.