

Instructional Strategies to Keep Girls in STEM

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The Bots who say Ni!

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1 Introduction

This isn't your typical paper on girls in robotics. This doesn't talk about why girls aren't in STEM. You can find hundreds of articles on that. This is about why girls aren't *staying* in STEM. A girl may take a coding class in sixth or seventh grade but then stop. Why? Were they intimidated? Did they lose interest? Were they overwhelmed? Or hit with the stereotypes? This paper goes into the reasons of why girls leave STEM and what you can do to prevent that and keep them interested throughout their education and into their professional careers.

2 Background Information

I have a lot of motivation for writing this paper. In my life so far, I have probably faced more discrimination than my male peers will experience in their entire life. Ever since I was a young child, I have been very analytical, pulling things apart and putting them back together until I figured out how they worked (I have the carcasses of many destroyed pens and clocks to prove it). I started my journey in STEM by taking rocketry classes at my local summer camp. Out of the 20 people in the class, I was the only girl. At one moment in the class, one of the boys said to me, "why are you here?" as if I was doing something wrong, like I shouldn't have been there. For some reason, I let his words get to me. I didn't take a single STEM-oriented class after that and was turned off from STEM for a long time. I only got back into STEM when I was in the seventh grade and saw an ad for my school's robotics team. I decided to turn in an application just to see what would happen. A few weeks later I got the notification that I had been accepted, though I think they just needed more girls. That year was very hard for me. I loved robotics and was so intrigued by it but there were so many people, so many things trying to stop me. If I hadn't had such a good support system, I probably would have stopped at the end of that season. After one year of being on my school's robotics team, I knew I had found my passion. The only problem was I couldn't nurture my talents in an environment where I knew people thought I didn't belong. With the help of my parents, I started my own robotics team. It didn't start out all girls but soon became that way, and it helped me discover my talents and figure out who I am without the judgement or aggressiveness of boys.

3 Our Brains

Because of the low numbers of girls in STEM, many think the problem lies within boys' and girls' brains. After all, unless girls are just naturally more stupid, why isn't there equal representation in STEM fields? A recent study shows, "that girls are every bit as competent as boys in [math and science]." So why is there this discrimination? As we all can clearly see, boys and girls can be *very* different. The main difference, biologically, that may keep girls from

continuing STEM is the way that they process information. Male brains utilize around seven times more grey matter than females while female brains utilize ten times more white matter than males. Grey matter gives humans a kind of tunnel vision that keeps them focused on a task with little regard for others while white matter connects the processing centers together. This difference makes girls better multi-taskers and boys better at focused tasks. Because of this, some believe it may be harder for girls to focus on STEM related activities for a longer amount of time (Gregory Jantz). I do not disagree with the connotation that boys and girls can be different. But just because they're different, doesn't make girls any less competent at completing STEM activities. That's why we need a mixture of both genders. This is an issue that can't be stopped, it's biological but if we want to make a change, we need to alter our mindset.

4 Lack of encouragement

Men can find many people to encourage them to follow their dreams of STEM while girls can't. Girls regularly are teased in school by their peers and their teachers for doing something "meant for boys." At Yale, there was a story uncovered that actually didn't surprise me as much as I wished it would. "One young woman had been disconcerted to find herself one of only three girls in her AP physics course in high school, and even more so when the other two dropped out. Another student was the only girl in her AP physics class from the start. Her classmates teased her mercilessly: 'You're a girl. Girls can't do physics.' She expected the teacher to put an end to the teasing, but he didn't" (Jennifer Welsh). This didn't surprise me because I've been a victim of similar teasing in similar situations. This isn't a rare occurrence. This is something that can occur to girls on a regular basis. It's not just the teasing, which girls can handle. It's the encouragement that girls frequently cannot find from their teachers, or even their family members.

4.1 Stereotypes

Our stereotypes on girls in STEM are obvious and can be seen in the classroom and on social media. They're even portrayed on TV. In a show we all know and love, *The Big Bang Theory*, the female scientists are portrayed as "weirdos" while the non-scientist is the only "normal" female character (Jennifer Welsh). Girls in STEM seem to only be accepted if they are tomboys or complete nerds, unattractive in every light. I've been told many times that because I'm not a tomboy and not completely unattractive, I must be doing STEM for another reason. These types of stereotypes keep completely competent girls from continuing to participate in STEM activities.

5 Female Role Models

A new survey by Microsoft "found that young girls in Europe become interested in [STEM] around the age of 11 and then quickly lose interest when they're 15" (Alanna Petroff) but the number of girls who stay in STEM past the age of 15 increased if they had a positive female role model in their life. The influence of a role model is bigger than any biological issues. If you see someone successfully doing something you want to accomplish, you are more likely to pursue it.

6 How to keep girls in STEM

Since there are many problems girls in STEM face, it is difficult to know what to do to help and inspire them. There are a few ways, however, to prevent girls from falling into the stereotypes or being persuaded by the teasing of their peers.

6.1 Surround them with other girls

At around the age of 6, girls tend to stop associating intelligence with their own gender (Andrei Cimpian and Leslie Sarah-Jane). They don't think they are good enough to accomplish something of high rigor. At an early age, I participated in activities "for boys" like rocketry, because they interested me but I lost confidence and interest fast because when I participated in an activity for boys, I was met with turned-up noses and boys looking down at me. I didn't start getting into STEM until I started my own team. As I mentioned earlier, the team turned out to be predominantly girls. This helped me hone my talents more than I could imagine. Sometimes girls feel as if they can't jump into the roles of "programmer" or "builder" because those are titles for boys. If you surround them with girls of the same title, they may not be as hesitant to participate and stay in those activities, especially throughout a girl's middle and secondary school education. Girls who are surrounded with other girls are, "6 times more likely to consider majoring in math, science, and technology" (Megan Murphy) than girls who are raised in coed environments.

6.2 Encourage them

I don't have the ability to stop girls from getting teased. It would take major shifts in people's perception on girls enjoying STEM activities. All I'm saying is encourage girls to accomplish whatever they want instead of telling them they can't do something because of their gender.

Giving them a role model is an amazing way of showing girls that they can accomplish their dreams. My role model was my mom who is an electrical engineer; for others it could be a famous scientist like Rosalind Franklin, who made major contributions to our understanding of the structure of DNA and RNA, or a famous engineer like Mae C. Jemison, the first African American woman to travel to space, or even famous youtubers like Simone Giertz, a woman who builds robots that go viral on the internet.

7 Conclusion

It is very important to have girls in STEM. They bring along a new perspective that guys do not have. They think in different ways that are no better or worse than the male perspective but are needed to create a cohesive team that accomplishes at a high level. They deserve to have the chance to accomplish what boys can. I hope this paper has helped you understand how you can help keep girls interested and inspired until they've achieved successful careers!

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