WITH GREATER OPPORTUNITY TO STUDY and work in science, technology, engineering, and math (STEM), girls and women have made significant progress in these fields over the past 40 years. Nonetheless, barriers to equality remain. Stereotypes about male and female abilities in math and science—which are perpetuated by society but have been debunked by scientific research—affect opportunities for girls and women in STEM. Hiring and promotion practices in academia and elsewhere also can hold women back.

In a global marketplace that is increasingly driven by technology, leveling the playing field for women in STEM is an essential strategy for boosting U.S. competitiveness. Ensuring that all students have equal opportunities is key to creating an environment where talent and innovation can flourish in our schools, businesses, hospitals, research facilities, and government agencies.

Reasons for the STEM Gender Gap

The stereotype that boys are innately better than girls at math and science is pervasive in the U.S., but recent trends in achievement—as well as years of scientific research—demonstrate that this notion is simply incorrect. Although the number of women still lags behind the number of men in many STEM fields, the reasons for this gap are cultural
KEY FINDINGS

1. The achievement gap between male and female students in science, technology, engineering, and math (STEM) is steadily closing, but cultural biases and institutional barriers still hinder the advancement of girls and women in these fields.

2. Despite overall gains, women’s participation in some STEM fields has stagnated or even declined in the past decade. In addition, female attrition in STEM at every level of education is still high. This attrition comes at a devastating cost to U.S. competitiveness in the global marketplace.

3. Title IX compliance with regard to STEM education is essential in order to take full advantage of the potential of our country’s best and brightest minds to advance technology and innovation.

4. Increased awareness of Title IX protections, outcome-based investments in outreach and retention programs, institutional policies that ease restrictions on faculty who need time off to care for family members, and stronger monitoring of regulatory compliance would help ensure that our nation’s schools, colleges, and research institutions are fostering an environment that encourages women to stay and thrive in STEM fields.

CULTURAL BIASES

Scientific research has not demonstrated that innate differences exist between boys and girls in terms of mathematical or scientific abilities. Spatial reasoning abilities and math performance are not biologically “programmed” by gender; rather, they are influenced by social context and degree of gender equality in a society.

The impact of cultural bias on student interest and performance in STEM fields is well studied. In a recent large-scale study, researchers Kane and Mertz (2012) demonstrated that the societal influence of gender stereotypes and bias against women in science is related to gender differences in aptitude. They compared the scores of 300,000 eighth graders in 34 countries on a standardized math and science test with population scores on the Implicit Association Test on gender and science, the standard test for detecting unconscious bias developed by researchers at Harvard. Kane and Mertz’s study shows a strong link between the implicit gender-science stereotype of the country and the gender difference in test performance. This statistically significant correlation provides the most compelling evidence to date that differences between male and female students’ performance in math and science are caused by cultural, rather than biological, factors.

Implicit biases can have an impact on whether girls and women enter and stay in STEM fields. Gender biases can affect students in both overt and subtle ways. They may prevent female students from pursuing science and math from the beginning, play a role in their academic performance, and influence whether parents and teachers encourage them to pursue science and engineering careers. They may also directly or indirectly influence whether women are hired, as well as hinder the promotion rate and career advancement of female employees.

STEREOTYPE THREAT

Stereotypes about girls’ math and science ability can affect their performance through an effect called “stereotype threat”—the feeling of being judged by a negative stereotype, or fear of reinforcing that stereotype. Stereotype threat is known to negatively affect girls’ performance. In one landmark study, girls who were primed
to feel inadequate did significantly worse than their male peers on a challenging math test, whereas girls in the control group, who did not face a stereotype threat condition, scored similarly to the boys.\(^5\) In the decade since that investigation appeared, some 300 additional studies have been published that support this finding.

Recent gains in girls’ mathematical achievement demonstrate the importance of culture and learning environments on students’ abilities and interests. As learning environments have become more open since the passage of Title IX, girls’ achievement has soared. For example, the proportion of girls who score in the top 0.01% of seventh and eighth graders on the math SAT rose from 1 in 13 in the early 1980s to 1 in 3 more recently.\(^6\) This short-term closing of the gender gap provides further evidence that gender differences in math ability are not innate.

### Progress Since Title IX

Under Title IX, educational programs that receive federal funding are prohibited from discriminating on the basis of sex and must ensure equity in STEM education for all students. In addition, federal agencies that award grants to educational institutions are obligated to take steps to ensure that these institutions provide equal opportunities for women and girls in STEM education, including equal consideration in promotion and tenure for faculty.

Women and girls have made great progress in many STEM areas, but more needs to be done to achieve true gender parity. In fields like biology, psychology, and chemistry, girls now make up close to, or more than, half of those receiving bachelor’s or postgraduate degrees. Engineering and computer science, however, remain male-dominated.

**If girls are interested, they have the potential to go further... There are still lingering stereotypes that affect girls in middle school, and they lose interest in the subjects.**

---

**Physicist and astronaut**

**Sally Ride,**

first U.S. woman in space

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**K-12 Education**

Among secondary school students, the gender gap in math and science is closing. In high school, girls earn more credits and have higher grade point averages in math and science than their male peers.\(^8\) Girls are more likely to take biology, chemistry, and pre-calculus than boys are, although they are less likely to take physics.\(^9\) Despite these gains, the performance gap in standardized testing persists, as girls still perform lower than boys on the math SAT.\(^10\)

Girls are taking more advanced placement (AP) classes overall, but fewer go on to take AP tests in STEM fields. According to the National Center for Education Statistics, in 2009 only 17% of students who took the AP test in computer science were girls.\(^11\) The participation rates of girls in STEM-related programs of study in high school career and technical education continue to lag behind their participation in math and science, at only 20%.\(^12\) Even with girls’ growing participation and success in math and science at the K-12 level, this academic success very
often does not translate into a college major and ultimately career selection in a STEM field.

POSTSECONDARY EDUCATION

At the postsecondary level, women are less likely to select a STEM major than a non-STEM major, and are more likely than their male counterparts to switch to a non-STEM major during their first year of college. With the growing number of students choosing community college as their first college experience, the STEM gender gap on community college campuses across this country is concerning. In 2009, only 22% of associate's degrees in STEM were earned by women. Even more troubling, the percentage of associate's degrees awarded to women in STEM fields has declined by 25% over the last eight years.13 (See the chart below.)

The shifting educational experiences of women in college, including the presence of female graduate students, affect their persistence in STEM fields.14 One review of student enrollment in STEM courses over a nine-year period (2001–2009) found that attrition varied greatly by field. In biology, for example, women made up 56% of introductory classes and 60% of fourth-semester classes. In contrast, the proportion of women taking computer science declined from 31% in the first semester to just 17% in the fourth semester (see the table on the next page, top). High attrition in many STEM fields signals a cultural problem that needs to be addressed through institutional and attitudinal changes as well as broader participation of women in STEM fields.

Percentage of Associate's Degrees Awarded to Women by STEM Field, 2000–2001 and 2008–2009

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Biological &amp; Biomedical Sciences</td>
<td>67.9%</td>
<td>67.9%</td>
</tr>
<tr>
<td>Physical Sciences</td>
<td>46.8%</td>
<td>41.8%</td>
</tr>
<tr>
<td>Mathematics &amp; Statistics</td>
<td>36.3%</td>
<td>37.4%</td>
</tr>
<tr>
<td>Science Technologies</td>
<td>30.4%</td>
<td>41.8%</td>
</tr>
<tr>
<td>Computer &amp; Information Sciences</td>
<td>16.2%</td>
<td>24.7%</td>
</tr>
<tr>
<td>Engineering &amp; Engineering Sciences</td>
<td>13.9%</td>
<td>16.2%</td>
</tr>
</tbody>
</table>


Women are earning more bachelor’s degrees in some STEM fields in recent decades, most notably the biological and social sciences. Women’s representation in these fields has climbed steadily since Title IX passed, and women now earn more than half of degrees granted in psychology. In other areas, however—including mathematics, physics, and engineering—progress has remained stagnant over the last decade, and in computer science, the percentage of women earning graduate and undergraduate degrees has actually declined in recent years.

At the postgraduate level the numbers are similar, with women earning slightly over half of PhDs in the life sciences (including health and biological sciences) and 46% of PhDs in social sciences (including sociology and economics), but only 29% of PhDs in physical sciences (including astronomy, chemistry, physics, and earth sciences) and just over 20% of PhDs in computer science and engineering. (See the graph at the top of the next page.) Since the passage of Title IX in 1972, progress has been impressive across all fields in science, engineering, math, and medicine, with women’s share of PhDs rising from just 11% in 1972 to 40% by 2006. As noted, however, this growth varies widely by field.

### Women in Academia

While the proportion of female assistant professors is somewhat consistent with the number of female PhDs in STEM, women are less likely than men to be promoted to full professorship, tenure status, and the highest ranks of academia, such as deans and department chairs. This gap reflects a tradition of institutional practices that make it difficult for women to advance through the ranks of academia.

Women have made some gains; their representation among all tenured or tenure-track professor positions in STEM increased from 9.5% in 1979 to 28% in 2006. Yet women made up only 19% of full professors in these fields in 2006. As with other measures of achievement, attainment of full professor status varies by field, with women making up 33% of full professors in psychology and near or over a quarter in the social and life sciences, but only 5% in engineering and less than 9% in math and physical sciences. (See the graph at the bottom of the next page.) The percentage of female full professors in computer science has actually
Percentage of STEM Doctoral Degrees Awarded to Women by Field, 1972–2006

NOTE: Data on computer sciences was not collected until 1978.

Women as a Percentage of Full Professors by Field of Doctorate, 1973–2006

NOTE: Missing data points indicate years when data were not collected or the sample size was too small for statistical significance. See the source for further notes on the data.
declined in recent years, from 23% in 1999 to 17% in 2006.

The academic pipeline for women in STEM fields is perpetually leaking, with the attrition of women outpacing that of men at all levels, from undergraduate school through tenured professorship. Even though many women persist through the attainment of a PhD, women continue to leak out of the academic pipeline at each step of career transition and promotion.

Part of the problem is that the tenure track often coincides with prime childbearing age for female academics. Without flexible options such as stop-the-tenure-clock, having children can be detrimental to a female faculty member’s chances of promotion and tenure. Typically, faculty members who do not receive tenure within a certain amount of time after obtaining a PhD will be encouraged to leave the institution, although some institutions allow them to remain at the lower adjunct or assistant professor level. For faculty members who take time off to raise families, the lack of supportive policies is detrimental to their careers and ultimately harmful to the STEM workforce.

Women who marry, and especially those who have babies, are considerably less likely to advance than those who don’t; those with babies are 29% less likely to enter a tenure-track position than those who don’t, and married women are 20% less likely to enter a tenure-track position than their single counterparts. In contrast, having children does not seem to affect men’s likelihood of attaining promotions or tenure. Overall, women are 25% less likely to attain full professorship than men.16

### STEM Careers

As in academia, the culture and expectations in STEM careers can make advancement in the workplace difficult for women, particularly those with family obligations. According to National Science Foundation (NSF) statistics, women comprise 47% of the total U.S. workforce, including more than half of all professional and related occupations, but only 24% of workers in STEM fields.17

The range of female participation in different STEM careers varies widely. According to the NSF, 49% of the workforce in life and biological sciences is female, with the total number of women in these fields increasing by 50% over the past two decades. In contrast, the proportion of women working in engineering is still extremely low. Women made up 11% of engineers in 2009, up from 6% in 1983. Over the same time period, the percentage of female engineering technicians increased barely at all, from 18% to 19%.

### KEY RESOURCES ON WOMEN AND STEM


In mathematics and computer science, the proportion of women has actually declined, from 31% in 1983 to 25% in 2009. It is unlikely that women’s ability in these fields has deteriorated, so this decline more likely reflects working conditions or other factors that impede female participation.

At the same time, men have made gains in several areas within health care that have traditionally been dominated by women, a finding that highlights the benefits of equal opportunity in STEM for all workers. For example, men made up 22% of health technicians in 2009, up from 16% in 1983. Similarly, men comprised 8% of registered nurses in 2009, up from just 4% in 1983.

In addition, corporations are letting employees take advantage of more flexible work options. In 1991, the Bureau of Labor Statistics found that only 14% of women had flexible work schedules. As of 2007, that number had climbed to 26%. This flexibility will give female employees more opportunity to stay in their STEM careers.

As the global marketplace becomes more focused on technology and innovation, it’s important to ensure that men and women have equal opportunities to participate and advance through the STEM pipeline. The attrition of women and girls from STEM fields does not benefit their male counterparts; rather, it incurs a major opportunity cost to our nation’s economic competitiveness in science and technology. Institutional and workplace policies that promote the full participation of women are needed in order to take advantage of our nation’s capacity for innovation.

Raising Awareness of Title IX and STEM

Those who look at the website of the U.S. Department of Education’s Office for Civil Rights (OCR), the federal agency that regulates and monitors compliance with Title IX, might assume that Title IX protections from sex discrimination in education apply only to sexual harassment, pregnancy, and athletics. In fact, Title IX also protects girls’ and women’s right to equality in STEM education, including equal access to academic and career and technical education courses; school-sponsored activities at the elementary, middle, high school, and college levels; and equal compensation, lab space, and institutional resources at research universities.

For example, if the use of a counseling test or other instrument results in a substantial underrepresentation of women in STEM courses, the school must take action to ensure that such disproportion is not the result of discrimination in the instrument, its application, or counseling practices in order to be in compliance with Title IX. Unfortunately, however, infractions often go unreported because many students—and even educators—do not realize that Title IX applies to STEM.

Raising awareness of existing protections is essential for ensuring that girls and women have equal access to education and careers in STEM. Often individuals who are responsible for Title IX are not aware of their responsi-
bilities as Title IX coordinators. Explicit and accessible instructions from the Department of Education on their duties and directives in relation to STEM education would allow schools to oversee compliance more effectively. On campuses and in national laboratories, advertisements or other awareness efforts would help boost compliance and therefore reduce the risk of institutions losing their federal funding.

Federal science agencies, which are responsible for ensuring that academic institutions to which they offer grants comply with Title IX, have an uneven track record in monitoring compliance. NASA has done over a dozen Title IX and STEM reviews since 2005. The agency has also published a comprehensive best practices report that can be used as a model for this type of activity, as well as other resources.1 The Department of Energy has done half a dozen reviews, and is now implementing the NASA model. The NSF and other federal science and engineering agencies have been less rigorous. Greater pressure from granting agencies would help promote equity in STEM education, including in hiring, promotion, and tenure practices.

NCWGE Recommendations

- The Department of Education guidelines for Title IX coordinators, which outline their responsibilities in ensuring equality in STEM education, should be broadly disseminated and publicized.
- Congress should direct federal, state, and local agencies to establish outreach and retention programs at the elementary, secondary, and postsecondary levels to engage girls and women in STEM activities, courses, and career development.
- Colleges and universities should establish standardized guidelines for tenure-track eligibility and offer a stop-the-clock option for women and men with small children.
- Federal grants should include interim technical support for researchers needing to take a leave of absence for care-giving purposes, and cover the cost of child care during travel that is related to the grant.
- Gender bias training is needed for awards selection committees and faculty department evaluators.

“[I love science and I like seeing how things work. I love to take things apart and see if I can get them back together. I always try to figure out how things work.]”
—Preteen girl, Austin, TX

“I think [STEM work] can be very rewarding in the end when you get the result that you were looking for, or when you find a completely different result than what you were looking for; just knowing that you were able to start from a question or hypothesis and work to find this result that could possibly make a big difference in people’s lives.”
—Teenage girl, Indianapolis, IN

“Everyone knows about teaching as a career, but not everyone our age really thinks about engineering. They don’t know all that much about it.”
—Preteen girl, Wilmington, DE

“My dad always tells me this is where you have the potential…not arts, but engineering. If you have the support it makes you believe in it, even if nobody else does.”
—Teenage girl, Austin, TX

“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 far away from it.”
—Teenage girl, Indianapolis, IN

chairs, professors, deans, and administrators at all levels of the STEM pipeline.

- All federal science agencies should conduct Title IX and STEM reviews to ensure that their grantee institutions are providing equal opportunities for women and girls in STEM, including education for students and promotion and tenure for faculty.

References


16. Leaks in the Academic Pipeline for Women. Available at http://ucfamilyedge.berkeley.edu/leaks.html/.


18. Ibid.


As part of its general ban on sex discrimination in schools, Title IX outlawed discrimination in career and technical education (CTE) classrooms. Forty years later, male students continue to predominate in courses that lead to many high-skill, high-wage jobs, while female students make up the majority in the low-wage, low-skill programs. These enrollment patterns reflect, at least in part, the persistence of sex stereotyping and discrimination.

Lowering the barriers to female enrollment in CTE is a key step in reducing the wage gap between male and female workers. Given worldwide demand for workers with technical knowledge, increasing female participation in CTE is unlikely to come at the expense of their male counterparts; rather, by increasing the total pool of skilled workers, it will help keep the United States competitive and benefit the economy as a whole.

Encouraging gender equity in CTE will also reduce barriers for males seeking entry into fields traditionally occupied by female workers, including high-growth areas such as nursing and other medical professions. Thus, ensuring equitable participation in CTE by eliminating discriminatory practices and increasing the engagement of women and girls in STEM has important implications for all students.

A Path to Economic Growth

CTE prepares both youth and adults for a wide range of careers. These careers may require varying levels of education, including industry-recognized credentials, postsecondary certificates, and two- and four-year degrees.
TRAINING SKILLED PROFESSIONALS

CTE is offered in middle schools, high schools, career and technical centers, community and technical colleges, and other postsecondary institutions. According to the U.S. Department of Education’s Office of Vocational and Adult Education, almost all high school students take at least one CTE course, and one in four students take three or more courses in a single program area. One-third of college students are involved in CTE programs, and as many as 40 million adults engage in short-term postsecondary occupational training. CTE is organized around 16 career clusters\(^1\) based on a set of common knowledge and skills that prepare learners for a full range of opportunities.

Currently, 12% of the U.S. population aged 18–24 is enrolled in a two-year college.\(^2\) Enrollment at these colleges has increased steadily over the past two decades. As of 2011, a record 43% of all college undergraduates were enrolled in community colleges.\(^3\) About one-fourth of community college students are parents, and 10% are single mothers.\(^4\)

Interest in postsecondary CTE has grown as a result of the recession, the high cost of four-year colleges, and the Obama Administration’s focus on the necessity of a postsecondary degree and industry-recognized credentials to ensure skilled workers for industries needed to expand the U.S. economy.

THE WAGE IMPACT OF CTE

Most working women who do not have a four-year college degree are concentrated in relatively few occupations, primarily in retail sales, services, and clerical positions.\(^5\) As the figure on the next page shows, these female-dominated professions pay considerably less than male-dominated technical professions. With the exception of registered nursing and teaching, the largest traditionally women’s occupations do not pay economically secure wages capable of supporting a family.\(^6\)

Today more young women than young men place great importance on their ability to have a high-paying career or profession, according to the Pew Research Center.\(^7\) Through CTE, women can gain the knowledge and skills required to enter higher-paying, “nontraditional” occupations for women, defined by law as those in which less than 25% of the workforce is of their gender.\(^8\) For example, a woman working as a surveying technician—a nontraditional field for women—can earn an average annual wage of $63,000,\(^9\) while a woman working as an administrative assistant—a traditional field for women—will earn an average annual wage of just $32,188.\(^10\)

Expanding access to high-paid technical occupations can be a major factor in shrinking the gender wage gap. To achieve this end, partici-
participation and achievement in CTE should not be bound by sex separation in education, gender stereotypes, harassment, or other barriers that prevent girls and women—including single mothers, pregnant and parenting students, displaced homemakers, and welfare recipients—from becoming economically self-sufficient.

### Impact of Title IX on Equity in CTE

Title IX sought to end discrimination in CTE among educational institutions that routinely denied students admission into classes deemed “improper” for their sex.

Historically, vocational classes were restricted by gender. Males took shop and automotive courses, while females took classes in child care, cosmetology, typing, and home economics. Separation by gender reinforced social stereotypes about what was considered “women’s work” and “men’s work.”

Title IX made it unlawful for schools to steer students into career and technical education classes based on their gender. Further, it required schools take steps to ensure that disproportionate enrollment of students of one sex in a course was not the result of discrimination. (For more details on the legislation and how it has evolved, see the section beginning on page 31, titled “Title IX Regulation and Enforcement.”)

### Barriers to Equality

Although discrimination is unlawful, barriers to equality in CTE remain high. Hurdles range from a lack of role models and information on nontraditional fields to overt discrimination.
Female students also face career counseling biased by gender stereotyping, unequal treatment by teachers, and various types and degrees of sexual harassment.

Girls and women are discouraged from pursuing traditionally male training programs in ways that are both subtle—such as an instructor inadvertently allowing male students to monopolize attention—and not so subtle—such as a guidance counselor telling a student that an electronics course is “not for girls.” Those who brave the barriers to take nontraditional courses often face an unwelcoming atmosphere, and many report harassment by fellow students or even teachers.

Males may be similarly discouraged from taking nontraditional courses, including courses in relatively high-growth, high-wage fields such as nursing, as well as in lower-wage fields like child care. Title IX is gender-neutral and applies to males as well as females, so discrimination in these settings is also unlawful.

OPPORTUNITIES FOR GROWTH
In the 40 years since the passage of Title IX, there has been a slight, gradual increase in the number of women and girls in technical and other occupational programs leading to nontraditional careers. According to an analysis of data from the U.S. Department of Education’s Office of Vocational and Adult Education (OVAE), conducted by the National Coalition for Women and Girls in Education (NCWGE) CTE task force, women’s participation in CTE programs leading to nontraditional careers has increased from close to 0% in 1972 to over 25% nationally in 2009–2010. Because of the lack of uniform definitions and reporting procedures, however, much of the gain may be attributable to female participation in broadly defined categories such as arts, audio-visual technology, and communications. Men have also made gains in nontraditional fields, with those preparing for teaching and nursing careers, relatively high-paying occupations, growing steadily.

The federal statute that funds CTE, the Carl D. Perkins Career and Technical Education Act of 2006 (known as the Perkins Act), requires states to set targets for performance on a measure of nontraditional enrollment and completion by gender. As the following chart indicates, a handful of states have boosted female participation and completion to unprecedented levels. Six report female participation in nontraditional fields of more than 40% at the secondary level, and five report completion rates at the postsecondary level of 45% or more—well above the national average of 28% and 27%, respectively.

Despite women’s gains in nontraditional fields as a whole, the rate of female enrollment in certain career clusters remains at stubbornly low levels, with some well beneath the 25% threshold. As shown in the figure on page 32, females made up less than 25% of participants in science, technology, engineering, and math programs nationally (21% at the secondary level and 24% at the postsecondary level), and much lower numbers in manufacturing (17% and 11%, respectively); architecture and construction (15% and 10%); and transportation, distribution, and logistics (8% and 7%).

Experience shows that obstacles to equity in CTE can be overcome by a commitment to change from the institution’s leadership.
Schools that have taken measures such as assigning staff to monitor and coordinate activities, providing specialized professional development for career counselors and educators, forging partnerships with employers, and introducing students to role models have had success in enrolling and retaining students in CTE focused on areas that are nontraditional for their gender.\textsuperscript{15}

**Title IX Regulation and Enforcement**

Gender equity in CTE is influenced by the statutes and regulations governing career and technical education. The Perkins Act, the key statute governing equity in CTE, has undergone several iterations, with accompanying shifts in requirements and funding. It is due for reauthorization by Congress in 2013.

**Evolving Legislation**

In 1976, Congress amended the Vocational Education Act to require that each state hire a “sex equity coordinator” and provided $50,000 for each state to support this position. In 1979, the Office for Civil Rights issued guidelines to reduce discrimination in vocational education. The guidelines required states to collect and report data, conduct compliance reviews, and provide technical assistance.\textsuperscript{14}

The high water mark for the designation of federal of resources for integrating girls and women into CTE was arguably attained with passage of the Carl D. Perkins Vocational Education Act of 1984. With that measure, Congress not only retained the required sex equity coordinators but also required states to set aside 3.5% of their funding for programs to eliminate sex bias and stereotyping, plus another 8.5% for serving individuals with significant barriers to occupational skill training, including displaced homemakers returning to the workforce after caring for family members, single parents, and pregnant or parenting teens. From 1984 through 1998, an average of $100 million a year was spent on programs to eliminate sex bias in career and technical education.\textsuperscript{15} By 1997, the number of sex equity programs exceeded 1,400 across the country.\textsuperscript{16}

In 1998, the reauthorization of the Perkins Act removed most of these requirements and set-asides except for a small reserve of $60,000 to $150,000 a year for state “leadership activi-

**States with High Female Participation in Nontraditional Perkins-Funded CTE Programs, 2010**

<table>
<thead>
<tr>
<th>SECONDARY PARTICIPATION OF 40%+</th>
<th>POSTSECONDARY COMPLETION OF 45%+</th>
</tr>
</thead>
<tbody>
<tr>
<td>District of Columbia</td>
<td>District of Columbia</td>
</tr>
<tr>
<td>Iowa</td>
<td>Nevada</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>New Mexico</td>
</tr>
<tr>
<td>New Mexico</td>
<td>Oregon</td>
</tr>
<tr>
<td>New York</td>
<td>Tennessee</td>
</tr>
<tr>
<td>Washington</td>
<td>National average=28%</td>
</tr>
<tr>
<td>National average=27%</td>
<td>National average=27%</td>
</tr>
</tbody>
</table>

Secondary and Postsecondary Female Enrollment by Career Cluster, 2009–2010

<table>
<thead>
<tr>
<th>Career Cluster</th>
<th>Secondary</th>
<th>Postsecondary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education &amp; Training</td>
<td>76.8%</td>
<td>77.7%</td>
</tr>
<tr>
<td>Health Science</td>
<td>55.3%</td>
<td>54.6%</td>
</tr>
<tr>
<td>Human Services</td>
<td>49.7%</td>
<td>49.5%</td>
</tr>
<tr>
<td>Hospitality &amp; Tourism</td>
<td>42.5%</td>
<td>43.7%</td>
</tr>
<tr>
<td>Marketing Sales &amp; Services</td>
<td>38.2%</td>
<td>37.0%</td>
</tr>
<tr>
<td>Finance</td>
<td>27.1%</td>
<td>40.8%</td>
</tr>
<tr>
<td>Arts, Audiovisual Technology, &amp; Communication</td>
<td>21.1%</td>
<td>23.9%</td>
</tr>
<tr>
<td>Business, Management, &amp; Administration</td>
<td>11.0%</td>
<td>15.1%</td>
</tr>
<tr>
<td>Law, Public Safety, &amp; Security</td>
<td>15.1%</td>
<td>9.6%</td>
</tr>
<tr>
<td>Government &amp; Public Administration</td>
<td>11.0%</td>
<td>8.1%</td>
</tr>
<tr>
<td>Information Technology</td>
<td>9.6%</td>
<td>7.1%</td>
</tr>
<tr>
<td>Agriculture, Food, &amp; Natural Resources</td>
<td>8.1%</td>
<td>7.1%</td>
</tr>
<tr>
<td>Science, Technology, Engineering, &amp; Math</td>
<td>38.2%</td>
<td>37.0%</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>16.8%</td>
<td>15.1%</td>
</tr>
<tr>
<td>Architecture &amp; Construction</td>
<td>15.1%</td>
<td>9.6%</td>
</tr>
<tr>
<td>Transportation, Distribution, &amp; Logistics</td>
<td>8.1%</td>
<td>7.1%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>46.0%</td>
<td>56.4%</td>
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ties” for students preparing for nontraditional careers. The law created performance measures requiring states to increase participation in and completion of nontraditional CTE programs among students of underrepresented genders. This “nontraditional measure” was one of four core performance measures for the entire Perkins program. The law provided no sanctions or incentives for improvement, however, thereby creating a culture of limited activity at the state and local level.

The most recent iteration of the law, adopted in 2006, continued the approach of requiring states to meet negotiated targets for placing males and females into programs leading to nontraditional occupations. For the first time, however, the law authorized sanctions and required triggers for state and local improvement plans for not meeting performance measures. The legislation also retained the $60,000–$150,000 state leadership set-aside for individuals preparing for nontraditional fields.

Looking Ahead

In April 2011, the Department of Education released its blueprint for reauthorization of the Perkins Act, which stressed the development of rigorous CTE shaped by four core principles:

1. Effective alignment between CTE programs and the labor market to prepare students for in-demand occupations in high-growth industry sectors.

2. Strong collaborative efforts among secondary and postsecondary institutions, employers, and industry partners to improve the quality of CTE programs.

3. Meaningful accountability for improving academic outcomes and building technical and employability skills in CTE programs for all students. [emphasis added]

4. Increased emphasis on innovation through state policies that support effective practices at the local level.

The word “nontraditional” does not appear in the 14-page blueprint, which ultimately needs to be refined, translated into statutory language, and adopted by Congress, a process not expected to be completed until 2013.

Without referring specifically to programs leading to nontraditional careers, the proposal would require states to collect data to “identify equity gaps in performance on the local and state levels, including where students of a particular background (including gender) are disproportionately enrolled in or absent from certain programs.” In addition to gender, state and local data would be collected on students’ race, ethnicity, disability, socioeconomic status, and English proficiency. States would be required to improve their data collection systems and use common definitions and performance indicators.

The blueprint also calls for requiring states to provide “wrap-around” supports such as tutoring and counseling to ensure that there are no equity gaps in participation or performance in CTE programs. In another dramatic change, it
SUCCESSFUL CTE EQUITY PROGRAMS

**STEM Equity Pipeline**
The National Alliance for Partnerships in Equity Education Foundation’s STEM Equity Pipeline started in 2007 with support from the National Science Foundation (NSF) and is now supported by corporate, foundation, and federal funds. The STEM Equity Pipeline provides a suite of professional development offerings focused on increasing the participation and completion of women in high school and community college science, technology, engineering, and math (STEM)-related programs of study. By working with state leadership teams, the project has been successful in influencing state policy, increasing resource investment, and integrating gender equity into professional development for STEM educators in 12 states.

Local pilot sites implement the Program Improvement Process for Equity in STEM™ (PIPESTEM™), where teams of administrators, teachers, counselors, and students conduct a performance gap analysis and implement research-based strategies to increase female participation in STEM programs. Outcomes include an increase in Project Lead the Way (pre-engineering) participation from 8 to 30 girls at one site and from 0 to 21 (33%) at another; an increase from 0% to 43% women in design technology; an increase in females in auto technology from 12% to 36%; and an increase of senior girls in advanced-level math from 15% to 55% in two years.

**WomenTech Extension Services**
The National Institute for Women in Trades, Technology, and Sciences (IWITTS) received a $2 million NSF grant for a project at eight community colleges in California to develop and expand a model for closing the gender gap. Each college identified two nontraditional programs, including 3D animation, computer networking and information technology, HVAC (heating, ventilation and air conditioning), welding, electronics, and automotive technology. The first cohort started in 2007, and female enrollment has increased annually in six of the eight colleges. At one college, women’s retention rose from 81% to 100% in 15 months.

**Grace Hopper Scholars Program, Community College of Baltimore**
The Scholars Program encourages women and other underrepresented groups to pursue careers in computer science and related fields, such as information technology and computer-aided design and graphics. Ninety percent of the students are women, and students of color exceed their representation in the overall student body. Full-time Scholars are five times more likely to complete an associate’s degree or certificate than the overall student body.

Scholarships of up to $3,125 are available to help cover tuition, fees, books, supplies, equipment, transportation, and dependent care; low-cost day care is available on campus. Students receive a $300 incentive to complete their first math credit or 200-level computer course. Retention is encouraged through community-building, including assigned industry mentors and a mandatory summer skill-development program.

**St. Paul College**
St. Paul College, a community and technical college in St. Paul, MN, has engaged in aggressive recruiting to attract more men to the health care profession, and respiratory care in particular. The number of men enrolled in the college’s respiratory care program has increased dramatically. In 2002, the program had only 5 male participants. By 2006, that number had jumped to 88 out of a total 169 enrolled students, or 52%. Male graduation rates post similar numbers; since 2005, males have made up anywhere from 42% to 62% of respiratory care graduates.

**Connecticut Regional Center for Next-Generation Manufacturing**
The NSF has funded the Connecticut College of Technology (COT), a virtual organization serving 12 community colleges, to prepare students for STEM careers in high-demand fields such as green technology, lasers, photonics, precision manufacturing, and alternative energy. The program allows high school students to take and receive credit for dual-enrollment programs in engineering and technology at nearby community colleges. Women’s participation between
calls for states to use a competitive process to allocate funds to local consortia of secondary and postsecondary schools.

As the Administration and Congress move toward reauthorizing the Perkins Act, striking a balance between the carrot and the stick approach will be important. For the statute to be effective, it needs to dedicate resources to activities that promote gender equity in CTE while at the same time maintaining the performance targets and sanctions embedded in the 2006 accountability measures.

NCWGE Recommendations

- Congress should continue to include accountability measures, improvement plans, and sanctions that hold states and municipalities accountable for increasing women’s completion of CTE programs that prepare them for high-wage careers in which they represent less than 25% of the workforce.
- The Office for Civil Rights (OCR) should collaborate with OV A E and better align its Methods of Administration process for ensuring Title IX compliance in CTE with OV A E’s processes for monitoring compliance and providing technical assistance to states.
- OV A E should create a national network of research and practice experts who can provide professional development and technical assistance on building programs that increase gender equity in CTE.
- States and municipalities should be required to report and use disaggregated data at the program level to identify performance gaps and drive program improvement. To best target improvements, gender-specific data must be cross-tabulated with other demographic characteristics, including race, socioeconomic status, disability, and parental status.
- Increasing women’s participation in and completion of high-wage CTE programs should be included as a criterion for any incentive program proposed in future CTE legislation.
- Congress should legislate requirements for leadership and resource investment at the state and local levels to implement research-based strategies for increasing female participation and achievement in nontraditional CTE programs.
- Federal, state, and local decision making must include gender equity in CTE as a quality standard for investments in program development, improvement, and expansion.
References

1. For more information about the 16 career clusters, see http://www.careertech.org/career-clusters/glance/clusters.html/.


12. Ibid.


