

FACT CHECK

What's Missing in The Urban Institute Report:

Into the Eye of the Storm: Assessing the Evidence on Science and Engineering Education, Quality, and Workforce Demand

Background

A new report from the Urban Institute takes issue with the findings and conclusions of the October 2005 National Academies' report, "Rising Above the Gathering Storm," and other reports such as Business Roundtable's "Tapping America's Potential" report, on threats to U.S. economic competitiveness.

The authors of the Urban Institute report claim that:

1. The United States produces more graduates in science and engineering (S&E) than can be accommodated in the workforce;
2. A significant fraction of S&E graduates report that their job is not closely related to their degree field;
3. U.S. students who express interest in S&E early in college tend to graduate with an S&E degree (no leaky pipeline); and
4. U.S. K-12 students perform well on international tests of math and science achievement, and claims to the contrary misinterpret the data.

None of these claims are supported by the data the report cites.

Talking Points

There are points in the report where the business community may agree with the authors, but disagree with what they conclude from the data.

- The business community has never argued that U.S. student achievement is in decline. There have in fact been significant improvements in math achievement for 9 and 13 year olds. Students are taking more math and science courses in high school. Achievement on the National Assessment of Educational Progress in different subjects for different age groups has either improved or remained flat, but it has not declined. *U.S. business is concerned with the rate of improvement in the U.S. compared to the rate of improvement of our international competitors.*
- The business community agrees with the authors that more "fine-grained" analysis is needed to examine trends and problems in specific S&E fields. For example, there has been a decline in enrollment in computer science at the same time that demand is growing and salaries are increasing.

The business community has serious problems, however, with many of the report’s assertions and the data sets on which they are based. The Urban Institute report examines degree production and workforce demand data for S&E graduates in all fields, but reports by the National Academies, the Council on Competitiveness, AeA, Business Roundtable, Business Higher Education Forum, and others on the U.S. competitiveness challenge focus on natural sciences and engineering. Most of these reports specifically focus on physical sciences, information sciences, mathematics and engineering.

- The Urban Institute report analyzes S&E degree production and workforce demand but this includes degrees in social and behavioral sciences—which constituted nearly half of all S&E bachelor’s degrees awarded to U.S. citizens and permanent residents (domestic students) in 2002.
- Degrees earned in disciplines identified as being more directly relevant to U.S. competitiveness—physical sciences, engineering and mathematics—*declined* between 1985 and 2002, despite U.S. population growth of 22 percent over the same period.

Bachelor’s Degrees Awarded to U.S. Citizens and Permanent Residents

Field	1985	2002	Change 1985-2002
Physical Sciences	23,067	13,471	-41%
Engineering	71,381	56,372	-21%
Mathematics/Statistics	14,504	11,819	-18%
Biological Sciences	38,490	60,311	+57%
Agricultural Sciences	11,981	17,098	+43%
Social and Behavioral Sciences	132,471	191,045	+44%

Source: NSF S&E Indicators, 2006

- The Urban Institute report states that there appears to be a rough equivalence in the proportion of students intending to pursue an S&E degree and the proportion of domestic students who obtain an S&E degree, but this statistic is meaningless because it includes students who, for example, enroll in an engineering program but end up with a degree in political science, anthropology or psychology.
- The Urban Institute report claims that there is a large mismatch between S&E degree production and S&E employment but this claim is based on strictly defined Bureau of Labor Statistics (BLS) classifications of S&E employment categories. Pre-college math and science teachers in middle schools and high schools with STEM bachelor’s degrees, and math and physics Ph.D.’s working in quantitative analysis on Wall Street, for example, are classified as not working in an S&E occupation.
- Even within the strictly defined occupational classifications, BLS projects that employment in S&E occupations will grow 70 percent faster than the overall growth for all occupations.
- The S&E workforce likely is larger than claimed in the Urban Institute report and demand is greatest for degree holders with quantitative skills. Unemployment rates for those with degrees in physical sciences, engineering or mathematics are very low and salaries are higher than for other S&E degree categories.

- The Urban Institute’s analysis of U.S. student performance is at odds with the key findings of a U.S. Department of Education report prepared by statisticians at the National Center for Education Statistics (NCES): “About one-quarter of 15-year-old students in the United States scored at or below the lowest proficiency level on the PISA 2003 combined mathematics literacy scale,” a higher proportion of low-performing students than in Germany, France and Canada. “These students failed to demonstrate consistently that they have baseline mathematical skills.” —“Comparative Indicators of Education in the United States and Other G-8 Countries: 2006”

S&E Knowledge Required More Broadly Beyond S&E Occupations

Using strictly defined S&E occupations, BLS estimated the size of the S&E workforce to be 5.6 million in 2003, the number cited in the Urban Institute report. That same year, a survey conducted by the National Science Foundation’s Scientists and Engineers Statistical Data System (SESTAT) estimated that 12.9 million workers were employed in occupations that required at least a bachelor’s level of S&E knowledge. Of that number an estimated 9.2 million were employed in occupations requiring knowledge of natural science or engineering.

Estimates of S&E Workforce (2003)

BLS Occupations and Employment Survey	4,962,000
NSF SESTAT data (BLS-defined occupations)	4,928,000
Census Bureau American Community Survey	5,604,000
NSF SESTAT data: worker self-report that bachelor’s-level S&E knowledge is required for job	12,851,000

Source: NSF S&E Indicators, 2006

Employment Patterns Differ for Bachelor’s in Physical Sciences, Engineering and Math

The Urban Institute report notes that only about 40 percent of S&E bachelor’s degree holders report that their job requires skills that are closely related to their college major. The National Science Foundation’s “InfoBrief” on the topic points out that: “The extent to which a job was reported as being related to field of degree differed by broad field. In general, those with bachelor’s degrees in engineering and in mathematics and computer science were the most likely to report that their job was related to their degree.”

Percentage of S&E bachelor’s degree holders in 2003 reporting their job is closely or somewhat related to their degree one to five years after graduation, by field of highest degree

Physical Sciences	85%
Engineering	92%
Mathematics and Computer Science	89%
Political and Related Sciences	55%
Sociology and Anthropology	66%

Source: NSF S&E Indicators, 2006

Report’s Claims of Inadequate International Comparisons Refuted by Experts

Many of the Urban Institute report’s specific claims about the inadequacy of international comparisons of student achievement have been refuted by experts. Here are a few examples:

- According to OECD (Organization for Economic Cooperation and Development), it is unscientific to claim that United States scored near the top on PISA (Program for International Student Assessment) in important subjects, such as reading, because few nations outperform it in statistically significant terms. In PISA 2000, the United States had a sample with a large sampling error, which led to a wide confidence interval. While there were few countries that outperformed the United States in reading, it is equally true that there were few countries that performed worse. U.S. students ranked somewhat between the 10th and the 20th position among students from all participating countries—not anywhere near the top.
- The argument that results are not comparable because 15-year-olds in different countries are enrolled in different grades does not make sense. The fact that some countries enroll their children earlier or get them through the system at a faster pace is precisely the kind of policy choices that PISA seeks to evaluate.
- The claim that all test items were in metric units and the United States was therefore at a disadvantage is incorrect. Each participating country adapted the instruments to its own nomenclature.
- U.S. performance in math and science is near the top in fourth grade but declines in eighth grade and twelfth grade. The argument that the results have limited value because the sequence of the coursework in other countries may be different from the U.S. is very odd—the business community has not said that U.S. students are less able; rather, it has expressed concern that U.S. students are not expected to learn what America’s economic competitors expect their students to learn.
- The authors dismiss the top performing countries because they are small compared to the United States. Until recently, the United States was able to compensate for relatively poor K-12 educational performance because of its size. China and India now have the size advantage.