



TPSE Mathematics Advisory Group (MAG)

Panel 1: Expanded Workforce Demand for Quantitative/Math Skills

Notes from Anthony Carnevale

Is the math shortage a myth?

- According to the Occupational Information Network (O*NET), less than half of prime age workers need to be able to “analyze data to determine areas with the highest sales” (O*NET level 4) in their occupations. Fifty-nine percent of prime age workers require levels of mathematic knowledge below this.
- Only 1 percent of prime age workers need to be able to “derive a complex mathematical equation” (O*NET level 6).
- STEM occupations do require the highest levels of mathematic knowledge. Almost 90 percent of STEM workers need to have mathematic knowledge equivalent to “analyzing data to determine areas with the highest sales” or greater (O*NET levels 4-7).
- But, STEM occupations only make up 5 percent of the workforce.
- Nineteen percent of students graduate college with a STEM major. Only 56 percent of these graduates work in a STEM occupation immediately after college, and 46 percent work in STEM occupations after 10 years.
- In 2014, 19.5 million American adults had science or engineering degrees, but only 28 percent worked in STEM fields.
- Non-technical occupations require very few workers to have the levels of mathematic knowledge above “analyze data to determine areas with the highest sales.” Community services and arts and healthcare support occupations require no workers to have these levels of mathematics knowledge (O*NET level 4-7).

Math is the chief academic reason student do not finish

- Twenty percent of ninth graders do not graduate high school – 28 percent in New Mexico and Georgia, 29 percent in Nevada.
- Only 56 percent of students who enroll in college obtain a Bachelor’s degree.
- In 1982, 55 percent of high school graduates had a course in algebra and 47 percent had taken geometry. Today, 88 percent have taken graduates and 76 percent had two years of algebra.
- More than half of all U.S. students fail math – in Los Angeles schools, 65 percent of students fail algebra I and 51 percent fail geometry.
- Failing mathematics is two to three times greater than that of all for all other courses – Institute of Postsecondary Education
- Two-thirds of community college students have to take remedial mathematics courses, for which they receive no credit, but must pass in order to enroll in any other courses.
- In Tennessee, over 70 percent of college freshman had to take remedial mathematics courses. Only 5 percent of these students graduate on schedule.



Is algebra an artificial barrier to entry?

- In 2012, only 38 percent of California's high school graduates were deemed eligible for branches of Cal State.
- Almost all the 1,191 community colleges in the United States require incoming students to obtain specified scores on standardized mathematics tests before they can start taking courses for credit. Sixty percent of would-be community college students did not have these specified scores and were assigned to remedial sections. Eighty percent of these students either failed these noncredit classes or subsequently failed when they took a regular mathematics course. Not passing algebra meant they could not start college – Carnegie Foundation for the Advancement of Teaching
- In an Association of American Medical College study, 82 percent of medical students said biology was important, 79 percent said biochemistry was important, and 65 percent said comparative anatomy was important. Only 3 percent said calculus was important, and most of these students were aiming at careers in research.
- At high-tech firms, knowledge of mathematics did not make the top-ten list of skills employers deem most important.

Alternatives to traditional math

- Formal school in algebra can be counterproductive because mathematical reasoning in workplaces differs markedly from school mathematics.
- The algorithms taught in school are often not the computational methods of choice for workers.

Notes come from a variety of CEW sources as well as:

Hacker, Andrew. *The Math Myth: And Other STEM Delusions*. New York: The New Press, 2016.