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Choke

A look into what the secrets of the brain reveal about success and failure at work and at play

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Women in Math and Science: It's Not about Daring to Discuss, It's About Discussing What is Important

Girls aren't given the chance to reach their mathematics potential

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Last week, John Tierney of the New York Times wrote a column, "Daring to Discuss Women in Science, " in which he questioned a proposed law designed to enhance gender equality in science and engineering. Tierney brought up new research pointing to sex differences in aptitude for math and science and, in a nut shell, suggested that if existing inequalities reflect naturally occurring sex differences, maybe we shouldn't be so quick to cry bias.

Usually, I read columns like Tierney's, shake my head, and move on. But, this time, I feel compelled to comment. Maybe it's because I am on vacation and have a minute to think about something other than getting grants, publishing papers, and finding jobs for my postdocs and graduate students. But, really, I think I am just over what seems like the

perpetual presentation of "new data" that "finally" explains gender inequality in terms of inherent sex differences in math and science aptitude.

Tierney brings up a number of points in his column, but I am going to focus on just one that I think is particularly important to address: the idea that there is strong evidence for innate sex differences at the highest end of the ability continuum. Tierney begins with the 1980 Benbow and Stanley data, in which the researchers found that, by age 13, boys outnumbered girls 13 to 1 in terms of top scores on the SAT-M. To be fair, Tierney also points out that, by 1991, this 13 to 1 imbalance had dropped to 4 boys for every 1 girl, and suggests that increased math opportunities for girls might explain the drop. But this is where Tierney thinking goes awry. He goes on to suggest that since the gender gap still exists today - in a climate where encouragement and support for girls in math is strong - then maybe socialization cannot account for the sex differences that remain.

First, according to my research, as of 2005, there were 2.8 (not 4) boys to every 1 girl scoring at the top on the SAT-M.1 But, whether the gap is 4 or 2.8 to 1, the issue is still the same. If girls and boys are being given the same opportunities, why is there still a gap at all?

To be frank, this question doesn't deserve an answer because, at least in terms of socialization and support for math achievement in the U.S., girls and boys are not yet on equal footing. This is true even at the high-end of math abilities where it has been suggested that boys are more likely to reside than girls because boys are more variable in their math-related aptitudes (by the way, this variability view means that there will be more boys at the bottom too).

Take data provided from the American Mathematics Competitions or AMC.2 The AMC are a series of contests sponsored by the Mathematical Association of America, held annually at more than 3,000 high schools across the U.S. Students who perform well on an initial AMC test are invited to participate in the American Invitational Mathematics Examination. Students who perform well on this exam are invited to the highly prestigious U.S. Mathematical Olympiad.

As an initial part of the AMC, students are asked to complete 25 problems in 75 minutes. Here is an example from one of the 2007 tests, the AMC 12 (for twelfth grade or below):

How many three-digit numbers are composed of three distinct digits such that one digit is the average of the other two?
(A) 96 (B) 104 (C) 112 (D) 120 (E) 256

The answer can be found here

Don't feel bad if you have difficulty solving this problem because the AMC test is designed to be hard so as to distinguish between students performing at the highest levels in math. To give you some idea of how performance on the AMC 12 tests translates to other tests you may be familiar with, only 44% of students who score in the 99th

percentile on the SAT-M (between 780-800 points) get the above question right. These tests are specifically designed to capture high-level math ability.

Most interesting is where top-scoring boys and girls come from. Whereas the boys who score at the top are from a variety of backgrounds, the top-scoring girls are all clustered in a small set of elite schools. Indeed, if one looks specifically at the data from the International Mathematics Olympiads and the China Girls Math Olympiad (which U.S. students qualify for after high level performance on the initial AMC test, stellar performance on the subsequent American Invitational Mathematics Examination, and after doing well at the U.S. Mathematics Olympiads), as many girls come from the top 20 scoring AMC schools as from all other high schools in the U.S. combined. Unless you believe that girls with the highest level of math ability choose to attend only a handful of schools, these data suggest that most girls aren't being given the chance to reach their full mathematics potential. In other words, only a handful of schools are giving girls the support they need to succeed.

So, what does one make of these data? Socialization differences are alive and well - even at the high end of the ability spectrum. Let's stop trying to nail the sexes to a bell curve and instead, like the House of Representatives, concentrate on what we can do to encourage everyone to reach their full potential in math and science. After all, it was less than two decades ago that Mattel stopped producing the Teen Talk Barbie that said things like, "Will we ever have enough clothes?" and "Math class is tough!" We still have some work to do.

1Brody L, Mills C (2005) Talent search research: What have we learned? High Ability Studies, 16, 97-111. See also, Monastersky R (March 4, 2005). Studies show biological differences in how boys and girls learn about math, but social factors play a big role too. Chronicle Higher Education, 51.

2Ellison, G., & Swanson, A. (August, 2009). The Gender Gap in Secondary School Mathematics at High Achievement Levels: Evidence from the American Mathematics Competitions. NBER Working Paper No. 15238.