

## Hey Barbie, Math Class is Not Tough

Consider a typical conversation at a restaurant dinner table amongst friends. Perhaps you just finished arguing about the recent *Hunger Games* movie when the waiter brings your food out. Eventually the time comes after you eat to leave a tip and you dread the thought of doing the math, so you take out your smart phone and use a calculator that saves you and all your friends from leaving a bad tip. After you all leave the table and head out the door, the waiter, who just happens to be a college junior chemistry major, laughs at how silly you and your friends are for having to use your phone calculators to figure out the tip.

For most Americans, math is a challenge and our least favorite subject, but there is a stereotype that girls can't do math and science. One popular Barbie doll, created by Mattel Inc. in 1992 but retracted a few months later due to outrage from women's groups, even would say "Math class is tough!" among other phrases (*The New York Times*). What is the explanation for this gender gap that gives so many girls an excuse not to try hard in math? Some believe there is an innate difference in biology that makes boys more adept at math and science while others argue that cultural and social factors of a population primarily explain differences in math and science ability. While we cannot entirely rule out genetics in one's ability to do math and science, the most reasonable explanation for math and science achievement lies in country-specific social and cultural factors.

The origin of the belief that girls cannot do math and science is in part because some things are believed just because of tradition and constant repetition. For example, American society has long believed girls do not need to excel at math and science but should instead focus on raising their children and teaching them how to read and write. It is not unusual for girls to stray away from math and science because of the stereotypes of scientists as geeky, antisocial

males stuck up in a laboratory working on crazy experiments. Girls have always seemed to think that math and science is for boys partially due to a geek factor. One vivid example of the stereotype that girls do not need to learn math and science is the t-shirt in Fig.1.



Fig. 1. “Sorry Barbie” [BOSTONGLOW.org](http://BOSTONGLOW.org) 15 Dec. 2011. 15 April. 2012.

Girls’ parents in many cases and possibly even teachers further promote the conventional wisdom that girls are not good at math and science. In an article written by Eve Tahmincioglu of NBC Los Angeles, 22 year old Sandra Guo describes how her mother discouraged her from pursuing a computer science degree, “When I first enrolled in college she was opposed for me taking computer science as a major. She said I’d never find a boyfriend.” The article also mentioned that the fear of failure and the lack of role models for girls might influence the lack of interest among women in math and science. A year-long University of Chicago study found that female elementary teachers can give female students their anxieties and stereotypes about math and decrease the performance of girls at math (Beilock et al). Although there seems to have always been a disconnect with girls and math and science, it appears that this disconnect is growing since women earned 37 percent of computer science degrees in 1987 compared to 18

percent in 2008 (Tahmincioglu). These findings are all the more worrying considering 80 percent of new jobs in the next decade will require some form of math or science, according to The Sally Ride Science Academy by ExxonMobil. Despite the negative stereotypes and historical tradition girls have toward math and science careers, some people still believe that stereotypes and tradition alone cannot explain why girls perform lower than boys in math and science.

Many people of high stature believe that the reason boys do better at math and science than girls is because of a difference of biology. Natalie Angier and Kenneth Chang of *The New York Times* point out that in 2005, the president of Harvard Lawrence Summers gave a controversial speech in which he explained boys' greater performance in math and science as a result of innate genetic differences between boys and girls. Dr. Summers defended his remarks by arguing that the male brain is a more delicate object and displays a greater range of intellectual aptitude because of the fact that boys tend to score both extremely high and extremely low on test bell curves. Another reason for girls' poor performance and lack of interest in science careers Dr. Summers offered is that girls find science "too abstract and cold-blooded," and mentioned as evidence how his daughter named toy trucks she was given "Daddy truck" and "baby truck" (Angier and Chang). Although Dr. Summers makes a point that there are genetic differences between boys and girls, he does not back up his points with full-proof evidence and fails to acknowledge other explanations for the gender gap.

While there is no doubt that differences in the structure of male and female brains exist as well as how they respond to medications, researchers indicate that they do not know of how any differences in structure affect the brain's ability to perform abstract math and science problems. Angier and Chang quoted MIT neuroscience professor Nancy Kanwisher arguing the claim some people have that boys have larger brains than girls is not really important: "It is cognition that

counts, not the physical matter that does the cognition.” Virginia Valian, a psychology professor at Hunter College, commented that “We can't get anywhere denying that there are neurological and hormonal differences between males and females, because there clearly are. The trouble we have as scientists is in assessing their significance to real-life performance” (Angier and Chang). Proponents of the belief that there is an innate difference in biology also point out that boys seem to perform better in aptitude on standardized tests such as the SAT. For example, boys have tended to outscore girls on the math section of the SAT by 30 to 35 points for the past three or so decades; moreover, boys also outperformed girls on the math portion in about over half of the nations in an internationally standardized test conducted in 2003 (Angier and Chang). Thus, Dr. Summers and others believe that boys’ superior range of test scores and differences in brain structure explain why girls tend to perform poorly in math and science, but they do not take any other factors such as environment into consideration.

A number of people simply do not believe that biological differences alone can explain why boys perform better at math and science, and instead point out flaws in the test score data and cite statistics that show how culture matters heavily. For example, boys outscored girls in about half of the nations in the 2003 international standardized test, but the average scores varied considerably from country to country as Japanese girls performed better in all categories of math than the boys of the United States and Icelandic girls outshined the country’s boys by large margins (Angier and Chang). Some people, such as sociologist Yu Xie from the University of Michigan, further deconstruct the argument that males are innately superior in math and science by arguing that Asian Americans rarely mention having a gene for math, but instead believe fervently that math achievement can be improved through practice and diligent work (Angier and Chang). The amount of criticism of Dr. Summer’s beliefs seems to overshadow his argument that

math ability is an innate trait that favors males and raises questions about the role of the environment on math ability.

The belief that cultural and societal views of gender and math greatly influence the differences in math performance is becoming more popular due to numerous recent studies. A 2010 study lead by Dr. Nicole Else-Quest of Villanova University found little difference between boys' and girls' ability to do math and also discovered that boys have greater confidence in doing math. In a news story on *ScienceDaily*, Dr. Else-Quest stresses the importance of one's environment on achievement: "These results show that girls will perform at the same level as the boys when they are given the right educational tools and have visible female role models excelling in mathematics." Another recent study by Dr. Janet Mertz and Dr. Jonathan Kane looked at international data from the 2007 Trends in International Mathematics and Science Study and the 2009 Programme in International Student Assessment and found that math achievement is strongly influenced by social and cultural factors rather than biology (Wood). The claim that math performance is linked with biology does not seem to hold up any more when looking at nations across the world and not just America.

It is now becoming apparent that countries with greater gender-equal cultures tend to have little or no gender gap. A 2008 study published on *Science* examined data from the 2003 Programme for International Student Assessment (PISA) and found that the gender gap disappears in gender-equal cultures, such as Norway and Sweden (Guiso et al). This result is not surprising considering how people want to think that well meant actions have good consequences. For example, people think girls and women will benefit from focusing on the upbringing of children and other home duties instead of education, but in reality they are disadvantaged by unfair wages and must often rely on their husbands for financial security. The

2011 study by Mertz and Kane also found that both boys and girls do better in math in more gender-equal countries and Kane asserts, “It makes sense that when women are well-educated and earn a good income, the math scores of their children of both genders benefit” (Wood). If public officials, teachers, and parents in the United States want to eliminate the gender gap, perhaps it would be beneficial to look at other countries around the world with more gender-equal societies and change some of our cultural expectations of women.

The debate on the conventional wisdom that boys are better at math and science than girls will no doubt continue to go on, but a thorough observation of the most recent research shatters that belief without question. The stereotype that girls cannot do math has existed in the United States for decades and is rooted in the culture of our ancestors; however, if we as a country want to keep high-paying crucial science and technology jobs on U.S. soil, we must change our collective attitude about math and science. Scientists, parents, and teachers currently working must work hard to cleanse themselves of any sexism and make a greater effort to encourage more girls to pursue careers in math and science. If we do not recognize that biology is not the main factor in math and science achievement and instead focus on changing some of our cultural expectations, then we will continue to fall behind the rest of the world and our economy and national power will degenerate.

#### Works Cited

Angier, Natalie and Kenneth Chang. “Gray Matter and Sexes: A Gray Area Scientifically.” The New York Times 24 Jan. 2005. Web 31 Mar. 2012.

“Bad at Math?” Change the Equation 5 Apr. 2012. 17 Apr. 2012.

Beilock, Sian L., et al. “Female Teachers’ Math Anxiety Affects Girls’ Math Achievement.”

*Proceedings of the National Academy of Sciences* 107 (2010): n. pag. Web. 30 Mar.

2012.

“COMPANY NEWS: Mattel Says It Erred; Teen Talk Barbie Turns Silent on Math.” New York

Times 21 Oct. 1992. Business Day. 17 Apr. 2012.

Else-Quest, Nicole M., Janet Shibley Hyde, and Marcia C. Linn. "Cross-National Patterns Of

Gender Differences In Mathematics: A Meta-Analysis." *Psychological Bulletin* 136.1

(2010): 103-127. *PsycARTICLES*. Web. 31 Mar. 2012.

ExxonMobil. The Sally Ride Science Academy. About Us. 2012. 17 Apr. 2012.

Guiso, Luigi., et al. “Culture, Gender, and Math.” *Science* 320 (2008): n. pag. Web. 31 Mar.

2012.

“Sorry Barbie.” BOSTONGLOW.org 15 Dec. 2011. 15 April. 2012.

Tahmincioglu, Eve. “Tech Industry Searching for Girls Gone Geek.” *Nbclosangeles.com* NBC

Southern California, 21 Feb. 2010. Web. 17 Apr. 2012.

Wood, Janice. “Study Debunks Conventional Wisdom About Math and Gender.” Psych Central.

14 Dec. 2011. 31 Mar. 2012.