

# Girl Power!

## How Parents Can Support Girls' Academic Success in STEM

By Ann Gadzikowski

Helping our daughters recognize science, technology, engineering, and math (STEM) in their daily lives, even in tasks like feeding the dog, baking a cake, or packing a suitcase, supports and encourages their STEM interests and abilities. Often young girls, even those who are very bright, aren't accustomed to thinking of themselves as being good at science or math. They might not know what engineering means, or might think that technology subjects, like computer programming, are just for boys. Understanding the misconceptions and obstacles girls may face as

they learn about STEM can help parents become better advocates for their young, gifted daughters.

### Girls Are Outnumbered

Females are still significantly underrepresented in STEM fields. According to the U.S. Department of Education, high school boys are much more likely than girls to enroll in challenging STEM courses such as Advanced Placement (AP) calculus, statistics, and physics.<sup>1</sup> At the college level, young women are still a minority in STEM majors. Recent studies show only

17% of bachelors' degrees in engineering were earned by women.<sup>2</sup> And, while women represent 48% of the total workforce after college, more than 75% of all STEM jobs are still held by men.<sup>3</sup>

We see similar trends in enrollment patterns at the Northwestern University's Center for Talent Development, even among our youngest students. For example, in the summer Leapfrog program for academically gifted and talented PreK–Grade 3 students, we consistently see more boys than girls enrolled in math and technology courses. In robotics courses for second and third graders, only a handful of girls typically enroll in a class of 18 students. The same is true in our enrichment and credit-bearing STEM courses at the middle and high school levels: Girls are consistently outnumbered by boys. It's possible that a girl with advanced STEM abilities may feel isolated, want peers who share the same passions, and seek female role models who don't conform to stereotypical gender roles.

### Fear of Making Mistakes

Some girls might be less willing than boys to take risks and make mistakes in an academic environment. For example, Stanford University researcher Carol Dweck has observed that girls are more likely than boys to perceive their



intellectual gifts as static and fixed, and that this perception can become an obstacle to girls' growth and achievement in STEM classrooms.<sup>4</sup> Dweck maintains that many girls are vulnerable when faced with confusion or challenge because they believe that being smart is a gift they are born with rather than an ability that can be developed over time.

As parents, we can help our daughters become more resilient and flexible learners by reassuring them that learning is a process and by modeling how we respond to our own mistakes:

- When you are talking or working together on homework or chores, let your daughter know you value the problem-solving process and reassure her that we learn much more from our mistakes than our successes.
- When your daughter comes home from school ask her, "What exciting mistakes did you make today?"
- The next time you wreck a home improvement project, instead of berating yourself, take the opportunity to show your daughter how to rethink and recover gracefully.

### Start Young: Early Signs of Exceptional STEM Abilities

If we want to encourage bright girls to pursue STEM studies and careers, we need to start early in their academic careers—as early as preschool—before they encounter obstacles, bias, and stereotypes. Parents are in a good position to recognize an early



ability in STEM learning by observing their daughters at home, watching how they play and tinker, and noticing topics that draw their attention.

**Science.** Does your child enjoy spending time outdoors, watching ants crawl, or chasing butterflies? Does she like to dig in a sandbox or garden? Your child may have an aptitude in science if she:

- Enjoys observing the natural world and notices details and characteristics of plants, earth, and insects.
- Loves to help in the kitchen. There's a great deal of chemistry involved in cooking and baking.
- Watches shows like *Wild Kratts*, *Cosmos* (both PBS), or *Mythbusters* (Discovery Network). Engage your daughter in conversations about the science concepts explored, and identify related resources, such as library books or enrichment classes.

**Technology.** Most children seem to be fascinated by computer games and smart phones, but a child's special interest or ability may be most evident in the questions she asks about how technology works. For example, your child might be curious about

Siri, the natural language interface on an iPhone. If your daughter enjoys asking Siri questions and has fun trying to come up with questions that will "stump" Siri, she is demonstrating that she can troubleshoot and test the limits of computer code. Encourage her to try introductory coding activities at [code.org](http://code.org) or, better yet, complete a coding tutorial

together.

**Engineering.** An interest and ability in engineering may be demonstrated by a child's block and construction play or in her drawings and doodles. Things to look for include a fascination with maps, arrows, and graphic design elements in picture books or on street signs; attention to symmetry, balance, and strength in what she creates or draws; and whether she asks questions about how things work and what they are made of.

**Math.** Our understanding of math, as traditionally taught in American schools, begins with addition and subtraction. But meaningful and exciting math in the life of a child often begins with geometry, the shapes of things, and the relationships between those shapes. Her interest in blocks, LEGO® bricks, puzzles, board games, and measurement may indicate an advanced ability or special interest in mathematics.

### Role of Play in STEM Learning

In 2013, mechanical engineer Debbie Sterling made a big splash in STEM

## Girl-Centric Programs

To minimize your daughter's isolation in STEM activities, look for "girl-centric learning environments" such as the girls-only animation and technology courses offered at Northwestern University's Center for Talent Development (CTD). Northwestern has found that girl-friendly courses have successfully increased the participation of second to sixth grade girls in animation and web design. Public libraries and other out-of-school programs may offer technology classes focused on engaging girls. If no courses are offered in your area, investigate online classes and social media groups that focus on encouraging girls and young women to study STEM subjects.

education and social media when she introduced *GoldieBlox*, a line of toys designed to teach engineering concepts to young girls. Sterling, who studied engineering at Stanford, was inspired to develop a girl-friendly line of construction toys because she observed that she and other female engineering students seemed to have much less hands-on experience than male students with tinkering, building, and creating 3D constructions.

At home, parents can provide opportunities for STEM play experiences by:

- **Playing with blocks, LEGO® bricks, and other construction toys.** Wooden unit blocks, with standardized sizes and ratios, provide a kinesthetic introduction to geometry and engineering.
- **Playing board games.** Most board games have some element of math, such as counting and estimation (traditional games like *Parcheesi* or *Sorry*); spatial reasoning (*Battleship*); and coding (*Robot Turtles* and *Code Monkey Island*). Some girls may prefer Euro-style games that require trading, negotiation, and collaboration (*Forbidden Island*, *Ticket to Ride*, and *Settlers of Catan*), when compared to military, war-themed, or “winner take all” games.
- **Coding video games.** Girls may be more interested in the story that drives the game rather than the game’s actual outcome. At the Center for Talent Development, while boys were more likely to use *Scratch* to explore different kinds of special effects, girls more often wanted to create a character and then use *Scratch* tools to create a setting and story about that character. *Scratch* and *Scratch Jr.* are great ways to introduce computer programming and coding to girls of all ages.

In short, girls—and, of course, boys, too—are most inspired to learn when learning is meaningful. This is especially true in challenging STEM subject areas. However, whether your daughter is playing a board game at home or studying physics at school, girls with interest and ability in STEM seem to thrive most when they



are engaged in creating stories, solving real-world problems, and collaborating with others. ☺

## Resources

### Websites

#### Code.org

[www.code.org/learn](http://www.code.org/learn)

#### Girls Who Code

[girlswhocode.com](http://girlswhocode.com)

#### Amy Poehler’s Smart Girls

[amysmartgirls.com/smart-girls-in-stem/](http://amysmartgirls.com/smart-girls-in-stem/)

#### Vi Hart, Mathematician

[www.youtube.com/user/Vihart/featured](http://www.youtube.com/user/Vihart/featured)

#### Scratch

[www.scratch.mit.edu](http://www.scratch.mit.edu)

[www.scratchjr.org](http://www.scratchjr.org)

#### GoldieBlox

[www.goldieblox.com](http://www.goldieblox.com)

## Author’s Note

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readers, and teacher guides including *Challenging Exceptionally Bright Children in Early Childhood Classrooms* (Redleaf Press, 2013) and *Creating a Beautiful Mess: Ten Essential Play Experiences for a Joyous Childhood* (Redleaf Press, 2015).

## Endnotes

- <sup>1</sup> U. S. Department of Education, Office for Civil Rights. (2012, June). *Gender equity in education: A data snapshot*. [www.ed.gov](http://www.ed.gov).
- <sup>2</sup> St. Rose, A. (2010). STEM major choice and the gender pay gap. *On Campus with Women*, 39(1). Washington, DC: Association of American Colleges & Universities. [http://archive.aacu.org/ocww/volume39\\_1/feature.cfm?section=1](http://archive.aacu.org/ocww/volume39_1/feature.cfm?section=1)
- <sup>3</sup> Economics and Statistics Administration. (2011). *Women in STEM: A gender gap to innovation: Executive summary* (Issue Brief No. 04-11). Washington, DC: U.S. Department of Commerce.
- <sup>4</sup> Dweck, C. A. (2006). Is math a gift? Beliefs that put females at risk. In S.J. Ceci & W. Williams (Eds.), *Why aren’t more women in science? Top researchers debate evidence*. Washington, DC: American Psychological Association.