



Technical Difficulties: Meeting California's Workforce Needs in Science, Technology, Engineering, and Math (STEM) Fields

Executive Summary

The Campaign for
**College
Opportunity**

BAY AREA COUNCIL



The Campaign for College Opportunity is joined by the Bay Area Council in co-releasing this report which commissioned the Institute for Higher Education Leadership & Policy (IHELP) at Sacramento State University to review the expected demand for and projected supply of workers educated in the Science, Technology, Engineering, and Math (STEM) fields. Funding for this study was provided with grants to the Campaign for College Opportunity by the California Wellness Foundation, the William and Flora Hewlett Foundation, The James Irvine Foundation, and the Koret Foundation.

The Bay Area Council is a business-sponsored, public-policy advocacy organization for the nine-county Bay Area. The Council proactively advocates for a strong economy, a vital business environment, and a better quality of life for everyone who lives here.

The Campaign for College Opportunity is a nonprofit 501(c)(3) organization devoted to ensuring that the next generation of college-age students in California has the chance to go to college as promised by the state's 1960 Master Plan for Higher Education. The Campaign was founded by the California Business Roundtable, the Mexican American Legal Defense and Educational Fund (MALDEF), and the Community College League of California in 2003. Michele Siqueiros serves as the Executive Director.

The goals of the Campaign are to substantially increase the number of students attending two- and four-year colleges in the state and to significantly impact the rate at which students succeed and achieve their post-secondary education objectives. Through building a strong committed coalition of key education, industry, labor, and policy leaders as well as leading public awareness efforts which highlight the crisis facing higher education in California, the Campaign works to create an environment of change and lead the state toward effective policy solutions.

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This Executive Summary is an adaptation of the original policy brief. To read or download the full policy brief, including all footnotes and citations, please visit www.collegecampaign.org/stem.

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California is Educating Too Few Students in Science, Technology, Engineering, and Mathematics

California's economic strength and position as a global economic leader relies on the ability of its educational systems to provide an adequate workforce of highly educated individuals. Jobs in science, technology, engineering, and math (STEM) fields are especially vital to the state's economy. A shortage of skilled workers may decrease the state's strength in STEM fields.

Recent studies have shown that California is projected to have a shortage of college-educated workers in comparison to the needs of the economy. In fact, a 2009 report by the Public Policy Institute of California projects that if current trends persist, California will have at least one million fewer college graduates than it needs in 2025. It is unlikely that California will be able to import these workers from other states and countries. This workforce shortage is particularly evident in STEM occupations, the majority of which require a postsecondary education.

Known for its vibrant agricultural, technology, biotechnology, and aerospace industries, California historically has had a disproportionately high share of the nation's STEM employment.

It would be hard to overstate the importance of STEM education and employment for the prosperity of California.

Jobs that require an education in these areas tend to be higher paying, and the innovation that results from having a workforce educated in these fields creates more employment opportunities for all workers.

A 2002 study found that while California's share of national employment has hovered around 11% for several years, its share of employment in science and technology has ranged between 15% and 18% over the same period of time. The state's strength in STEM employment has provided its citizens with high-paying jobs and a high standard of living.

In view of the importance of STEM employment in California, the skills gap now facing the state in STEM fields is cause for concern.

Whereas today California has an economy that ranks highly among states in terms of its knowledge base, the state's awarding of fewer degrees per enrolled student in comparison to other states may lead the state to lose its competitive edge in the future.

As a discomfoting example, California ranks near last in bachelor's degrees conferred in natural science and

engineering among the top ten "new economy" states. States identified in the New Economy Index have economies that are innovative, globalized, information-based, and technology-driven.

Of 123 STEM occupations requiring postsecondary education, nearly half are likely to have shortages.

For occupations with projected shortages, approximately 90% more degrees or certificates in relevant STEM fields are required each year to meet projected demand.

Not surprisingly, the industry sectors most heavily impacted by shortages in STEM occupations are Health Care and Social Assistance and Professional, Scientific, and Technical Services.

California Confers Fewer Bachelor's Degrees than Other New Economy States

	Top Ten Highest Scoring States on the New Economy Index (2007)	Bachelor's Degrees Conferred in Natural Sciences & Engineering per 1000 18-24 year olds (2005)
Massachusetts	96.1	12.2
Maryland	85.0	11.1
Colorado	78.3	11.1
New York	77.4	8.7
Virginia	79.5	8.4
Delaware	79.6	8.3
Washington	84.6	7.3
New Jersey	86.4	7.2
California	82.9	6.9
Connecticut	81.8	6.8

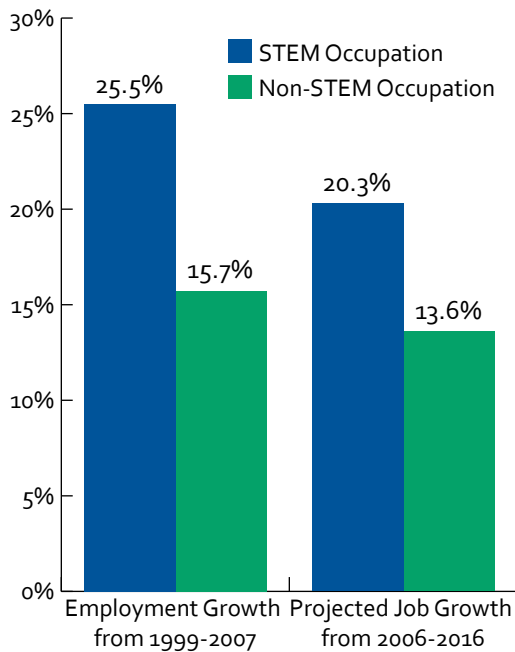
Sources: Atkinson, R. D. & Correa, D. K. (2007). *The 2007 state New Economy Index: Benchmarking economic transformation in the states.* Kansas City, MO and Washington, DC: Kauffman Foundation and The Information Technology & Innovation Foundation; National Science Board (2008). *Science and Engineering Indicators 2008.* Two volumes. Arlington, VA: National Science Foundation.

The Demand for College-Educated STEM Workers Is Growing

Multiple factors are working to increase demand for a STEM-educated labor force: (1) California's increasingly knowledge-based economy; (2) the increasing healthcare needs of an aging population; and (3) California's aging workforce.

An Increasingly Knowledge-Based Economy: As California's economy is becoming more knowledge-based, STEM employment is increasing at a faster rate than non-STEM employment. Between 1999 and 2007, STEM employment increased by 25%, while non-STEM employment increased by 16%. Furthermore, the California Employment Development Department projects that the

Growth in STEM Employment is Greater than Growth in Non-STEM Employment in California



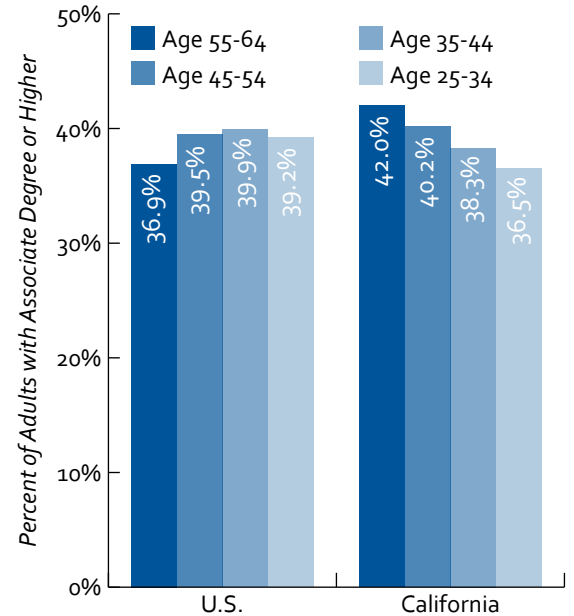
Sources: Authors' calculation based on Bureau of Labor Statistics, U.S. Department of Labor, Occupational Employment and Wage Estimates; U.S. Department of Labor, Occupational Information Network, Career Clusters; National Center for Education Statistics, Classification of Instructional Programs: 2000 Edition.

number of STEM jobs will grow 20% between 2006 and 2016, whereas non-STEM jobs will grow by 14%.

Healthcare Needs of an Aging Population: The size of California's population that is 65 or older is expected to grow from 4.1 million to 6.5 million between 2000 and 2020, and increase further to 10.4 million by 2040. By 2040 the median age of the population will have increased from 34.7 to 40.2 and healthcare expenditures are expected to have increased by 15%. Further complicating the situation, the current health care workforce is aging and like all areas of the economy, large numbers of educated health care workers are expected to retire in the near future. Undoubtedly, the state will need a larger health care workforce to provide adequate care to its aging population.

California's Aging Workforce: By one estimate, 2.4 million Californians will retire between 2006 and 2016. In comparison to younger Californians, a greater percentage of Californians approaching retirement age are college educated. Forty-two percent of Californians between ages 55 and 64 have earned at least an associate degree, compared to 37% of Californians between 25 and 34. The reverse trend is found for the U.S. overall, where younger populations are more highly educated than older populations (with the exception of the youngest age range).

Educational Attainment is Lower for Younger Populations of Californians than for Older Populations



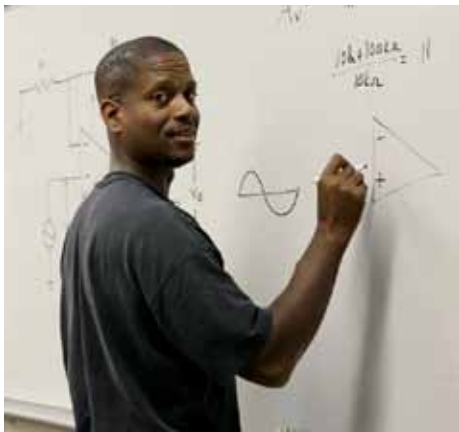
Source: Organisation for Economic Cooperation and Development at a Glance 2007.

The Supply of College-Educated STEM Workers Is Not Keeping Pace With Demand

The state faces a future in which there are too few workers skilled in STEM fields to meet the demand. Many STEM jobs require some postsecondary education, and the state is currently producing too few graduates to meet projected demand.

More than three-quarters of the expected job openings in STEM occupations between 2006 and 2016 in California will require some postsecondary education. Half of the expected job openings will require at least a bachelor's degree.

Clearly, postsecondary education is critical to meeting the state's STEM workforce needs.



Between 2006 and 2016, on average there will be approximately 46,100 job openings in STEM occupations that require a postsecondary education each year, including 24,000 jobs requiring at least a bachelor's degree.

The Number of STEM Degrees Is Increasing More Slowly than Non-STEM Degrees

The decline in the share of degrees and certificates awarded in STEM fields is particularly notable in California Community Colleges (CCC), where the difference in the increase between STEM and non-STEM certificates and associate degrees exceeds 30 percentage points. Between 1998 and 2007, the number of certificates awarded in STEM fields increased from 10,651 to 12,468 (15%) while non-STEM certificates increased from 20,158 to 31,844 (37%). Similarly, over the same time period, the number of STEM associate degrees increased from 10,826 to 11,274 (4%) and the number of non-STEM degrees increased from 50,214 to 71,235 (30%).

The number of degrees and certificates awarded in health fields has grown faster than in non-health fields in recent years. The recent increases in the numbers of certificates, associate degrees, and bachelor's degrees in health care fields have probably occurred as a result of warnings of workforce shortages in these areas. However, although there have been gains in recent years in healthcare education, these gains have to be considered in the context of the large increases in demand expected in these fields, as discussed earlier in this report. Recent research still warns of shortages in health fields.

Ethnicity and Gender Differences Contribute to Growing Shortages of STEM Degrees

By 2021, the share of high school graduates who are Latino will increase more than 12 percentage points, from 37% of the graduating class in 2004/2005 to a projected 49% of the graduating class in 2021/2022. The growth of the Latino population may restrict the supply

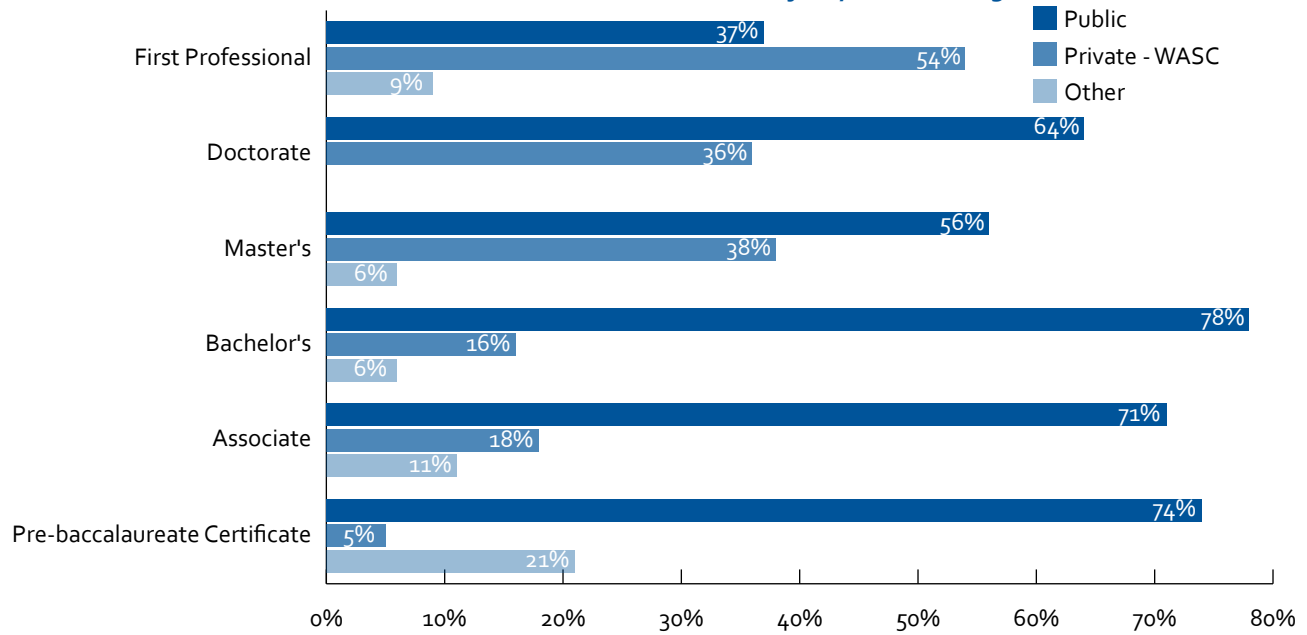


of STEM-educated workers because Latinos have historically been less likely to enroll in and complete college than whites.

While Latinos make up 43% of the college-age population, they represent only 13% of the students enrolled at the University of California (UC), 23% at California State University (CSU), and 30% at CCC. Additionally, only 10% of Latinos in California older than the age of 25 have a bachelor's degree compared to 47% and 38% for Asian/Pacific Islander and white Californians, respectively. Among Latinos who do earn certificates and degrees, a smaller share of those degrees and certificates are awarded in STEM fields than is the case for white and Asian/Pacific Islander students. For example, only 15% of bachelor's degrees awarded to Latinos in 2007 were in STEM fields, compared to 22% of degrees awarded to whites and 34% of degrees awarded to Asians/Pacific Islanders.

Although women earned more bachelor's degrees in any field than men (57.8% of bachelor's degrees in 2007 were awarded to women), a smaller proportion of degrees awarded to women were in STEM fields than was the case for men. Women also earned more associate degrees and certificates in any field than men (62.5% of associate degrees and 53.9% of certificates in 2007 were awarded to women). In this case, a larger proportion of those associate degrees and certificates were in a STEM field

The Public Sector Awards the Majority of STEM Degrees at Most Levels



Source: Authors' calculations based on 2007 data from the California Postsecondary Education Commission's Custom Data Reports.

compared to men. However, this gender difference is primarily explained by the larger number of women who earned awards in health fields.

National and International Competition for STEM Workers is Increasing

California has benefited from the migration of college-educated people from other states and countries to the state. However, a recent report by the Public Policy Institute of California concluded



that migration of college educated workers to California would have to increase dramatically to meet the expected demand, a prospect the authors consider unlikely. National and global competition for STEM-trained workers will increase with growth in knowledge-based economies, making it less likely that California

will continue to be able to import a skilled labor force.

California's Higher Education Systems Play an Important Role

Postsecondary education is critical to meeting California's STEM workforce needs. The majority of certificates, associate degrees, and bachelor's degrees awarded in the state are granted by the public colleges and universities.

Although each of the state's public education systems has an important role to play, arguably the largest role is played by the community colleges. The CCC is the only segment that awards pre-baccalaureate certificates and associate degrees. Seventy percent of students receiving associate or bachelor's degrees from the state's public colleges are either CCC students or UC/CSU students who transferred from the CCC.

California's Financial Problems Will Affect Education

The cuts to education that result from the current state budget shortfall are also likely to limit the size of the future STEM workforce. All three systems of higher

education are having to plan for substantial reductions in enrollment beginning in Fall 2009. Furthermore, the higher cost of education in some STEM fields, such as health care courses and sciences requiring laboratory work, may result in budget cuts disproportionately affecting STEM education. Limiting enrollment at public institutions threatens the state's longer-term prosperity by reducing the education level of the future workforce.

Not all STEM Graduates Become STEM Employees

As in any field, not all college graduates in STEM fields enter and stay employed in the field for which they were trained. This can occur because graduates are unable to find STEM employment or choose not to work in STEM occupations. On the one hand, STEM graduates may not find employment because surpluses of workers can exist simultaneously with shortages in other fields. Additionally, employers may find that STEM graduates lack needed skills despite their credentials. On the other hand, STEM graduates may choose not to enter STEM jobs because of a fear of losing a job due to off-shoring, changes in interest or finding higher wages in non-STEM fields.

Conclusions and Recommendations

Conclusions

- California has a strong employment base in STEM occupations and the state is projecting continued growth in these occupations.
- The generally higher pay of STEM jobs makes them economically important to the state. STEM occupations enrich the state's tax base and offer the opportunity of well-paying employment to Californians.
- Current rates of degree production indicate that the number of workers with the education necessary for STEM employment will fall short of demand.
- Increases in the number of degrees and certificates awarded in STEM fields between 1998 and 2007 have not been as large as awards in non-STEM fields.
- In the CCC, increases in the degrees awarded in STEM fields have been particularly concentrated in health fields. Increases are necessary in other fields as well, particularly because of the important transfer function served by the colleges.
- Latinos are the fastest growing segment of the population but are less likely to complete college, and those who do complete earn a smaller share of their degrees and certificates in STEM fields than white and Asian/Pacific Islander students.
- Although more degrees are earned by women than by men, a smaller share of degrees earned by women are in non-Health STEM fields.

Recommendations for Meeting STEM Workforce Needs

Historically, California has benefited from a disproportionately high share of the nation's STEM employment. Today, however, our state is challenged with a potential skills gap that could diminish the state's capacity to generate, retain, and attract STEM jobs.

It is critical for the state to address these challenges in order to supply enough STEM-educated graduates to meet its STEM workforce needs.

Fortunately, this challenge is surmountable.

To overcome the challenges of insufficient STEM graduates and to better match STEM graduates with STEM employment opportunities, we offer the following recommendations to policymakers and education leaders:

- Develop a statewide policy framework or a public agenda for higher education that is focused on setting goals to increase the number of college-educated Californians and meet the state's workforce needs in high-demand fields, such as STEM and health care
- Support a student success agenda, including strategies to increase the number of transfers from the community colleges to four-year universities – better preparing students for college success, and expanding institutional practices that improve student outcomes
- Better prepare K-12 students, particularly in math and science, to improve the success of students in postsecondary education and foster interest in STEM fields

- Improve communication about opportunities in STEM and create clear pathways for students from high school to college
- Create financial incentives for students, colleges, and universities to increase the supply of STEM workers
- Increase STEM achievement by under-represented groups
- Better coordinate educational programs with industry needs to ensure that graduates have the skills necessary to succeed in STEM occupations of high demand
- Encourage people with STEM degrees to enter and remain employed in STEM fields

Our growing population of Californians can benefit from greater educational opportunities, help meet the state's workforce needs and maintain our global position as a leader in the STEM fields.

Through changes to policy and practice, such as those summarized here and detailed in the full report, the state's public higher education institutions can educate and train sufficient numbers of students in high-need fields to ensure that STEM workforce needs are met.

This report is an adaptation of the original policy brief. To read or download the full policy brief, including all footnotes and citations, please visit www.collegecampaign.org/stem.

A Snapshot of Wages for Occupations With Largest Shortages for Each Degree Level

Minimum Education Requirement	STEM Occupations with Largest Shortages	Median Hourly Income (2008)	Percent Increase in Employment from 2006-2016
Certificate	Health Technologies and Technicians	\$19.83	22.1%
	Licensed Practical and Licensed Vocational Nurses	\$22.59	17.5%
	Medical Transcriptionists	\$19.44	10.7%
	Surgical Technologists	\$21.64	26.8%
Associate Degree	Biological Technicians	\$20.50	29.8%
	Computer Support Specialists	\$23.26	17.2%
	Dental Hygienists	\$41.71	35.7%
	Engineering Technicians	\$27.36	15.8%
	Medical Records and Health Information Technicians	\$15.98	19.0%
	Registered Nurses	\$37.71	25.0%
	Bachelor's Degree	Accountants/Auditors	\$29.88
Computer Software Engineers, Systems Software		\$48.40	28.2%
Computer Systems Analysts		\$37.32	28.2%
Industrial Engineers		\$39.57	27.3%
Medical Laboratory Technologists		\$34.57	16.3%
Master's Degree	Health Educators	\$19.45	24.2%
	Mental Health and Substance Abuse Social Workers	\$17.79	22.8%
	Operations Research Analysts	\$34.31	6.5%
Doctoral Degree	Biochemists and Biophysicists	\$42.93	24.4%
	Medical Scientists	\$37.80	26.6%
First Professional Degree	Pharmacists	\$57.17	26.1%
	Surgeons	N/A	5.3%

Includes new jobs and job openings resulting from experienced workers leaving the occupation and workers leaving the geographic area.

Source: Authors' calculations based on data from the California Employment Development Department's Occupational Projections: 2006-16, the California Postsecondary Education Commission's Custom Data Reports; U.S. Department of Labor, Occupational Information Network, Career Clusters; National Center for Education Statistics, Classification of Instructional Programs: 2000 Edition.