

The Importance of Early Science Education and Mentorship for Girls

Wellesley College Science Club for Girls

K-12 Education Course Choice

Girls Comprise:

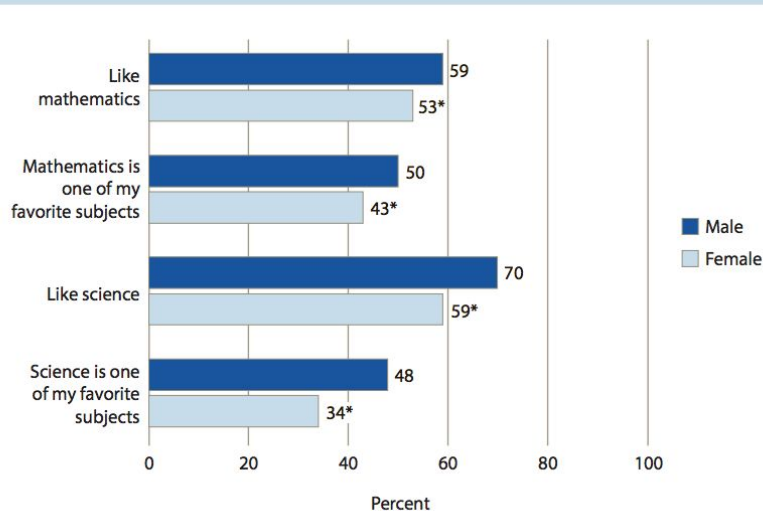
56% of all Advanced Placement (AP) test-takers

46% of all AP Calculus test-takers

but only ...

19% of all AP CS test-takers

Percent of high school graduates who reported interest in mathematics and science, by gender: 2009



What Underlies this Gender Disparity in Science Interest

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- * Irrelevant curriculum and reliance on lecturing instead of hands-on projects
- * Teaching styles that discourage collaboration
- * Lack of opportunities to take risks and make mistakes
- * Limited knowledge or inaccurate perceptions about computing careers
- * Lower confidence than boys, even when actual achievement levels are similar

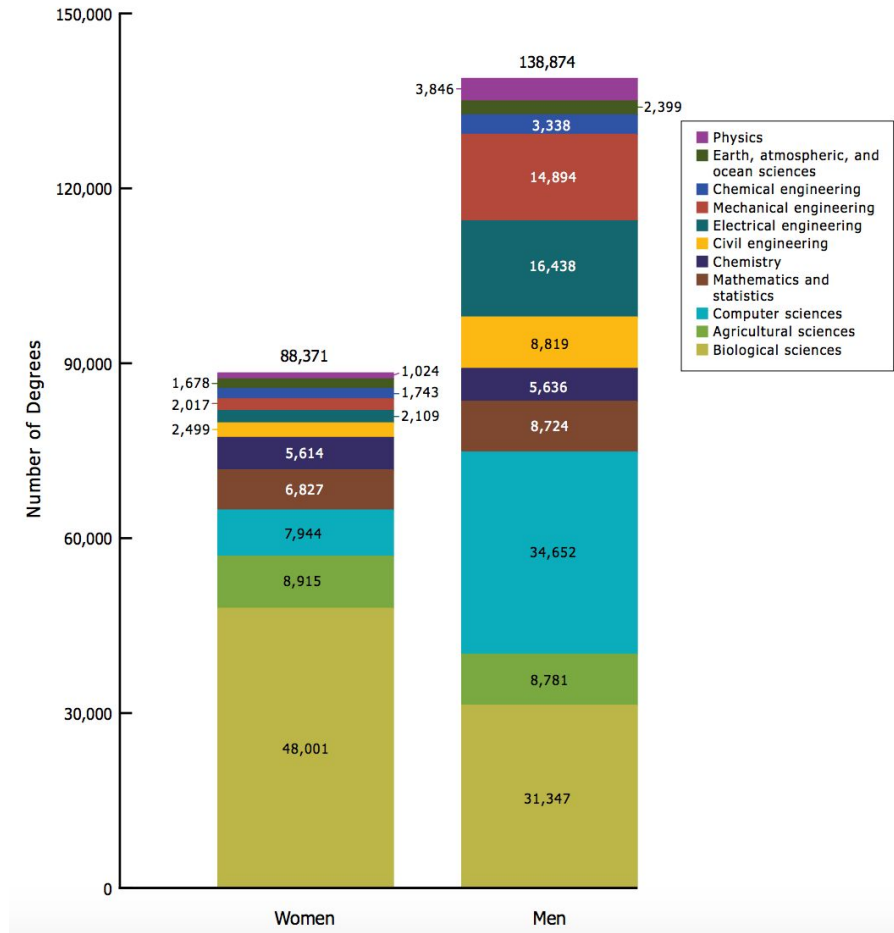
Higher Education

- ❑ Women earned **57.3%** of bachelor's degrees in all fields in 2011 and 50.4% of science and engineering bachelor's degrees, but only: (NSF, Women, Minorities, and Persons with Disabilities in Science and Engineering, 2015).
 - ❑ **18.2%** of all computer science degrees
 - ❑ **19.2%** of all engineering degrees
 - ❑ **19.1%** of all physics degrees
 - ❑ **43.1%** of all and mathematics and statistics degrees

(NSF, Women, Minorities, and Persons with Disabilities in Science and Engineering, 2015).

□ In 2012, **11.2% of bachelor's degrees in science and engineering**, 8.2% of master's degrees in science and engineering, and 4.1% of doctorate degrees in science and engineering **were awarded to minority women** (NSF, 2015).

Figure 7. Bachelor's Degrees Earned in Selected Science and Engineering Fields, by Gender, 2007



STEM Workforce

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- ❑ **Women make up 47% of the total U.S. workforce**, but are much less represented in particular science and engineering occupations (U.S. Department of Labor, Bureau of Labor Statistics, Women in the Labor Force: A Databook, 2014). For example:

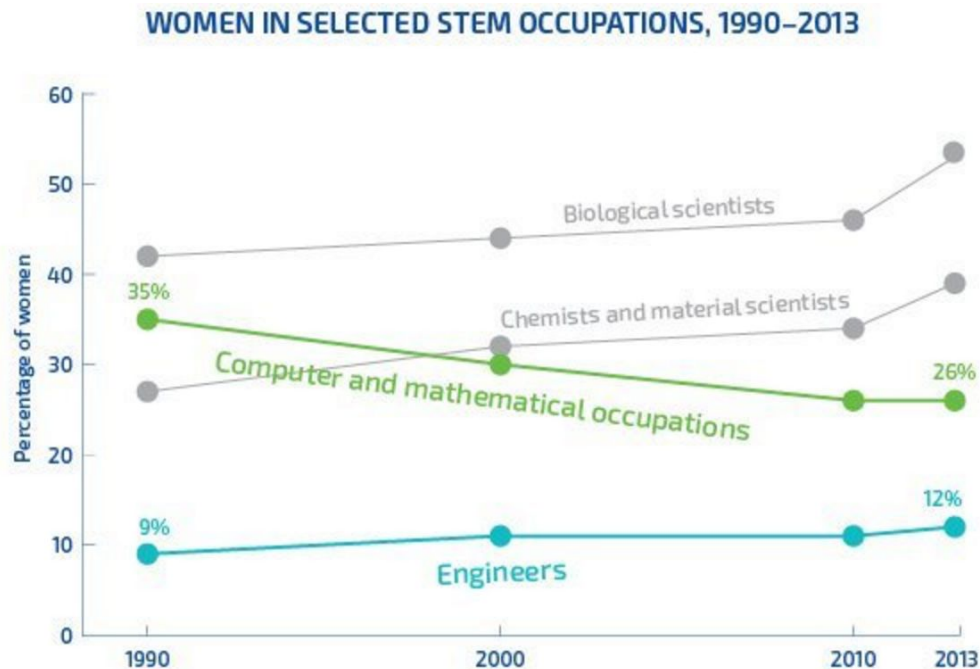
- ❑ 39% of chemists and material scientists are women;
- ❑ 27.9% of environmental scientists and geoscientists are women;
- ❑ 15.6% of chemical engineers are women;
- ❑ 12.1% of civil engineers are women;
- ❑ 8.3% of electrical and electronics engineers are women;
- ❑ 17.2% of industrial engineers are women; and
- ❑ 7.2% of mechanical engineers are women.

Women represent 50% of the population and 49% of the US workforce,



of the STEM workforce (Science, Technology, Engineering, Math).

The gap doesn't end after Graduation

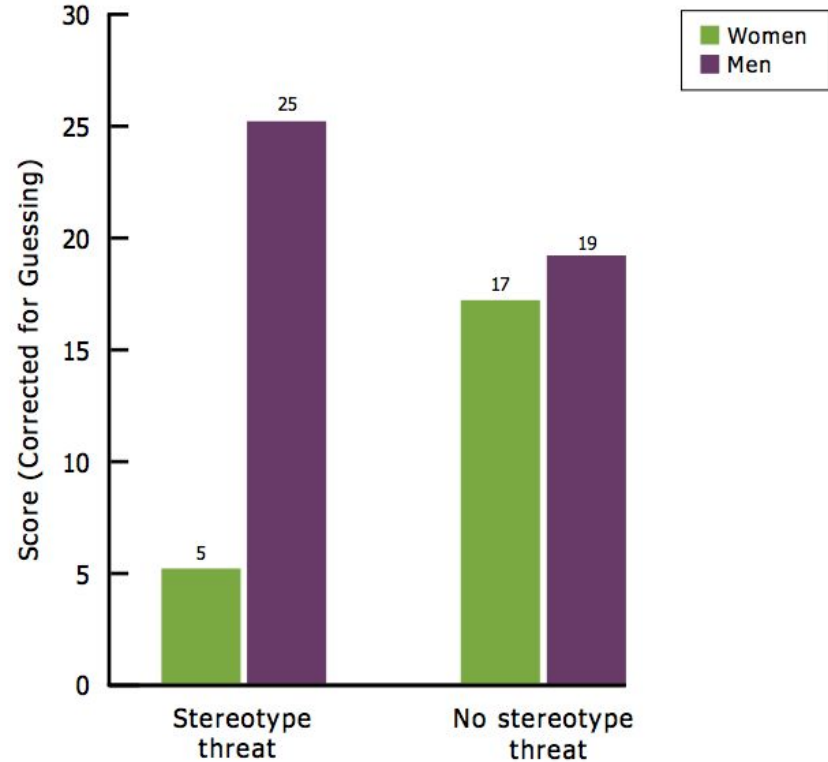


- ❑ The percentage of men working in a STEM job with some college, an associate's degree, bachelor's degree or master's degree is more than **triple** the percentage of women in selected stem occupations
- ❑ The percentage women with a **doctorate** working in STEM jobs is only about $\frac{1}{2}$ that of men with a doctorate

Stereotype Threat

“a situational predicament in which people are or feel themselves to be at risk of conforming to **stereotypes** about their social group”

Figure 15. Performance on a Challenging Math Test, by Stereotype Threat Condition and Gender



Source: Spencer et al., 1999, "Stereotype threat and women's math performance," *Journal of Experimental Social Psychology*, 35(1), p. 13.

STEREOTYPES ARE INGRAINED EARLY



ON TESTS MEASURING VISUAL-SPATIAL ABILITIES MIDDLE SCHOOL GIRLS

SCORED POORLY

- when they were told that boys do better on the tasks OR
- when they were given no information and allow cultural stereotypes to operate

SCORED HIGHER

- WHEN they were led to believe that there were no gender differences on the tasks

Recommendations from the American Association of University Women(AAUW)

- ❑ Encourage students to have a more flexible or growth mindset about intelligence
 - ❑ Reduce vulnerability to stereotype threat and positively affect academic performance
- ❑ Expose girls to successful female role models in math and science
- ❑ Teach students and teachers about stereotype threat
 - ❑ Research shows that acknowledging and explicitly teaching students about stereotype threat can result in better performance