# BUILDING EQUITY IN LEARNING

## *Debunking Gender Stereotypes in the Classroom*

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Gender affects how children relate to one another, as well as how they learn and develop. Many of us have heard gender-based learning assumptions such as: "Boys are better at math and girls are better at reading." Are these fallacies? Or is there some basis in research for these assumptions?

In this report, we will examine three common gender-based assumptions about learning. We'll explain what researchers have concluded in this area, illustrate replicable prevention and intervention models, and offer specific steps that school board members can take to overcome these assumptions and help all children succeed.

## *Assumption #1*

Girls mature earlier than boys, so their brains are more developed at earlier ages.

## *Reality*

Science points to the brain's pre-frontal cortex – the reasoning center – as more developed at earlier ages for females than males. This difference in brain development influences learning and behavior for boys and girls.

## *Discussion*

There are distinct differences between male and female brains when it comes to learning and behavior, according to Michael Gurian and Kathy Stevens of The Gurian Institute, an organization dedicated to education training in gender differences.

For instance, girls tend to have an advantage in reading and writing skills more than in spatial skills because girls' brains exhibit more connections between hemispheres – thereby aiding in functions related to memory and listening – and a bigger hippocampus,[1] which aids in memory and learning languages and literature.[2]

In addition, Gurian and Stevens note, the area of the brain which aids in reasoning, the prefrontal cortex, is more fully developed at younger ages for females than males. This, along with a greater amount of serotonin[3] in the brain, enables females to exhibit less rash behavior and impulsivity.[4]

The emphasis on brain functioning for these purposes tends to limit functioning for other purposes, such as spatial skills, which can explain from a neuroscientific perspective why girls may not gravitate to computer programming, physics or engineering, say Gurian and Stevens.[5]

In males, the reverse is true. Male brains possess more area related to spatial functioning, which leaves less for "verbal-emotive functioning." Males don't have as much serotonin, so they tend to be more rash or impulsive than females and "compartmentalize learning," say Gurian and Stevens. The male brain also periodically goes into a "rest state," characterized by defocusing on an activity – like zoning out in class – they say. This is a way for the male brain to reset. Girls don't need these "rest states" to reset their brain activity and focus.[6]

Gurian and Stevens believe these aspects of male and female brains help explain the gender gap that favors boys when STEM subjects are taught in a theoretical or "abstract" way, or the gender gap that favors girls when boys are disciplined for not staying still or remaining focused.[7]

## *What Schools Can Do*

Pilot studies in Kansas City, Missouri school districts demonstrate that teachers can improve student performance by using teaching techniques geared to the student's gender.[8] In a 2004 *Educational Leadership* article, Gurian and Stevens recommend the following teaching strategies for primary grade students:

- Dedicate space in classrooms for boys to move and incorporate movement in lessons;
- Keep verbal directives to boys brief (less than 60 seconds);
- Incorporate male role models in the learning process;
- Work with puzzles to hone girls' spatial skills.

**Takeaways**

- Differences exist between male and female brains when it comes to learning and behavior.
- Teachers can improve student performance by using teaching techniques geared to the student's gender.
- Teachers should be sensitive to the amount of time they devote to boys and girls in the classroom.

Educational Consultant Bill McBride believes the brain configuration of females and males is not as important in determining achievement as the *timing* of brain development. According to McBride, one of the most influential regions of the brain affected by the timing of brain development is the pre-frontal cortex, which houses reasoning. The neurotransmitter serotonin is also created at this site in the brain.[9] This helps explain boys' inclination toward impulsivity,[10] since males lag in the development of the pre-frontal cortex and therefore the processing of serotonin.[11]

To overcome this, educators should "model these higher-level thinking skills," such as helping boys with organizational skills.[12] McBride adds that "danger" and "competition" interest boys, so teaching them about the possible negative outcomes of their behavior is important.[13]

Along these lines, one out of five high school boys is diagnosed with Attention Deficit Hyperactivity Disorder (ADHD), according to a May 2013 *On Board* article. Educators should understand that boys' rash behavior or periodically zoning out in class may just be a result of normal development or some other issue and not necessarily ADHD.

Often, classroom teaching focuses on language and literacy, which doesn't attend to boys' strengths of spatial-mechanical skills, says McBride. Classroom reading topics do not engage boys because boys like to read about war, science-fiction and "fictional violence," which aren't typically in the curriculum. In addition, reading interventions for boys, if needed, must be done at an early age or else the chance of reading success is slim.[14]

Teachers should also be sensitive to the time they spend with boys and girls. Research shows that teachers pay more attention to boys than girls in the classroom, ask them to speak more, solicit more complex feedback from them, provide them with more feedback on their responses and more time to answer questions, according to research compiled by the University of Virginia's Teaching Resource Center. Teachers don't necessarily do this intentionally, but it happens across all grades and subjects.[15]

### *Assumption #2*

Boys are better at math and girls are better at English.

### *Reality*

Boys and girls have similar capacity to do well in math and English. So, it's intriguing that gender differences *sometimes* exist in terms of grades and test performance – especially when it comes to math test performance. Why? Socio-cultural messages, educator bias, psychological roadblocks and teaching methods can all contribute to this difference.

### *Discussion*

A decade ago, Elizabeth Spelke, a Harvard psychology professor, examined over 100 studies and concluded that, in general, math and science capacity for males and females was the same.[16] In addition, a 2008 University of Wisconsin at Madison/University of California at Berkeley study that involved more than 7 million students in 10 states found no real differences in math performance between the sexes.[17]

Other researchers point out that, in general, females outperform males in terms of grades, noting that females "tend to study in order to understand the materials, whereas boys emphasize performance, which indicates a focus on the final grades."[18] In other words, girls exhibit more balance in studying by focusing on day-to-day studying, while boys focus their efforts on tests.

**Takeaways**

- Boys and girls have similar capacity to do well in math and reading.
- Social-cultural messages, teacher bias and teaching methods can contribute to differences among boys and girls in grades and test performance.

Results from the Programme for International Student Assessment (PISA) show that high-scoring males, overall, perform better than high-scoring females in math "in all but two of the 63 countries in which the tests were given, including the United States," according to a *New York Times* article.[19] A study spanning the past decade of PISA math scores shows that these differences are exacerbated at the highest levels of performance.[20]

On the other hand, PISA scores show that in reading, females on average excel over males. Moreover, underachieving students as evidenced by PISA scores in "math, reading and science" tend, more often than not, to be boys. "More boys than girls underperform in every country tested except Luxembourg and Liechtenstein," according to the above-referenced *New York Times* article.[21]

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### *Explaining the Differences*

Researchers offer several explanations for why test scores differ for males and females, especially when it comes to math and reading. These explanations are often categorized into the following groups: biological (relating to genes and/or the brain), psychological (relating to the mind) and/or socio-cultural (relating to society). [22]

Biology may influence math ability at the onset when it comes to developing spatial skills, per Gurian and Stevens, yet research presented in the American Association of University Women's (AAUW) report, *Why So Few? Women in Science Technology, Engineering, and Mathematics*, shows that spatial skills can be learned.

Spatial-visualization training is one way to help girls do better in math. Sheryl Sorby, a mechanical engineering professor at Michigan Technological University, shows that spatial skills training increases female capacity for performance on spatial tasks. Training on this skill improves retention in engineering, according to Sorby's research. Seventy-seven percent of female graduates of her spatial skills class remained in their engineering studies, compared to 48 percent of women who did not take the spatial skills course.[23]

Additionally, middle school girls who completed "a spatial-visualization course took more advanced-level math and science courses in high school than did girls who did not take the course," Sorby found.[24] To help girls develop spatial skills, AAUW recommends incorporating play-based building objects like Legos in the curriculum.[25]

Psychology may also factor into gender differences in math or reading ability. Research by Carol Dweck, a developmental psychologist at Stanford University, shows that when females understand that STEM ability is not innate, they do better. She recommends making sure students understand that math skills can be learned.[26]

There may be self-esteem and confidence differences between boys and girls. Boys "will overestimate their abilities and, unfortunately, many girls will underestimate theirs. Adults need to continuously build up the self-esteem of girls, modeling and supporting a 'can-do' attitude. And conversely, adults need to give reality checks to boys, reminding them of the consequences of their behavior."[27]


Females not only self-assess themselves more critically than males, but "fundamentally differently" too, according to *Psychology Today*.[28] When presented with challenging material, girls may be more apt to quit the task, while boys are more likely to view "the difficult material as a challenge." In fact, boys are "more likely to redouble their efforts, rather than give up." The reason for this is because smart females think their ability is fixed, while smart boys think skills can be learned.[29] Children learn this from parents and teachers, who provide different types of feedback to girls and boys.[30]

Teacher perceptions about gender can also influence student performance. A recent study out of Israel demonstrates how educator bias can result in lower math scores for girls. The study examined the results of tests in Hebrew and math scored by students' teachers compared with tests scored "anonymously."[31] Girls scored slightly higher than males on both types of the Hebrew tests, but for the math assessments, girls received higher grades on the anonymously-graded tests than on the classroom-graded ones – signaling educator bias.[32] The results, writes Harvard Law School Professor Cass Sunstein, were dramatic because "girls who had a biased teacher in primary school were less likely to continue with math and science in high school."[33]

Socio-cultural influences can also affect boys in the classroom. According to Susan McGee Bailey, a former administrator at Wellesley College, these influences include "gendered assumptions about literacy … in much the same way that gendered assumptions about science and math have inhibited girls' persistence and achievement…. It's a 'girl thing' to read; real boys don't sit around with a book."[34] In addition, she notes that gendered assumptions include performance expectations, and explains that "one of the most damaging expectations is that doing well in school is for girls."[35]

To increase achievement for both males and females, McGee Bailey recommends mentoring and having school-family partnerships, including reading initiatives with fathers, and incorporating physical counting objects in math lessons to aid in spatial development for students needing some assistance.[36]

For example, the **Niagara Falls City School District** takes part in an annual event entitled *Dads Take Your Child to School Day*, which gets fathers and father-figures involved in their child's education. Community Relations Director Judie Glaser says the district wanted "to introduce more masculinization to the elementary grades." Toward that end, the district invited male stakeholders in the community to learn about volunteer opportunities. The event, now in its fifth year, has grown from about 400 attendees to more than 1,000.[37]

Another district, the **Haldane Central School District,** incorporates a state PTA program entitled *Parents as Reading Partners*. This program encourages parents and/or guardians to read with their children for an assigned block of time. To interest boys, Program Director Mary Bates suggests parents pick a book with their son like "The Hobbit."[38] In 2013, Hurricane Sandy influenced the program's theme, "Heroes." The program chair chose books that featured heroes and encouraged dialogue between parents and their children about heroes.[39]

### *Assumption #3*

Girls tend to lose interest in math and science in middle school.

### *Reality*

Teacher recruitment and student retention problems abound when it comes to gender differences and STEM subjects. Female engagement in middle- and high-school STEM subjects can suffer because there typically aren't enough female STEM teachers. Educators should also connect STEM subjects to doing good work in society, in order to attract and retain more female students to those fields of study.

### *Discussion*

Women comprise 75 percent of K-12 public school teachers, yet men outnumber women in high school science teaching positions, according to a March 2015 article in *The Hechinger Report*. Data from a 2012-13 national survey of over 3,500 high schools showed that only 37 percent of physics teachers were women. While this percent is greater than it was in 2005 (30 percent) it doesn't constitute half of the physics educators.[40]

Why does this matter? Findings of a recent study about STEM and gender show that when there is more female representation on high school STEM teaching staff, girls tend to major in science or math in postsecondary school more. This percentage increased for girls with higher performance in these subjects. Boys weren't similarly influenced by their teacher's gender, according to the study.[41]

To increase female involvement in engineering classes, **Colonie Central High School** physics teacher Michele Famoso believes there needs to be more female teachers and more student support for females taking engineering courses. Girls need to know that STEM subjects can affect others in a positive way because they want to positively affect other people through their work, she says. One way to achieve this is through mentoring.[42]

Educational Consultant Dale Baker adds that teachers should not express that a science concept is hard to learn. "Girls, unlike boys, avoid tasks labeled difficult and don't return to difficult tasks if they experience failure," Baker says.[43]

Baker emphasizes "teaching that promotes equity" by making sure girls are given the opportunity to serve as leaders when working in groups in science class. Incorporating female role models in teaching lessons also benefits female students.[44]

In addition, textbooks should include more photos of female scientists, shown on an equal footing with their male counterparts. Currently, most science textbooks don't have many photos of female scientists. When they do, the photos usually portray a male in a position of power over the female (like a "female nurse" and "male doctor").[45]

The **Niskayuna Central School District** has taken a novel approach to involving more middle school girls in STEM subjects with its summer Engineering Institute for Young Women. The aforementioned AAUW report, *Why So Few?,* and the National Research Council's Frameworks for K-12 Science Education – which emphasizes the elimination of obstacles to STEM learning for females and the application of STEM theory to practice – served as the blueprint for the Institute.[46]

Girls' interest and engagement in science and engineering courses has increased, according to Jackie Carrese, the district's director of science and engineering technology. Female enrollment in the district's engineering courses and afterschool activities such as robotics has also risen in the past few years, she said.[47]

**Takeaways**

- Girls' engagement in secondary school STEM subjects suffers when there aren't enough female STEM teachers.
- Connect STEM subjects to doing good work in society in order to attract and retain more female students.
- Be sure that textbooks show gender equity and present men and women on an equal footing.

## *What School Board Members Can Do*

Understanding that learning assumptions about gender are often built on biological, psychological and socio-cultural misconceptions is the first step to building equity in learning.

NYSSBA recommends the following seven steps school board members can take to empower school districts to ensure such equity:

**1. AWARENESS:** Provide professional development to administrators, teachers and staff to address their own potential bias about subjects such as math, gender assumptions in learning and strategies to foster gender equity in the classroom.

**2. UNDERSTANDING:** Incorporate kinesthetic learning (i.e., physical activity) in lesson plans, especially for younger students to enable them to be physically active as they learn.

**3. CONNECTION:** Build strong family-school partnerships that connect parents and families to their children's learning.

**4. DIVERSITY:** Ensure teacher recruitment strategies and placement reflect diversity of the pool, including females for STEM subjects and males for elementary and middle school placement.

**5. SKILL-BUILDING:** Incorporate spatial skills-building in lessons for female students.

**6. GROWTH MINDSET:** Have a shared vision that includes a growth mindset for both educators and students.

**7. MENTORING:** Include mentoring programs and/or role models in the learning process.

With the implementation of these measures, school board members can help to create a positive learning environment for all students, regardless of gender, in their districts.


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