

# Has the Gender Gap Closed?

## Yes

A gender gap, by definition, is a disproportionate difference or disparity between the sexes. Conventional wisdom is that differences between boys and girls in math and science are not a matter of biology; any observable differences are influences of the social environment. When parents encourage school-age children to excel in all subject areas, the school-based gender gap disappears.

In the workplace, gender gaps refer to job opportunities and salary differences. Statistics show that men often earn more for the same work than women. The difference may be a result of the fact that men have been at the top of their professions longer. It takes a long time to undo the past, but bit by bit, the playing field has become more even.



By Gertrude Abramson

College majors are based largely on pre-college subject mastery; change reflects and must begin in early grades. My mom went to college in the late 1920s, when most of her classes were predominantly

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Looking at the past 20 years of gender equity research in the areas of science, technology, engineering, and mathematics education (STEM), it is clear that progress has been made, but that in some areas the gender gap persists at alarming levels, for example in physics and computer science.

One of the best (although admittedly limited) ways to explore the gender gap in schools is to look at who is taking AP exams in the traditional STEM disciplines. According to the College Board's 2006 Report to the Nation ([http://www.collegeboard.com/about/news\\_info/ap/2006/](http://www.collegeboard.com/about/news_info/ap/2006/)), there has been considerable progress. In 2005, 59% of the students who wrote the biology exam were female, as were 48% of



By Chris Stephenson

those who wrote the calculus exam, and 46% of those who wrote the chemistry exam. The numbers, however, drop to 35% for the physics exam and a startling 15% for the computer science exam.

In 1997, Tracy Camp published a ground-breaking article titled *The Incredible Shrinking Pipeline* outlin-

male, although she majored in English literature. Dad's graduation picture from law school in 1933 shows a class that is 100% male. My husband Ted and I attended the same public college in the late 1950s. Most of Ted's math and physics classes were all-boy and most of mine, in elementary education and English literature, were almost all-girl. In the late 1970s and early 1980s, our daughters, one who majored in business and the other in drama, reported that most classes were truly representative of both genders. Currently, two of our granddaughters are in high school and one in the seventh grade. They, and their peers, compete successfully with the boys across the subject areas and in extracurricular activities. One reported, "Everyone knows that Jessica is the math whiz." Her gender is not significant.

In the 1960s, Phi Delta Kappa (PDK), the premiere society in education, was open only to males. Coedu-

cational membership in PDK became a reality, first in select chapters, later everywhere. The first time I spoke at the conference of the Society for Applied Learning Technology in 1988, I was the only female speaker of the eight for the day, and I addressed a largely male audience. The ratio of male-to-female speakers has become about 50-50, and a similar ratio has evolved in the attendees.

Although certain professions such as computer science, engineering, and physics are still heavily male, at least in the United States, women have become viable players in medicine, law, and business. There are more male full professors than there are female but much of that is legacy; women are catching up. My globally based doctoral students, graduates, and peers include women professors of computer science, math (not just math education), and technology.

Also, you can find female directors of training, vice presidents of colleges, chief librarians, upper level members of the CIA and FBI, officers of the armed forces, and more.

I have lived through the closing of the gender gap. Years ago, my friend Sylvia Charp, who was the first district computer coordinator in the United States, observed that we could count our peers (women in educational technology) on 10 fingers. That disparity is a thing of the past. Today's educational gap is the digital divide.

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ing the extent to which women were underrepresented at every stage of the computer science educational pipeline ([http://www.mines.edu/fs\\_home/tcamp/cacm/paper/html](http://www.mines.edu/fs_home/tcamp/cacm/paper/html)). In the 1993-94 academic year, while women made up 50% of high school computer science classes, fewer than 28.4% of the bachelor's degrees, 25.8% of the master's degrees, and 15.4% of the PhDs were awarded to women. At the same time, only 15.6% of the assistant professors and 5.7% of the full professors in computer science were women.

Camp's article (and similar studies) prompted a number of major educational interventions by individual researchers and groups such as the Association for Computing Machinery and the American Association of University Women. Research was conducted and strategies were devised. One the most important pieces of research to come out of this effort was a four-year study conducted at Carnegie Mellon Univer-

sity by Jane Margolis and Allan Fisher involving university computer science students, college faculty, and high school teachers, published in 2002 in the book *Unlocking the Clubhouse: Women in Computing*. This study uncovered a culture of computing that was both explicitly and implicitly hostile to women and provided a set of recommendations that included improving the course content, pedagogy, and culture.

One would, of course, hope that these kinds of studies would lead to significant improvements, but in the four years since Margolis and Fisher's study, the situation has actually gotten worse, especially in the high schools. In 1999, 17% of the high school students who took the APCS exam were females (compared to physics at 20%, chemistry at 42%, calculus at 47%, and biology at 56%). By 2002, 16% of the students taking the APCS A exam were female (the number dropped to 10% for the

advanced AB exam). By 2005, the percentage of females taking either the A or AB exam had dropped to 15%.

We need to take a long hard look at not just what and how we teach, but at the serious misconceptions our students have about the discipline of computer science and the educational and career opportunities it provides. Despite the negative media focus on offshoring, every economic prognostication indicates that our need for highly skilled technical workers will continue to grow. Doing a better job of engaging, teaching, and inspiring young women in computer science will improve the educational experience for all students. A rising tide raises everyone.

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