Improve Girls' and Women's Opportunities in Science, Technology, Engineering, and Math

Since its founding in 1881, the American Association of University Women has been committed to making the dream of higher education a reality for women. AAUW's 2009-2011 Public Policy Program reaffirms our commitment to **"**a strong system of public education that promotes gender fairness, equity, and diversity….and advocates increased support for, and access to, higher education for women and other disadvantaged populations."[1]

AAUW supports promoting and strengthening science, technology, engineering, and math 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 these fields.

The shortage of American scientists threatens our nation's ability to compete and innovate in the coming years, especially as the outsourcing of jobs to, and importing of science from, other nations continues to grow. By 2014, the U.S. will have added more than one million additional information technology jobs to the workforce.[2] However, women still lag far behind in earning computer technology degrees and working in computer technology-related professions. High school girls represent only 17 percent of computer science Advanced Placement (AP) test takers.[3] Women earned 18 percent of computer and information sciences degrees in 2008 compared to 37 percent of computer science degrees in 1985.[4] According to the National Science Foundation, women earned only 21 percent of doctoral degrees in computer science in 2006.[5] Overall, women comprise 24.8 percent of computer and mathematical professionals, down from 27 percent in 2006.[6] AAUW's *Tech Savvy* (2000), *Women at Work* (2003), and *Why So Few?: Women in Science, Technology, Engineering, and Mathematics* (2010) publications have documented the troubling shortage of girls and women preparing to work in science, technology, engineering, and math. In order to close this gap, AAUW supports efforts that train teachers to encourage girls and other underrepresented groups to pursue careers in these fields.

Early Barriers and Inconsistent Scoring

Girls' participation rates in science, technology, engineering, and math courses have unquestionably increased since the passage of Title IX. Before Title IX, many opportunities to advance skills in these topics were denied to women, inside and outside of the classroom, including opportunities to participate in higher-level courses and math and science clubs.[7] However, barriers to girls' and women's progress in these fields 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."[8] A report by 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 these subjects: as they enter middle school, late high school, college and graduate school, and in their professional lives.[9] 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.[10] These pervasive attitudes and messages influence girls' academic paths early, and future options in such professions may be curtailed for girls because they have insufficient course foundations.

Not surprisingly, girls' achievement in STEM lagged behind boys' through much of the last century. The 1969-70 National Assessment of Educational Progress (NAEP) assessments in science found that grade-school and middle-school boys outscored girls by an average of 5 points; in high school, the gap increased to 17 points.[11] However, in recent years girls have made strong strides in science and mathematics achievement. According to the 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'. On average, girls now earn more credits in math and science courses than boys, and female high school graduates have a higher combined GPA in math and science courses than boys as well.[12] However, despite completing more challenging curricula and earning higher GPAs, on some NAEP exams, boys still outperform girls in math and science overall.[13] In 2008, 59.5 percent of AP test-takers were girls, but in STEM-related areas, those numbers were smaller.[14] In 2009, 38 percent of AP physics test-takers were girls, and girls made up only 19 percent of those taking AP computer science.[15]

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. [16,17] 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.[18]

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.[19] 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 computer science.[20] In that same year, 29 percent of all male freshmen planned to major in a science, technology, engineering, or mathematics field, while only 15 percent of female freshman chose to study in these fields.[21] 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.[22] By 2006, this number had decreased to only 26.8 percent of mathematics and computer science degrees granted.[23] Between 2000 and 2008, there was a 79 percent decline in the number of incoming undergraduate women interested in majoring in computer science.[24] The percentage of women receiving master's degrees in mathematics and computer sciences also decreased, from 35.7 percent in 2000 to 30.3 in 2006.[25]

Overall, women earned 38.4 percent of science and engineering doctoral degrees in 2006.[26] (The category "science and engineering" includes the fields of biological, earth, physical, and computer sciences, in addition to engineering, mathematics, and social sciences.) While still less than half, this is nearly five times the percentage they earned in 1966.[27] Progress is being made, but not in all fields and not at acceptable speeds.

The need for science, technology, engineering, and math education 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.[28] With globalization and increased global competitiveness, it is more important than ever that the United States put in place policies that encourage study in these fields. Of the college-age population earning science and engineering degrees, the United States currently ranks 17th in the world, down from third place several decades ago.[29]

One way to improve this situation is to address challenges that cause girls and women to lose interest in science, technology, engineering, and math and leave these fields. Unsupportive classroom environments and outdated pedagogy inhibit women's participation in these topics, as do a lack of female role models and a limited peer group.[30] It has been shown that through highlighting broader, multidisciplinary applications early in a curriculum, as opposed to first focusing on technical aspects of the program, women and men are more likely to report more interest in a program and continue with it.[31] However, 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 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.[32]

A National Academy of Sciences study entitled *Beyond Bias and Barriers: Fulfilling the Potential of Women in Academic Science and Engineering* notes that women faculty are slower to gain promotion than men, are less likely to reach the highest academic rank, have lower salaries, and are awarded less grant money than their male colleagues.[33] Women represent fewer than one in five faculty members employed in computer science, mathematics, engineering, and the physical sciences. In engineering, women account for just over one in ten faculty members.[34] At the university level, perceptions of equity vary among faculty. Through research at Virginia Tech, the Society of Women Engineers has found that 78 percent of male faculty members, but only 41 percent of female faculty members, believe that faculty members are treated fairly

regardless of gender.[35] By conducting departmental reviews and developing mentoring programs for all faculty, colleges can create a working climate that supports the retention of their female employees.

Labor Market Requires Women in Science, Technology, Engineering and Math Fields

The small number of women and girls in these fields has significant implications for our economy. There is rising concern about declining scientific inquiry and a shortage of American scientists. The U.S. outsources work to, and imports scientists from, many countries to try to meet the needs of American competitiveness and innovation. By 2018, 1.4 million computer specialist job openings are expected to exist in the U.S. labor market, but U.S. universities will only produce enough graduates with computer science bachelor's degrees to fill 29 percent of these jobs.[36] Fortunately, the U.S. has an untapped pool of potential workers. If women and members of other traditionally underrepresented groups joined the science, technology, engineering, and math workforce in proportion to their representation in the overall labor force, the domestic shortage of these professionals would disappear.[37] Women made up 57 percent of professionals in the 2008 U.S. workforce, but only 24 percent of professional IT-related occupations were held by women.[38] The Commission on Professionals in Science and Technology's 2007 report, "Professional Women and Minorities," notes that women make up 25 percent of the labor force in science, engineering, and technology fields. However, that proportion varies widely, with fewer women in occupations that require a high level of skill in math, such as engineering. Women comprise no more than 15 percent of any engineering sub-discipline (i.e. mechanical, electrical, civil, industrial, etc.) and only 9.5 percent of engineering managers.[39]

Science, Technology, Engineering, & Math as a Step Towards Pay Equality

Careers in science, technology, engineering, or math 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 of these fields earn more than average. For example, on an hourly basis, women with a four-year college degree earned about 80 percent more than women with only a high school degree in 2001. Jobs in these fields pay more throughout a person's career than other fields. For example, a woman working as a computer scientist or systems analyst—a nontraditional field for women—earned, on average, $56,264 per year in 2008, while a woman working as an administrative assistant—a traditional field for women—earned a mean annual wage of $31,928 in the same year.[40]

Improving Women's and Girls' Opportunities in Science, Technology, Engineering, & Math

In order to improve upon recent gains in science, technology, engineering, and math education and provide much-needed opportunities to women and girls, programs must be developed that encourage girls and women to pursue studies and careers in these fields.

AAUW is pleased that the America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science (COMPETES) Act, signed into law on August 9, 2007, included multiple provisions that will improve opportunities for women and girls in these fields. AAUW also supports the following continued efforts to improve girls' achievement in math and

science and increase the number of women who choose careers in science, technology, engineering, or math:

Improve Teacher Recruitment and Training: The Business-Higher Education Forum (BHEF) estimates that American elementary and secondary schools will need 280,000 new science and math teachers between now and 2015 to keep up with teacher retirement and attrition, as well as growth in the population of school-aged children.[41] There is currently a shortage of highly-qualified teachers and an even greater shortage of highly-qualified math and science teachers. The BHEF's report, "An American Imperative: Transforming the Recruitment, Retention, and Renewal of Our Nation's Mathematics and Science Workforce," calls for higher education to collaborate with school districts, state governments, the federal government and businesses to recruit, retain and provide professional development to science and math teachers.[42] Two such programs are included in the America COMPETES Act: the Robert Noyce Teacher Scholarship Program, which provides grants for teacher recruitment, training, and scholarships, and Teachers for a Competitive Tomorrow, which provides additional funds for teacher preparation. AAUW recognizes teachers' ongoing need for content development in order to strengthen math and science curricula and improve student achievement.

Furthermore, 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.[43]

Strengthen Academic Preparation for Science, Technology, Engineering, & Math Postsecondary Study and Careers: The need for qualified professionals in these fields continues to grow, making it critical to ensure that students are receiving adequate preparation to pursue careers in these high-demand fields. Through the America COMPETES Act, a pilot program will be launched to support the development of comprehensive secondary schools for math and science education. Other important initiatives in this law include expanded access to Advanced Placement and International Baccalaureate classes and the alignment of secondary and postsecondary education systems. AAUW is also supportive of SMART grants, which will further women's interest and participation in the science, technology, engineering, and math These grants are awarded to students pursuing a degree within these topics who are in the third or fourth year of the academic program and have maintained a minimum 3.0 grade point average.[44]

Encourage the Inclusion of Science, Technology, Engineering, & Math Subjects and Activities in Co-curricular Programs: Incorporating these subjects and activities in after-school and summer programs enables students to explore the field in a supportive atmosphere and enhances student interest in these 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.[45] The need for co-curricular activities in these topics is addressed in the America COMPETES Act through experiential summer internships for middle and high school students at the National Laboratories, as well as summer term education programs to prevent learning loss between school years.

Emphasize Math and Science in Early Education, Not Just High School: Studies show that students begin to lose interest in science, technology, engineering, and math by junior high school; this is particularly true for girls. [46] A 2009 poll of 8-17 year-old students found 24 percent of boys but only 5 percent of girls showing interest in an engineering career.[47] 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 the creation of common core standards that cover math 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 the teaching and learning of these topics; 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.

Enact Recommendations from "Beyond Bias and Barriers": The National Academies' report, *Beyond Bias and Barriers*, concludes that women face a lifetime of subtle biases that discourage them from careers in science and engineering. To overcome these challenges and to expand women's participation in such occupations, 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, publish demographic and funding data for grant applications, and extend grant support for researchers on care-giving leave. AAUW strongly supports the report's recommendation 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 faculty recruitment, retention, and promotion in these fields.

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 science, technology, engineering, and math. AAUW recommends that Congress request a more specific follow-up study on methods to increase the number of women in these 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 Science, Technology, Engineering, & Math: 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."[48] 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.

Resources for Advocates

It is AAUW advocates across the county who speak their minds on issues important to them that truly advance AAUW's mission. Stay informed with updates on science, technology, engineering, and math education and other issues by subscribing to AAUW's Action Network. Make your voice heard in Washington and at home by using AAUW's Two-Minute Activist to urge your members of Congress to support promoting and strengthening education in these fields, especially for girls and other underrepresented populations. Write a letter to the editor of your local paper to educate and motivate other members of your community. Attend town hall meetings for your members of Congress, or set up a meeting with your elected official's district office near you to discuss these policies. AAUW members can also subscribe to *Washington Update*, our free, weekly e-bulletin that offers an insider's view on the latest policy news, resources for advocates, and programming ideas. For details on these and other actions you can take, visit www.aauw.org/takeaction.

For more information, read AAUW's related position papers on Title IX, the No Child Left Behind Act, and the Higher Education Act, and AAUW's research, including *Why So Few?: Women in*

Science, Technology, Engineering, and Mathematics and *Where the Girls Are: The Facts About Gender Equity in Education*. AAUW members and branches can also get involved with the National Girls Collaborative Project, a program implemented by AAUW and designed to reach girl-serving science, technology, engineering, and math organizations across the United States. A list of science, technology, engineering, and math projects your branch can start from scratch, along with other valuable resources, are available on our website at www.aauw.org.

Conclusion

In the last 50 years, more than half of America's sustained economic growth was created by the five percent of the workforce who create, manage, and maintain the processes and products of innovation: engineers, scientists, and advanced-degree technologists.[49] America's science, technology, and math workforce is aging while jobs requiring specialized training are growing at five times the rate of other occupations. The supply of new workers in these fields is struggling to keep up with demand, and women remain severely underrepresented.[50] Women make up half of the population and are a largely untapped resource that could prove essential in maintaining the technological 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 science, technology, engineering, and math.

For more information, call 202/785-7793 or e-mail VoterEd@aauw.org.

AAUW Public Policy and Government Relations Department
May 2010

[1] American Association of University Women. (June 2009). *2009-11 AAUW Public Policy Program.* Retrieved July 9, 2009, from http://www.aauw.org/advocacy/issue_advocacy/principles_priorities.cfm.
[2] National Center for Women and Information Technology. (2007). *NCWIT Scorecard 2007: A Report on the Status of Women in Information Technology*. Retrieved June 26, 2009, from http://www.ncwit.org/pdf/2007_Scorecard_Web.pdf.
[3] National Center for Women & Information Technology. (2009). *By the Numbers*. Retrieved June 22, 2009, from http://www.ncwit.org/pdf/BytheNumbers09.pdf.
[4] Ibid.
[5] National Science Foundation. Women, Minorities, and Persons with Disabilities in Science and Engineering. Table 2. http://www.nsf.gov/statistics/wmpd/pdf/tabf-2.pdf
[6] Bureau of Labor Statistics. (2008). *Current Population Survey, Table 11. Employed persons by detailed occupation, sex, race, and Hispanic or Latino ethnicity*. Retrieved June 29, 2009, from http://www.bls.gov/cps/cpsaat11.pdf.
[7] Roché, Joyce. (June 19, 2007). "U.S. House Committee on Education and Labor Hearing, 110th Congress: Building on the Success of 35 Years of Title IX."
[8] Girls Inc. (October 2006). *The Super Girl Dilemma: Girls Feel the Pressure to be Perfect, Accomplished, Thin, and Accommodating*. Retrieved December 29, 2008, from http://www.girlsinc.org/supergirldilemma/.
[9] 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 December 29, 2008, from http://www.nsf.gov/pubs/2000/cawmset0409/cawmset_0409.pdf.
[10] Dean, Cornelia. (April 17, 2006). Computer Science Takes Steps to Bring Women to the Fold. *The New York Times*. Retrieved December 29, 2008, from http://www.nytimes.com/2007/04/17/science/17comp.html?_r=1&oref=slogin.

[11] U.S. Department of Education, National Center for Education Statistics. (1977). http://nces.ed.gov/index.asp.
[12] U.S. Department of Education, National Center for Education Statistics (February 2010). *2005 NAEP High School Transcript Study*. Retrieved February 12, 2010, from http://nces.ed.gov/nationsreportcard/hsts/.
[13] U.S. Department of Education, National Center for Education Statistics. (2007.) *The Nation's Report Card: America's High School Graduates (NCES 2007-467)*. Retrieved December 29, 2008, from http://nces.ed.gov/nationsreportcard/pdf/studies/2007467_4.pdf.
[14] College Board. (2008). *Program Summary Report.* Retrieved June 29, 2009, from http://professionals.collegeboard.com/profdownload/ap-data-2008-Program-Summary-Report.pdf.
[15] Corbett, Christianne, Catherine Hill & Andresse St. Rose. (2010). *Why So Few?: Women in Science, Technology, Engineering, and Mathematics.* AAUW. Washington, D.C.
[16] Corbett, Christianne, Catherine Hill & Andresse St. Rose. (2008). *Where The Girls Are: the Facts About Gender Equity in Education.* American Association of University Women. Washington, D.C.
[17] College Board. (2008). *2008 College-Bound Seniors: Total Group Profile Report.* Retrieved June 29, 2009, from http://professionals.collegeboard.com/profdownload/Total_Group_Report.pdf,
[18] Sullivan, Morgen. *Sex Bias and the Scholastic Aptitude Test.* Retrieved December 29, 2008, from http://www.dartmouth.edu/~chance/course/student_projects/morgen/node1.html.
[19] U.S. Department of Education, National Center for Education Statistics. (2009). *The Condition of Education 2009* (NCES 2009-081). Retrieved June 29, 2009, from http://nces.ed.gov/pubs2009/2009081.pdf.
[20] National Science Foundation, Division of Science Resources Statistics. (2009). *Women, Minorities, and Persons with Disabilities in Science and Engineering: 2009, NSF 09-305*. Retrieved July 17, 2009, from http://www.nsf.gov/statistics/wmpd/pdf/nsf09305.pdf.
[21] Corbett, Christianne, Catherine Hill & Andresse St. Rose. (2010). *Why So Few?: Women in Science, Technology, Engineering, and Mathematics.* AAUW. Washington, D.C.
[22] National Science Foundation, Division of Science Resources Statistics. (October 2008). *Science and Engineering Degrees: 1966-2006. (NSF 08-321).* Retrieved June 29, 2009, from http://www.nsf.gov/statistics/nsf08321/pdf/nsf08321.pdf.
[23] Ibid.
[24] National Center for Women & Information Technology. (2009). *By the Numbers*. Retrieved June 29, 2009, from http://www.ncwit.org/pdf/BytheNumbers09.pdf.
[25] National Science Foundation. *Table 18: Women as a percentage of all master's degree recipients, by major field group: 1966-2006.* Retrieved June 29, 2009, from http://www.nsf.gov/statistics/nsf08321/pdf/nsf08321.pdf.
[26] National Science Foundation. *Table 25: Women as a percentage of all doctoral degree recipients, by major field group: 1966-2006.* Retrieved June 29, 2009, from http://www.nsf.gov/statistics/nsf08321/pdf/nsf08321.pdf.
[27] Ibid.
[28] National Center for Women & Information Technology. (2009). *By the Numbers*. Retrieved June 29, 2009, from http://www.ncwit.org/pdf/BytheNumbers09.pdf.
[29] Society of Women Engineers. (February 2006). *General Position Statement on Science, Technology, Engineering, and Mathematics (STEM) Education and the Need for a U.S. Technologically-Literate Workforce*. Retrieved June 29, 2009, from http://societyofwomenengineers.swe.org/images/stories/SWE_STEM_Education_Statement.pdf.
[30] 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.
[31] Corbett, Christianne, Catherine Hill & Andresse St. Rose. (2010). *Why So Few?: Women in Science, Technology, Engineering, and Mathematics.* AAUW. Washington, D.C.
[32] Society of Women Engineers. (April 26, 2006). *Attitudes and Experiences of Engineering Alumni.* Harris Interactive Market Research.
[33] National Academies of Science. (2006). *Beyond Bias and Barriers: Fulfilling the Potential of Women in Academic Science and Engineering*. Retrieved June 29, 2009, from http://www.nap.edu/catalog.php?record_id=11741#toc.
[34] Commission on Professionals in Science and Technology. (2006). *Professional Women and Minorities: A Total Human Resources Data Compendium. 16th ed.*
[35] Layne, Margaret Edith. (June 19, 2007). "U.S. House Committee on Education and Labor Hearing, 110th Congress: Building on the Success of 35 Years of Title IX."

[36] National Center for Women & Information Technology. (2009). *By the Numbers*. Retrieved June 29, 2009, from http://www.ncwit.org/pdf/BytheNumbers09.pdf.
[37] 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 December 29, 2008, from http://www.nsf.gov/pubs/2000/cawmset0409/cawmset_0409.pdf.
[38] National Center for Women & Information Technology. (2009). *By the Numbers*. Retrieved June 29, 2009, from http://www.ncwit.org/pdf/BytheNumbers09.pdf.
[39] Thacker, Paul. (January 9, 2007). Progress Over the Long Term. *Inside Higher Ed*. Retrieved June 29, 2009, from http://www.insidehighered.com/news/2007/01/09/science.
[40] 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.
[41] Epstein, Jennifer. (June 12, 2007). Calling Would-Be Science Teachers. *Inside Higher Ed*. Retrieved June 29, 2009, from http://www.insidehighered.com/news/2007/06/12/teachers.
[42] Ibid.
[43] 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 on December 29, 2008, from http://www.nsf.gov/pubs/2000/cawmset0409/cawmset_0409.pdf.
[44] U.S. Department of Education (2008). *The National Science and Mathematics Access to Retain Talent Grant (National SMART Grant)*. Retrieved December 29, 2008, from http://studentaid.ed.gov/PORTALSWebApp/students/english/SmartGrants.jsp.
[45] 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.
[46]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 on December 29, 2008, from http://www.nsf.gov/pubs/2000/cawmset0409/cawmset_0409.pdf.
[47] Corbett, Christianne, Catherine Hill & Andresse St. Rose. (2010). *Why So Few?: Women in Science, Technology, Engineering, and Mathematics.* AAUW. Washington, D.C.
[48] Title IX of the Education Amendments of 1972, 20 U.S.C, § 1681-1688 (1972). Retrieved January 6, 2009, from http://www.usdoj.gov/crt/cor/coord/titleixstat.htm.
[49] 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.
[50] Society of Women Engineers. (February 2006). *General Position Statement on Science, Technology, Engineering, and Mathematics (STEM) Education and the Need for a U.S. Technologically-Literate Workforce*. Retrieved December 29, 2008, from http://societyofwomenengineers.swe.org/images/stories/SWE_STEM_Education_Statement.pdf.