

Title IX *40 years and counting*

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The Next Generation of Title IX: STEM—Science, Technology, Engineering, and Math

Title IX of the Education Amendments of 1972 prohibits sex discrimination in educational programs or activities that receive federal funding. Title IX requires that women and girls be given equal opportunities to pursue science, technology, engineering, and math (STEM) fields free from discriminatory barriers. It mandates equality of opportunity at all education levels regardless of gender, and covers career counseling and guidance, admissions, recruitment, outreach, and retention practices. Since 1972, Title IX has opened the doors for women to pursue many fields, but in STEM women remain underrepresented in classes and fields that are pathways to high wage careers.

Title IX at 40: The Road Traveled

Despite the dramatic gains women and girls have made in education since the early 1970s, they continue to be underrepresented in some STEM fields and classes. Although high school girls have made gains in STEM classes over the last few decades, boys continue to earn more credits in physics, computer/information science, and engineering and science technologies classes than girls.¹ Overall, in the 2003-2004 academic year, men made up over three quarters of the students enrolled in higher education programs in computer sciences, engineering, and technology.² While women make up a majority of all college and graduate students,³ in 2009 women earned just 19 percent of physics bachelor's degrees, and received only 16 percent of bachelor's and 22 percent of master's or doctorate degrees in engineering and engineering technologies.⁴ And in computer science, women's representation has actually been *declining*; in the late-1980s women earned 32 percent of

computer science bachelor's degrees;⁵ by 2009 women's representation dropped to 18 percent.⁶

Stereotypes and institutional obstacles exist that depress the number of women in STEM fields, including the following:

Gender barriers and lack of encouragement in grades K-12

Eighth-grade boys and girls perform equally well on math assessment tests, and have for at least two decades,⁷ but a number of barriers hold young women back from pursuing STEM careers. For example, in a recent nationwide study of girls ages 14 to 17, nearly half said that they would feel uncomfortable being the only girl in a group or class. And 57 percent believed that if they went into a STEM career, they would have to work harder than a man just to be taken seriously.⁸ One teen in Indiana put it this way: "I think some girls don't want to do [STEM] because they don't think it's something girls should do. It's a boy subject; they should stay away from it."⁹ These stereotypes and barriers likely affect whether girls consider STEM fields as a viable option.

Discrimination, including "stereotype threat"

Women continue to encounter discriminatory barriers in their educational environments. A recent study showed science faculty from research-intensive universities held subtle gender-biases against women, rating male applicants higher than identical female applicants and offering them higher starting salaries and more career mentoring.¹⁰ In another study, women in university

physics departments reported pictures of nude women on faculty office walls, being asked to substitute for secretaries during their breaks, being called “honey,” and hearing snide remarks about women made in front of male faculty who remained silent.¹¹ And although now a leader in her field, mathematician, computer scientist, and President of Harvey Mudd College Dr. Maria Klawe was “consistently told by teachers in adolescence, then later by colleagues, that the things she was interested in were things women didn’t do.”¹²

Female students may also be discouraged from pursuing careers in STEM because they internalize pervasive stereotypes that women are not fit to succeed in such fields. For example, one study of standardized math and science test scores of 8th grade boys and girls in 34 countries indicated that higher levels of implicit gender science stereotypes are related to wider gaps in performance between girls and boys in math and science.¹³ In another experiment, groups of male and female college students with strong math backgrounds and similar abilities were given a math test; one group was told men perform better on the test, the other that there was no difference. In the group told that men do better, men had an average score of 25 compared with the women’s average score of 5. In the group told that there was no difference between male and female performance on the test, men scored 19 and women 17.¹⁴

Fewer role models and mentors

Female students and faculty in STEM often attribute their success and desire to remain in the field to the encouragement and support of mentors,¹⁵ but there are very few female faculty members in many departments. This cycle perpetuates women’s underrepresentation. Indeed, a congressional commission found that a greater proportion of women than men switched out of STEM majors, in part due to a lack of role models and difficulty obtaining academic guidance.¹⁶ While in 2005 women made up 40 percent of full-time faculty in degree-granting institutions, they made up just 22 percent of the faculty in computer and information sciences, 19 percent in math, 18 percent in the physical sciences and 12 percent in engineering.¹⁷ Women of color are even more underrepresented. Even in the biological sciences, where women are represented in the highest numbers, in 2006 less than three percent of postsecondary teachers were women of color.¹⁸ This may be the result of discrimination in hiring and tenure decisions in STEM fields: one study showed that female post-doctoral candidates had to publish 3 more papers in prestigious journals, or 20 more in lesser-known publications, to be judged as productive as male applicants and to be given the same peer review score.¹⁹

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The Road Ahead: Recommendations for Action

The U.S. Department of Education’s Office for Civil Rights should strengthen enforcement of Title IX

by initiating compliance reviews of schools and ensuring that schools take the steps necessary to provide girls and women with equal access to STEM fields and classes, and all federal science agencies should do the same for their grantee institutions.

Schools and universities should conduct regular trainings for teachers/professors and administrators about Title IX, stereotypes, and implicit bias and should address negative climate issues that may discourage or intimidate girls and women, including harassment, isolation, lack of mentorship, and lack of feedback.

Schools should work to make their campuses more welcoming for and supportive of women faculty members in an effort to increase the number of female role models for students in STEM fields.

Why It Matters: The Impact on Women and Girls

The underrepresentation of women and girls pursuing STEM subjects has drastic implications for women's economic security, and increasing the number of women who pursue STEM degrees and careers has the potential to decrease the wage gap between men and women. STEM careers are relatively lucrative. For example, in 2012, the median starting salary for a bachelor's degree recipient in marketing was \$49,600, compared to \$63,000 for a bachelor's degree recipient in chemical engineering.²⁰ Increased female participation in STEM fields would help to close the overall wage gap between men and women.

In addition, barriers to female participation in STEM fields directly affect the United States' competitiveness on the international stage. In a 2009 study of fifteen-year-olds across 34 countries, the United States ranked 14th in science and 25th in mathematics, below countries such as China, Korea, Finland, Japan, Canada, and Estonia.²¹ In this global economy, our prosperity and national security depend on our ability to lead the world in innovation. Studies have shown that the American workforce needs to produce approximately 1 million more STEM professionals than we are set to produce at current rates.²² The United States cannot tap into the brainpower and innovation of all its people when women and girls are discouraged by stereotypes and structural barriers from pursuing careers in STEM. Removing barriers to women's participation and success in STEM fields will benefit the whole nation.

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- 2 U.S. Gov't Accountability Office, *Higher Education: Federal Science, Technology, Engineering, and Mathematics Programs and Related Trends* 20 (Oct. 2005), available at <http://www.gao.gov/new.items/d06114.pdf>.
- 3 U.S. Dep't of Educ., Digest of Education Statistics, 2010 (2011), Chapter 3: Postsecondary Education Enrollment, Table 200: Total fall enrollment in degree-granting institutions, by level of enrollment, sex, age, and attendance status of student: 2007 and 2009, available at http://nces.ed.gov/pubs2011/2011015_3a.pdf. Postbaccalaureate students include first-professional and graduate students. In 2009, women made up 57 percent of undergraduate students and 59 percent of postbaccalaureate students enrolled in degree-granting institutions.
- 4 NWLC calculations from U.S. Dep't of Educ., Digest of Education Statistics, 2010 (2011), Chapter 3: Postsecondary Education Degrees, Table 286: Bachelor's, master's, and doctor's degrees conferred by degree-granting institutions, by sex of student and discipline division, 2008-2009, available at http://nces.ed.gov/pubs2011/2011015_3b.pdf. Data are for "physics general" plus "physics, other."
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- 9 *Id.*
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- 12 Katie Hafner, *Giving Women the Access Code*, N.Y. Times, Apr. 3, 2012, at D1, available at <http://www.nytimes.com/2012/04/03/science/giving-women-the-access-code.html?pagewanted=all>.
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