



**Written Testimony of the American Association of University Women
United States House Committee on Science and Technology
Subcommittee on Research & Science Education
Hearing on “Encouraging the Participation of Female Students in STEM Fields”
July 21, 2009**

Subcommittee Chairman Lipinski, Ranking Member Ehlers, and members of the committee, thank you for the opportunity to submit testimony for the hearing “Encouraging the Participation of Female Students in STEM Fields.”

The American Association of University Women is a membership organization founded in 1881 with approximately 100,000 members and 1300 branches nationwide. AAUW has a proud 127-year history of breaking through barriers for women and girls. Today, AAUW continues its mission through education, research, and advocacy. AAUW supports promoting and strengthening science, technology, engineering, and mathematics (STEM) education, especially for girls and other underrepresented populations. These efforts will help increase America’s competitiveness by reducing gender barriers that deter women from pursuing academic and career goals in STEM fields.

Early Barriers and Inconsistent Scoring

Girls’ participation rates in STEM courses have unquestionably increased since the passage of Title IX. Before Title IX, many opportunities to advance STEM skills were denied to women, inside and outside of the classroom, including opportunities to participate in higher-level courses and math and science clubs.¹ However, barriers to girls’ and women’s progress in STEM are still present and begin in K-12 education, starting with the messages received in the schools themselves. In a 2006 Girls Inc. survey, 44 percent of girls and 38 percent of boys agreed with the statement, “the smartest girls in my school are not popular,” and 17 percent of girls and 14 percent of boys thought that it was true that “teachers think it is not important for girls to be good at math.”² A report of the Commission on the Advancement of Women and Minorities in Science, Engineering and Technology says that there are four points in life at which girls and women seem to lose interest in STEM: as they enter middle school, late high school, college and graduate school, and in their professional lives.³ According to a 2005 report by the National Center for Women and Information Technology, when high school girls think of computer scientists, they think of geeks, pocket protectors, isolated cubicles and a lifetime of staring into a screen writing computer code.⁴ These pervasive attitudes and messages influence girls’ academic paths early, and future options in STEM may be curtailed for girls because they have insufficient course foundations.

According to the National Assessment of Educational Progress (NAEP) 2005 High School Transcript Study, the largest gap between boys’ and girls’ scores on math and science assessments in grades 4, 8, and 12 was a mere four points, and girls’ high school math grades were higher than boys’. However, despite the fact that on average girls complete more challenging curricula, earn higher GPAs in high school, and in 2008 comprised nearly 60 percent of AP test-takers, among AP physics test-takers, only 31 percent were girls, and girls made up only 17 percent of those taking the AP computer science exam.⁵

Another area of concern is the disparity between girls’ grades in high school and college and their scores on the SAT exam. The SAT is designed to predict the performance of a student in his/her first year of college and is regularly used as an admissions factor by colleges. Although girls are achieving higher high school grades in math than boys, the average SAT math scores for 2008 showed that boys were 33 points ahead of girls, and this trend is consistent as far back as 1972.^{6,7} Likewise, the Massachusetts Institute of Technology found that a woman with the same SAT score as a man was likely to get better grades. After adjusting its admissions process to compensate for the SAT’s “under-prediction,” MIT has found that its women students earn higher GPAs in more than half of majors even though their average SAT-math score is 20-25 points lower than that of their male peers.⁸

Slow Progress in College

Women now make up a majority of college students. In 2006-2007, 57 percent of undergraduate degree recipients were women, up from 42 percent in 1970.⁹ Despite this incredible growth, women earned only 23 percent of all

bachelor's degrees granted in engineering and engineering technologies in 2006, and a decreasing share of bachelor's degrees in mathematics and computer science.¹⁰ According to the National Science Foundation, the number of mathematics and computer science degrees earned by women peaked in 1985 at 39.5 percent of total mathematics and computer science degrees granted.¹¹ By 2006, this number had decreased to only 26.8 percent of mathematics and computer science degrees granted.¹² Between 2000 and 2008, there was a 79 percent decline in the number of incoming undergraduate women interested in majoring in computer science.¹³

The need for STEM legislation is greatest for female minorities. In 2008, 27 percent of computer scientists were female, while only 3 percent were female and African-American and 1 percent was female and Hispanic.¹⁴ With globalization and increased global competitiveness, it is more important than ever that the United States put in place policies that encourage study in STEM fields. Of the college-age population earning science and engineering degrees, the United States currently ranks 17th, down from third place several decades ago.¹⁵

One way to improve this situation is to address challenges that cause undergraduate women to transfer out of STEM fields before graduating. Unsupportive classroom environments and outdated pedagogy inhibit women's participation in STEM, as do a lack of female role models and a limited peer group.¹⁶ After college, women scientists and engineers earn less and advance more slowly than men in both academia and the private sector. This can, in turn, deter all but the most persistent women from choosing and staying on these paths. For example, research by the Society of Women Engineers recently found that 25 percent of women who had earned college degrees in engineering were not working in engineering or a related field compared to 10 percent of men.¹⁷

Improving Girls' and Women's Opportunities in STEM

In order to improve upon recent gains in STEM education and provide much-needed opportunities to girls and women, programs must be developed that encourage girls and women to pursue STEM studies and careers. AAUW supports the following efforts to improve girls' achievement in math and science and increase the number of women who choose careers in STEM fields.

Improve Teacher Training: AAUW supports efforts that train teachers to encourage girls and other underrepresented groups to pursue math and science careers. Teachers need to be trained on how to be sensitive to gender differences when teaching all subjects, especially math and science. Teacher training would include ways to engage students in the face of gender-based peer pressure and parental expectations. This is particularly important because while studies show that all students start to lose interest in science and math by junior high, the loss is particularly steep for girls at puberty and likely results from gender-based social expectations and peer pressure.¹⁸

Encourage the Inclusion of STEM Subjects and Activities in Co-curricular Programs: Incorporating STEM subjects and activities in after-school and summer programs enables students to explore the field in a supportive atmosphere and enhances student interest in STEM careers. Research suggests that information about the usefulness of engineering to everyday human concerns and hands-on experiences with science, math, and technology may help girls develop an interest in these fields.¹⁹

Emphasize Math and Science in Early Education, Not Just High School: Studies show that students begin to lose interest in STEM subjects by junior high school; this is particularly true for girls.²⁰ Teaching children about math and science in elementary and middle school is critical to not only improving subject matter competency but also sparking and maintaining girls' interest in the field. AAUW supports voluntary content standards that cover mathematics and science for kindergarten through grade 12 and reflect the knowledge students need to enter college or the workforce and compete in the global economy. The America COMPETES Act directs the National Academy of Sciences to convene an expert panel to identify promising practices and critical skills in STEM teaching and learning; their work may be helpful in developing these standards.

Measure Student Achievement in Science: AAUW supports measuring student achievement in science. This will provide schools with necessary information on how well students are progressing and the improvements that still need to be made. The data gathered from such testing programs should always be disaggregated by sex, race and

socioeconomic status and cross-tabulated. While testing is an important measure of success, high stakes testing should not be the sole indicator of student competency or a school's progress. Additional flexibility in Adequate Yearly Progress (AYP) measures required by the No Child Left Behind Act should be explored.

Ask For a Report Responding to "Rising Above the Gathering Storm": The report, commissioned by Congress from the National Academies on Science, Engineering and Medicine and published in 2007, states that the United States' advantages in science and technology are eroding and discusses the need to improve math and science education. Unfortunately, the report largely ignores the issue of women and underrepresented minorities in STEM fields. AAUW recommends that Congress request a more specific follow-up study on methods to increase the number of women in STEM fields and the effect this would have on U.S. leadership in the global marketplace.

Use Title IX to Improve the Climate for Women in STEM Fields: AAUW recommends requiring agencies to broadly and proactively conduct Title IX compliance reviews. Title IX of the Education Amendments of 1972 is the federal statute prohibiting sex-discrimination in education programs and activities that receive federal financial assistance. The law states, "No person in the United States shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any educational program or activity receiving federal financial assistance."²¹ To ensure compliance with the law, Title IX regulations require recipients of federal education funding to evaluate their current policies and practices, and adopt and publish grievance procedures and a policy against sex discrimination. Title IX does not require quotas or proportionality. Simply put, Title IX reviews ensure that women are not being discriminated against.

Federal agencies and departments such as NASA, Department of Energy, and Department of Defense should conduct Title IX compliance reviews at grantee institutions regularly. All agencies are required by law to ensure they are not violating Title IX, however very few Title IX reviews are conducted outside of the Department of Education. However, the Department of Energy and NASA have both conducted Title IX reviews at grantee institutions. These Title IX reviews could serve as a model in terms of what factors to consider, how to conduct reviews, and how to improve reviews, when conducting future reviews. The administration should make it a government-wide priority that agencies use their contracting and grant making authority to ensure that universities that receive agency funding are complying with Title IX. In addition, AAUW strongly supports the idea that colleges form an NCAA-like inter-institutional monitoring organization that shares data, evaluates progress, and uses Title IX and other civil rights laws to eliminate gender bias in STEM fields.

STEM Programs and Activities

AAUW branches run many programs that increase girls' interest and participation in STEM. One example is AAUW California's Tech Trek Science Camp, which is a one-week residential summer scholarship camp for rising eighth graders. Founded in 1998, the camp was designed to encourage young women to continue studying science and math in middle school. So far, over 5,600 girls have participated in the program. Activities at Tech Trek include hands-on projects such as designing and building roller coasters, hot air balloons or rockets, and core classes including astronomy, crime scene investigation, marine biology, mathematics, microbiology, physics, and robotics. The history and achievements of women in math and science is emphasized through courses, skits, guest speakers, and the excellent example of the volunteers and staff of the Tech Trek camp itself.

The camp takes place on college campuses, projects are led by experienced STEM professors and professionals, and AAUW members organize and run the camp. Several years ago, AAUW began surveying participants. They indicated much higher levels of science and math course taking in high school, as well as increased participation in AP science and math sources. They exceed national norms for college attendance, with 96 percent enrolled in college. Fifty-three percent indicated that they were majoring in science and math-oriented fields, a greater percentage than the national average. All participants credited Tech Trek for encouraging their interest in science and math-related careers.²²

Another STEM program AAUW members run is Tech Savvy in Buffalo, NY. This day-long program for girls in sixth to ninth grade targets minority and lower-income girls and includes workshops on different STEM careers and

keynote speakers to inspire girls to consider careers in STEM. The program also includes sessions for parents and teachers since their feeling towards these careers often influences girls' decisions to pursue STEM careers. In four years, the program has grown from approximately 275 students and adults to almost 700 students and adults. Assessments of the program indicate that students expanded their view of the career possibilities not previously imagined as well as the immediate application of concepts from the books and materials provided in the conference.

AAUW is also a key partner in the National Girls Collaborative Project (NGCP), which receives funding from the National Science Foundation. NGCP strengthens the capacity, impact, and sustainability of existing girl-serving STEM programs. The goal of the project is to facilitate collaboration among organizations, institutions, and businesses committed to expanding participation of women in STEM. Regional collaborative teams across the U.S. bring together organizations to compare needs and resources, share information, and strategically plan to expand STEM-related opportunities for girls and women. To date, 14 regional collaboratives have been established to bring together local organizations committed to informing and encouraging girls to pursue STEM careers. These regional teams have appeared on public TV, offered professional development for teachers, and held forums demonstrating best practices to encourage girls to enter STEM fields.

The NGCP, website www.ngcproject.org, offers a wealth of resources to serve a growing nationwide community that supports girl-serving STEM programs. Approximately 1,350 programs across the U.S., representing more than 3 million girls, are now listed in the NGCP's Program Directory. The site also hosts information about the more than 84 competitive mini-grants awarded by regional collaboratives for projects such as AAUW North Carolina's pilot program to provide IT training for girls. The website also provides free access to NGCP-produced webcasts, statistics about STEM education, and proven strategies, curricula, and assessment tools that build the capacity of organizations to provide high-quality learning environments for girls in STEM. Many NGCP projects use the Assessing Women and Men in Engineering (AWE) assessments to evaluate their programs.

Research on Girls and STEM

While a large body of research exists on the involvement of girls and women in STEM fields, most of this research remains inaccessible to many audiences. In early 2010, AAUW will be releasing a report targeted towards a general audience that will highlight key findings from recent academic research on girls and women in STEM. Focusing on top findings, rather than comprehensive overview, the report will focus on topics such as gender differences in interest in STEM fields, gender differences in cognitive abilities, how stereotypes influence girls, and how mentoring can make a difference. Case studies and personal stories will be used to illustrate common themes across STEM disciplines and across stages of educational and work-life progression. Throughout, reasons behind the persistent gender inequity in STEM will be explored.

While the report is still in draft form, early findings show that most differences between boys and girls in terms of math achievement in elementary and high school have disappeared. However, there is a big drop-off in women's participation in science and math at the transition from high school to college. High school girls are as likely as boys to take advanced math and science classes but are much less likely than boys to intend to major in a STEM field once they go to college. College and work environments in certain STEM fields continue to be unwelcoming to women. Mentoring can help women persist in STEM fields in both college and the workplace. AAUW looks forward to sharing the report with the committee once it is completed.

Conclusion

Girls and women continue to face barriers to entering and persisting in STEM fields. At the same time, the supply of new STEM workers is not keeping up with the demand, and women remain severely underrepresented.²³ Women make up half of the population and are a largely untapped resource that could prove essential in maintaining the global competitiveness of the United States. With better enforcement of Title IX and increased investment, the United States can begin to close the gender divide in STEM fields.

Thank you for the opportunity to submit written testimony.

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