

## Women and Girls in STEM: A Comprehensive Approach to Achieving Equity

Good morning. My name is Linda Hallman, and I am the Executive Director of the American Association of University Women. It is my honor to be with you today, and a privilege to address the members of the National Science Foundation's Committee on Equal Opportunities in Science and Engineering.

Before I begin with my formal presentation, some of you may be wondering what AAUW is and why we do the work that we do. Since you'll be hearing a lot from me this morning, I thought it would be best to let others answer those questions. Please enjoy this brief DVD.

*(‘Breaking Through Barriers’ DVD is shown)*

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Since 1881, AAUW has been working to break through barriers for women and girls in all facets of life. Today I will discuss the ways in which we support promoting and strengthening science, technology, engineering, and mathematics (STEM) education, especially for women, minorities and other underrepresented populations. The lack of women and girls in STEM fields has significant implications for women's economic security as well as the overall economy and America's global competitiveness. Fortunately, the U.S. has a significant pool of untapped talent. If women and members of other traditionally underrepresented groups joined the STEM workforce in proportion to their representation in the overall labor force, the shortage of STEM professionals would disappear.<sup>1</sup>

After a brief review of the current landscape—which indicates that while progress has been achieved, much more work remains to be done—I will provide you with an overview of AAUW's STEM-related work, a comprehensive approach that includes distribution of fellowships and grants, publication of research findings, and the pursuit of new public policy.

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As you know, women and girls have made a great deal of progress in STEM over the past five decades. Today, girls are doing quite well in high school math and science. These charts show that between 1990 and 2005, both female and male high school graduates, on average, earned more credits in math and science, and both earned higher grades. Since 1994, girls have actually taken *more* math and science classes than boys, and girls earned somewhat higher grades in these classes as well.

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Where we see high school girls falling behind their male peers is on high stakes tests such as Advanced Placement examinations. In STEM subject areas such as calculus, physics, computer

science, statistics, and chemistry, female high school students are outnumbered by their male peers. Here we see, for instance, that the number of total students taking the AP Calculus exams has increased over time. However, more boys than girls took the Calculus tests and they earned higher scores than girls. Boys are more likely to take and achieve higher scores than girls on AP exams in STEM subjects. We also see a small yet persistent gender gap on math scores on SAT exams. There are several theories about the gender gap in high stakes STEM exams, including the impact of stereotype threat—a subject that we discuss in our upcoming research report.

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It is at the college level that the gender gap in STEM really begins to show its face. Nearly one-quarter of male freshmen planned to major in engineering, computer science or the physical sciences, compared to only about five percent of female first-year students. Many women are coming to college prepared to pursue STEM subjects, but few choose to do so.

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Over the past three decades, the overall percentage of women receiving degrees in STEM has increased dramatically. However, there is substantial variance in women's representation across STEM disciplines. Women now actually earn the majority of bachelor's degrees in biology and half the bachelor's degrees in chemistry, but receive a much smaller percentage of bachelor's degrees in physics and engineering. Moreover, in a troubling trend, the number of women receiving bachelor's degrees in computer science has dropped significantly since the mid-1980s. The number of men receiving bachelor's degrees in computer science also dropped in the 1990s but not as steeply.

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As this data from the previous five census counts shows, women's representation in the STEM workforce has also increased, but participation varies significantly. For instance, women have experienced steady growth in the biological sciences and now make up about 44 percent of these scientists. On the other end of the spectrum, women made up only about 10 percent of engineers by 2000. The trends in mathematics and computer sciences remind us that progress is not always linear, as we see a drop between 1990 and 2000.

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Finally, women remain greatly outnumbered among the most highly educated workers. Here we see charts of the doctoral workforce in Biological, Agricultural and Environmental Life Sciences and the Doctoral Workforce in Computer and Information Sciences in 2006. At this level, women remain a minority.

In short: as the Committee is aware, progress has been made, but there is still a long way to go. From AAUW's perspective, an issue of such magnitude requires a comprehensive approach to achieve real progress for women, girls, and our entire nation.

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We begin with our Fellowships and Grants programs. Going all the way back to 1885, AAUW sponsored "radical" research debunking the myth that higher education was harmful to a woman's health. Just a few years later, we awarded the first fellowship in the country for a graduate woman scholar. AAUW has a rich history of supporting women in STEM fields; as a matter of fact, we provided Dr. Marie Curie with \$156,000 in 1920 to purchase one gram of radium for her research. Today, AAUW has become one of the largest sources of funding exclusively for graduate education for women, providing nearly \$80 million from our donor-restricted endowment fund to more than 11,000 recipients since 1888. Annually, AAUW provides more than \$3 million in funding—supporting the dreams of many remarkable women as they work to break through the glass ceiling.

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Through AAUW's fellowships and grants, we provide vital funding to women preparing research for publication, advancing or changing their careers, or re-entering the workforce. We target funding for advanced studies in the traditionally male—and traditionally higher paying—STEM fields. We support women of color as well in fields in which they have traditionally been underrepresented. We award financial support to women around the world to enable them to gain access to academic training and contribute to the economic and social development of their countries. Finally, we support nonprofits and individuals in their efforts focused on women and girls' educational and economic development, with a preference for STEM-related programming.

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AAUW provides three different types of fellowships. The first, **American Fellowships**, are awarded to women scholars who are completing doctoral dissertations or conducting postdoctoral research across the spectrum of the sciences, social sciences, and arts and humanities. The program also provides small grants to women scholars who are preparing completed research for publication. These fellowships seek women with an active commitment to helping women and girls through service in their communities, professions, or fields of research. A secondary goal is to increase the number of women in higher education who are tenured and in positions of faculty leadership.

The second form is **International Fellowships**, which broaden the community of women who have access to advanced study. This program supports women from other countries in full-time graduate or postgraduate study or research across disciplines.

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The final form is our master's level **Selected Professions Fellowships**, where AAUW promotes increased opportunities for women in STEM fields, with a special focus on increasing the representation of women of color. Selected Professions Fellowships are awarded for programs such as computer and information sciences, engineering, and mathematics/statistics. Moreover, fellowships in business administration, law, and medicine degree programs are set aside specifically for women of color.

Annually, these three fellowship programs—American, International, and Selected Professions—support more than 100 women in STEM fields. More than 600 women in these fields have received fellowships in the past five years.

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AAUW also provides three different types of grants.

**Career Development Grants** address the needs of women who are advancing careers or re-entering the workforce in order to enhance their professional qualifications and marketability. In the past two years AAUW has increased this funding by more than 40 percent to meet the increasing demand by women for additional professional training—particularly important in today's economy. Special consideration is given to women seeking credentials in nontraditional fields.

In addition, **Campus Action Projects** provide a platform for campus programming that is informed by AAUW's research. This year's grants will focus on our latest upcoming research report, which I will discuss later on, on barriers to women in the STEM fields. Projects will focus on STEM literacy and awareness, mentoring, and campus departmental culture. We anticipate that projects will address some of the barriers that girls and women encounter in STEM fields in early education, post-secondary, and the workplace, and we are hopeful that the outcomes of the projects will help to increase the number of young women entering and pursuing those fields of study.

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Finally, **Community Action Grants** engage women and girls in communities across the U.S, supporting innovative programs or projects that promote education and equity—particularly on increasing girls' and women's achievements in STEM. Successfully funded programs include AAUW state and local branch Girls Excelling in Math and Science (GEMS) workshops with over 300 girls in attendance, marine science workshops, mentoring collaborations, and CEO University. One of the most successful, ongoing programs for more than a decade is

AAUW-California's "Tech Trek" summer STEM camps for girls. These camps are hosted by local campuses and provide opportunities for middle school girls to learn about STEM careers.

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One of the most significant ways in which AAUW seeks to advance the gender equity goal in the STEM fields is through our participation and leadership in the **National Girls Collaborative Project**, which is a five-year grant funded by the National Science Foundation. AAUW, in partnership with other like-minded organizations, is focused on connecting the many informal programs around the country devoted to increasing the number of girls interested in STEM. The NGCP is designed to reach girl-serving STEM organizations across the United States. Focus areas include higher education institutions, community-based organizations, and private non-profits which all work to increase gender equity in STEM fields. The project has now expanded to 14 regional collaboratives nationwide, and AAUW members serve as Liaisons to these collaboratives. There is also an additional, dedicated AAUW liaison for diversity whose purpose is to increase the participation of underrepresented programs and populations in NGCP.

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The goals of NGCP are to maximize access to shared resources within projects and with public- and private-sector organizations and institutions interested in expanding girls' participation in STEM. By strengthening the capacity of existing and evolving projects, the NGCP uses the leverage of a collaboration of individual girl-serving STEM programs to create a tipping point for gender equity in STEM.

Through NGCP, programs can share resources, work together, and learn from one another. Often, individuals working on one particular project are unaware of similar projects nearby. The basic idea, then, is to bring these forces together. The project also seeks to increase diversity and coordinate services available to girls interested in STEM careers.

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A major component of the NGCP is the creation of a program directory of girl-serving projects. The program directory allows organizations interested in creating more opportunities for girls in STEM to register with the NGCP, along with learning about and sharing resources with similar organizations. Currently, the Program Directory lists at least 1,400 programs that serve more than 25,000 girls annually nationwide.

Another important element of the NGCP is the mini-grant program. NGCP makes \$1,000 mini-grants available to collaborations of two or more participating programs who apply through the program directory. More than 65 mini-grants have been awarded for projects to strengthen girls' participation and interest in STEM fields. The NGCP also provides research-based promising practices in informal learning environments, and evaluation and assessment to the

participating programs to help further advance their work via monthly webcasts, forums, and other methods.

In short, the National Girls Collaborative Program has demonstrated success in bringing together hundreds of organizations and individuals to network, share resources, and collaborate on STEM-related projects for girls.

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We now turn to AAUW's research publications. In addition to the on-the-ground work just described, we have earned a solid reputation for producing quality research reports that have informed the national debate on gender equity in education and the workplace.

AAUW released two reports earlier this decade on girls and gender equity in STEM: *Tech-Savvy: Educating Girls in the New Computer Age* and *Under the Microscope: A Decade of Gender Equity Projects in the Sciences*. These reports have enjoyed widespread public interest that has continued through our free on-line publications. Both publications provided practical ideas for encouraging girls in science, technology, engineering and mathematics.

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The most recent AAUW report, released last year, is entitled: *Where the Girls Are: the Facts About Gender Equity in Education*. This report addressed a question that has been posed to AAUW in various forms for decades: do our efforts to help girls come at the expense of boys? More recently, the issue has been raised as a concern about a so-called "boys' crisis" in education. This report refuted this argument by examining test performance data from the National Assessment of Educational Progress examinations, the SAT and the ACT college entrance exams and graduation rates for high schools and colleges. The bottom line—girls' gains have not come at boys' expense.

The report received significant media and public attention but more importantly, with this report, AAUW demonstrated that our—and others'—work on behalf of girls and women has not come at the expense of boys or men. That is, education is not a zero sum game where improvement for one group comes at a cost to another group.

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With this groundwork laid, a new AAUW report is soon to be released, thanks in part to the generous support of the National Science Foundation. The report is tentatively called: *Why So Few: Women and Girls in Science, Technology, Engineering, and Mathematics*, and will be released in early 2010.

Despite the many gains that women and girls have made in STEM performance and participation, we are finding that there is still a relatively high level of public misunderstanding of the factors that can impede women and girls in their efforts to thrive in STEM fields. The new report will provide an up-to-date look at female participation and performance in STEM in education and the workplace. We will highlight the significant progress that women and girls have made, as well as discuss where barriers to their full participation remain.

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The goal of this report is to identify and select important findings from recent research on women and girls in STEM that can help to inform the public debate and social policy on these issues. Some of the subjects we tackle include gender gap performance in science and math; the role of gender stereotypes potentially impacting the underrepresentation of women and girls; and what causes women to leave these fields in college, graduate school, and the workforce.

We will provide brief reviews of relevant research that addresses these issues and also present case studies or profiles of specific research that is being used to inform interventions and policy to address barriers in these areas. Although the report highlights academic research, it is geared to a general audience. The overall goal is to take important and recent findings supported by research and make them more accessible to a wider audience, including educators, parents, local and national policymakers, and the general public.

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Finally, we turn to AAUW's work in the realm of public policy. AAUW's advocacy work builds upon a century of responsible public participation at the local, state, national, and international levels. Since 1881, we have been a leading voice for educational equity and economic opportunity for women and girls. Our members have historically examined and taken positions on the fundamental issues of the day—educational, social, economic, and political. Today, AAUW develops and implements coordinated legislative, regulatory and grassroots strategies to break through educational and economic barriers for women and girls. Our member-endorsed Public Policy Program promotes our mission of advancing equity for women and girls through advocacy, education, and research.

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Full participation for women in STEM is a direct offshoot of AAUW's role as a leader in the drive for pay equity. Earlier this year, the U.S. Census Bureau released its latest figures showing that a woman working full-time earned, on average, only 77 cents for every dollar a man earned. STEM careers, fortunately, provide women with solid economic security. In general, women with a college degree earn more than women without this credential, and women with a college degree in many STEM fields earn more than average. Jobs in STEM fields pay more than

other fields throughout a person's career. For example, a woman working as a computer scientist or systems analyst—a nontraditional field for women—earned, on average, more than \$56,000 per year in 2008 while a woman working as an administrative assistant—a traditional field for women—earned a mean annual wage of less than \$32,000 in the same year.<sup>2</sup> The high-wage nature of STEM careers is an important reason to encourage women and girls' full participation; such work complements our other legislative efforts to end the gender pay gap once and for all.

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In order to improve upon recent gains in STEM education and provide much-needed opportunities to women and girls, programs must be developed that encourage girls and women to pursue STEM studies and careers. As such, AAUW proposes a number of legislative and policy recommendations to improve girls' achievement in math and science and increase the number of women who choose careers in STEM fields:

- First: the National Academies' 2007 report, *Beyond Bias and Barriers*, concluded that women face a lifetime of subtle biases that discourage them from careers in STEM professions. To overcome these challenges, AAUW supports enactment of the report's recommendations, which would require agencies that fund scientific research to conduct anti-gender bias workshops, enforce existing federal anti-discrimination laws such as Title IX, publish demographic and funding data for grant applications, and extend grant support for researchers on caregiving leave.
- AAUW also recommends requiring agencies to broadly and proactively conduct Title IX compliance reviews. All agencies are required to ensure they are not violating Title IX; however, very few Title IX reviews are conducted outside of the Department of Education. We believe it ought to be 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.
- AAUW supports measuring student achievement in science as well. 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.
- AAUW also supports efforts that create more STEM teachers and train teachers to encourage girls and other underrepresented groups to pursue math and science careers in the face of gender-based differences, 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 and results from gender-based social expectations and peer pressure.<sup>3</sup>
- Finally, AAUW believes in incorporating STEM subjects and activities in after-school and summer programs that enable students to explore the field in a supportive atmosphere. 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.<sup>4</sup>

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Ladies and gentlemen, it has been an honor and privilege to speak with you this morning. AAUW and this committee share the same goal: the full inclusion of women, girls, minorities, and all underrepresented populations in the STEM fields.

Over the last 50 years, more than half of America's sustained economic growth was created by the five percent of the workforce who drive, manage, and maintain the processes and products of innovation: engineers, scientists, and advanced-degree technologists.<sup>5</sup> Women make up half of the population but are a largely untapped resource that could prove essential in maintaining the technological competitiveness of the United States. AAUW believes that this is an issue that demands a national response, and our entire organization is devoted to seeing this vision become reality.

Thank you again for your time and attention this morning. I'll be glad to answer any questions you may have.

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<sup>1</sup> Congressional Commission on the Advancement of Women and Minorities in Science, Engineering and Technology Development. (2000). *Land of Plenty: Diversity as America's Competitive Edge in Science, Engineering and Technology*. Retrieved April 8, 2009, from [http://www.nsf.gov/pubs/2000/cawmset0409/cawmset\\_0409.pdf](http://www.nsf.gov/pubs/2000/cawmset0409/cawmset_0409.pdf).

<sup>2</sup> Bureau of Labor Statistics. (2008). *National Wage Data, Table 39. Median weekly earnings of full-time wage and salary workers by detailed occupation and sex*. Retrieved June 29, 2009, from <http://www.bls.gov/cps/cpsaat39.pdf>.

<sup>3</sup> Ibid.

<sup>4</sup> Jozefowicz, D. M., B. L. Barber, et al. (1993). Adolescent Work-Related Values and Beliefs: Gender Differences and Relation to Occupational Aspirations. *Biennial Meeting of the Society for Research on Child Development*. New Orleans, LA: 1-22. And Fancsali, Cheri. *What We Know About Girls, STEM and Afterschool Programs*. Retrieved December 29, 2008, from [http://gsg.afterschool.org/images/public/Resources/We\\_Know\\_About.pdf](http://gsg.afterschool.org/images/public/Resources/We_Know_About.pdf).

<sup>5</sup> BEST: Building Engineering and Science Talent. *The Talent Imperative: Meeting America's Challenge in Science and Engineering, ASAP*. (April, 2004). Retrieved December 29, 2008, from <http://www.bestworkforce.org/PDFdocs/BESTTalentImperativeFINAL.pdf>.