The Mathematics Gender Gap

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It seems that the stereotype about girls and math is so engrained into our collective consciousness that it is simply accepted as fact. Fortunately, much serious research has been done into if and why boys outperform girls in mathematics. Are boys genetically predisposed to excel in mathematics? Or perhaps the stereotype is now outdated and equal opportunity education has finally enabled girls to close the gender gap completely. Or, does the gender gap persist merely because society expects it to? A consensus about the nature of the gender gap does not yet exist, but a consensus is not necessary for educators to take action in providing a truly equal opportunity mathematics education.

Many standardized test results tell us that while the gender gap does in fact exist, it is not universal. According to the American Association of University Women (AAUW) Report, *How Schools Shortchange Girls* (1992), while boys and girls score equally well when their mathematics education begins, boys eventually outscore girls as their education progresses and higher math skills are evaluated. The *Third International Mathematics and Science Study* (Mullis, Martin, Fierros, Goldberg & Stemler, 2000) confirms this, noting that the international gender gap increases with age.

It is imperative to recognize that standardized tests are by no means the final authority on intelligence, nor are they predictors of future success. Kessel and Linn (1996) refer to numerous studies showing that, among students with similar scores on the math SAT, girls tend to perform better in college math courses. Are SAT tests biased against women, or does the university setting ill suit men's learning style? Either way, something is amiss.

The disparity in test performance is troubling, but it is not the only evidence of a gender gap. Participation in mathematics fields is also a key issue. *Gender Gaps, Where Schools Still Fail Our Children* (AAUW, 1998), a follow-up to *How Schools Shortchange Girls*, notes that while the trend is decreasing, it is still the case that girls are not participating in higher-level mathematics courses as frequently as boys. The up-and-coming field of computer science, for example, remains male dominated. "In 1996, girls comprised only 17 percent of AP test takers in computer science" (AAUW, 1998, p. 4). At the college level, the majority of mathematics-related majors are male. Boys participating in physics and calculus courses in high school were three times more likely to intend to major in science and engineering than were their female counterparts (AAUW, 1992).

There is some debate over the origins and causes of the mathematics gender gap. Some research shows that our society bears a good deal of the responsibility for girls' underperformance. As an example, studies have shown that teachers unintentionally favor boys in the classroom. Sadker and Sadker's research (as cited in AAUW, 1992) indicated that teachers called on boys more than girls in school. In addition, when boys shouted out an answer, the teachers tended to listen; yet when girls shouted out, they were reprimanded. Specifically in mathematics classes, it has been reported that teachers tend to concentrate on a select group of high-performing, almost exclusively male students, often to the exclusion of other students. (Eccles, as cited in AAUW, 1992)

There are several theories that attempt to use inherited sex differences to explain why boys perform better than girls in mathematics fields. Among the participants in their study, Geary, Saults, Liu & Hoard (2000) noted that "There was no sex difference on the IQ test, but males showed significantly higher mean scores on the arithmetical computation, arithmetical reasoning, and spatial cognition measures" (p. 337). The implication is, among boys and girls of roughly equal intelligence, boys have certain math skills that would put them at an advantage in mathematics learning and evaluation. In another study, Royer & Wing (2002) found that males were faster at math fact retrieval, which put them at an advantage in tests. They concede that their theory "only pertains to test performance. That is, there is no reason that an advantage in math fact retrieval would influence any aspect of mathematics performance other than that related to performance on speeded tests" (para 19).

This of course begs the question: should standardized tests be altered so that men do not have an advantage due to possible natural strengths? Certainly Royer & Wing's statements (2002) regarding the advantage of faster math fact retrieval pertaining only to standardized tests would indicate that tests should indeed be rewritten to avoid that bias. But what about spatial recognition? Some might argue that if men do indeed possess this inherent skill, it would be unfairly penalizing them by not recognizing it. I disagree. If it is true that women are at a disadvantage regarding spatial recognition, many women have overcome it. This is evidenced in women's performing above and beyond what their test scores would suggest. Since, therefore, a natural inclination for spatial recognition is not a skill required to excel in practical situations, it is only logical that it should not be included in a measure of mathematical potential.

What can be done to reduce the gender gap? Quite a bit, research tells us. Studies show that teacher education and certification programs can do much more in gender equity education. Campbell & Sanders (1997) found that, "Although most professors [of education] say they cover gender equity, few give much time to it. Two thirds spend two hours or less per semester; a third spend one hour or less" (p. 71). They continue to note that very few states have language in their education policies that specifically mention gender (or equality) as a consideration in pedagogy. The AAUW (1992) also lists among its recommendations that state boards of certification require more gender issues course work and research.

Michael Gurian has a different suggestion. Rather than address issues of equity, we should accept that men and women think differently and teach them accordingly. As women are not inclined to mathematics, it is unfair to expect that half of the mathematicians emerging from our schools be women:

> We are not going to get fifty percent female politicians and mathematicians. Why? Because to get to the top, you're going to need more testosterone. All those women who are trying to become politicians are fighting men with up to twenty times more testosterone (Swainson, 2002, para 11-12).

An interesting, if not callous, point. But I believe Gurian misses the mark. Children are not being encouraged to pursue fields that are beyond their abilities or interests, as he implies. Of course educators cannot ignore the fact that boys and girls do have different life experiences and perspectives. But to relax expectations of girls due to perceived difficulties is a poor excuse for lowering standards. It allows laziness to creep into the curriculum, and makes it far too easy to dismiss girls who are not fulfilling their potential as "at their limit." Our methods and understanding must adapt, not our expectations.

The AAUW (1998) states, "Simply offering boys and girls the same menu of career choices without actively encouraging them to consider nontraditional fields does little to change the status quo" (p. 7). Gender equity is all about changing the status quo. Girls have been and continue to be shortchanged. Improvements have been made and progress must continue. Mathematics is one of the cornerstones of our curriculum. To allow the system to continue without addressing all of its inequities is truly leaving our girls behind.

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