An Untapped Workforce

Are We Doing Enough to Fix the 'Leaky Pipeline'?

During my elementary school years, I spent car rides calculating the profit made from selling 200 stocks for $2 more than buying price. I spent my weekends at robotics competitions, feeling a thrill every time the robot opened a door or lifted a ball. I spent summers building small-scale rockets that blasted off in perfect arcs and ate my morning cheerios on periodic table placemats.

As the years went by, the placemats were thrown out, but the science stayed with me. Science became my world and I couldn't imagine a future without it. When I got to high school, I signed up for as many science and math classes as I could, not once considering that my peers may not join me. So, when I first entered the computer lab, I was perplexed.

I counted five. Five out of twenty-eight. Seventeen percent of my AP Computer Science class was comprised of females, me being one of those five. I couldn't quite comprehend the predicament I was in. There was no more a feeling of familiarity or comfort. For the first time, I felt like I did not belong in that computer science classroom, and I wasn't the only one to feel this way. Two days later, we were down to three girls.

This low female involvement is not only limited to Stevenson High School, but is prevalent in high schools across the nation. According to the National Center for Education Statistics, "Female high school students made up only 15% of engineering technologies concentrators, 8.5% of manufacturing, 14.5% in computer and information sciences, and 9.6% in construction and architecture" (qtd. in Milgram 1-2). Although programs such as Former President Obama's Educate to Innovate and Girls Who Code exist to motivate girls to join science, technology, engineering, or mathematics (STEM) fields, females still only make a small percentage of the class size.

This small percentage of women is not only limited to the classroom; women make up 12.9% of engineers, 3.9% of maintenance workers, and 20.9% of software engineers (Milgram 2). Without a female presence in STEM, science becomes more inherently masculine, losing the female perspective (Blickenstaff 14). Women diversify the workforce and bring new perspectives to the STEM disciplines, according to Donna Milgram, the Executive Director of the National Institute for Women in Trades, Technology and Science.

There have been many proposed solutions to reduce the gender gap in STEM fields; however, ultimately, the power of increasing the female presence in the workforce rests in the hands of schools and educators. <u>In today's Digital Age, a larger female presence is needed in the STEM fields to add perspective and cope with the acceleration of technological advancements. Ultimately, the power of increasing the female presence in the workforce rests in the hands of educators and high schools such as Stevenson need to not just spark, but maintain STEM interest by introducing role models in addition to offering a wide range of STEM classes and extracurriculars.</u>

It is true that boys tend to take more STEM classes in high school. As stated before, only 14.5% of computer and information sciences classes comprise of females (Milgram 1-2). This can be problematic because if girls are not exposed to science or math classes, they will not consider pursuing a career in any of these fields. This eventually leads to the large gender gap in the STEM workforce. To combat this problem, according to Stevenson High School counselor Maggie Ely, counselors highly encourage students to take at least one course in biology, chemistry, and physics to get an exposure to the sciences. In addition, Stevenson has a 2-year science requirement as well as a 3-year math requirement (Ely).

While this makes a huge difference in academically preparing girls and introducing them to the possibility of a STEM career, percentages of girls in STEM classes still drop as classes get more difficult. This phenomenon of females dropping STEM classes is referred to as the ‘leaky pipeline’ (Blickenstaff). There were only 21 girls out of the total 74 students taking AP Physics C at Stevenson as of the 2015-2016 school year (Ely). Although this number was higher than the national percentage of females in AP Physics C that year, 3% according to the College Board, there is a downward trend as classes increase in difficulty (Ely). In other words, Stevenson has succeeded in exposing girls to STEM disciplines; however, more needs to be done to maintain interest and patch up the ‘leaky pipeline’.

Naturally, psychologists have delved into the underlying causes of the ‘leaky pipeline’ in the STEM fields. In the late 20th century, they focused on quantifiable data: the biological differences between men and women. According to a study summarized in the book Failing At Fairness: How Our Schools Cheat Girls, it was found that women had a smaller head size, and this was attributed to their ‘intellectual inferiority’ (qtd. in Blickenstaff 372). However, these initial findings were really due to the fact that men had larger body masses; therefore, women are not incapable of pursuing STEM careers (Blickenstaff 373). Furthermore, according to a study originally published in the *International Journal of Science Education*, “females had higher course grades and scores on national exams studying physics in their undergrad, which is further proof that women are not incompetent or lacking in skill” (qtd. in Blickenstaff 374).

Although scientifically, women are competent, they may believe that they are not capable based on the stereotypical norms society sets for them and, therefore, feel underappreciated. According to a study published in the *Journal of Higher Education,* many women reported feeling that their work was undermined or not valued by their colleagues (Hart). This sense of being devalued is a common trend throughout high school, university, and in the workplace. Boys who did not complete their work but still managed to pass their exams were admired while girls who worked hard and completed their assignments lacked “sparkle” (Blickenstaff 380). These implicit social cues often act as a reminder to the social norms of society. While explicitly stating that ‘science is not for girls’ is rare, these implicit actions in schools and in the workplace can lead to sentiments of being unwanted, prompting the decreasing numbers of women joining the STEM workforce.

Another example of this implicit bias is evident in the use of textbooks in schools. According to Jacob Blickenstaff, a U.S. delegate for the Third International Conference on Women in Physics, textbooks reinforce gender roles as pictures of girls and women in these books are rare. When girls were included (although rarely), they were shown as passive observers, rather than having an active role in the science. This gives the impression that women are not prevalent in STEM careers, leading girls to think they will be alone if they decide to join STEM disciplines. If girls see that there are few women in the STEM fields, then they come under the impression that science and engineering careers are unattractive (Blickenstaff 376).

Another cause of isolationism can be attributed to a lack of female role models in the STEM fields. If there are few women present in the workforce, girls will be less likely to join as it seems difficult and impractical to ‘make it’ as a female scientist. According to a study published in the *Journal of Advanced Academics,* “Personal relevance [promotes] positive self-concept, while practical relevance [gives] meaning and purpose to the women’s endeavors in math” (Mullet, et al). In other words, without seeing female role models present in the field, girls do not see an engineer or a scientist as a possible career path. Girls cannot relate to anyone as they see science as a male-dominated industry, and believe they will be isolated if they join the STEM fields.

Stevenson has taken steps to reduce sentiments of isolation by bringing attention to STEM extracurriculars. Through events such as co-curricular fair and Stevenson’s wide array of STEM club choices, students are able to meet like-minded peers and network so they don’t feel as lonely (Ely). Therefore, by introducing students to peers to clubs where they meet others like them, girls develop personal connections and are less likely to drop out of STEM classes. Collaboration is necessary to succeed in any field, and when students feel that they are in a comfortable environment where they can network with others, they are more likely feel as if their work is valued (Hart). Overall, by offering a multitude of STEM activities, students can meet like-minded peers and work in a more collaborative environment.

Although Stevenson does address the networking aspect of STEM, the school should do more to introduce female role models in order to allow girls to think of STEM as a prospective career. Females who have personal connections to engineering and science fields, are not as greatly influenced by gender stereotypes (Mullet, et al). As a result, by bringing in female guest speakers in the field, girls are more likely to stick to the STEM field. Other high schools have implemented this through a program called Techbridge, and one of the alumni explained that she could see herself being an engineer after meeting with female engineers in the workforce. This prompted her to participate in the Engineering Academy at her school (Kekelis, et al). Another Techridge alum claimed she was extremely interested in cars after listening to a car mechanic. She said, "It made me think, 'What am I interested in? What do I want to make?'" (qtd. in Kekelis, et al). Through these meetings, a sense of purpose and relevance is established and girls can be empowered by the women in the workforce to push past the stereotypes. Students learn that it is possible to succeed and dedicate a life to STEM; it's not just a class requirement. Stevenson already provides the resources and classes in STEM, but a connection to the impact STEM can have on others is fostered through meetings with role models.

In addition to opening doors to STEM careers, role models play a hand in increasing confidence. By explaining, for example, the engineering design process, girls witness the creativity, experimentation, and possibility of failure, helping to strengthen their "confidence muscle" to experience the "fun and challenge of engineering" (Kekelis, et al). As a result of having increased confidence, girls will have an increased and prolonged interest in the field. According to a study conducted Carol Heaverlo, "participants who reported higher scores in math interest also reported higher scores in math confidence" (66). Therefore, introducing female role models could play a part in maintaining STEM interest to patch up the 'leaky pipeline'.

This 'leaky pipeline' explains why there were only five girls in my AP Computer Science class. It explains why only three percent of individuals taking the AP Physics C test were females (College Board). It explains why only fifteen percent of high school students in engineering classes were female (Milgram 1-2). But educators have the power to patch up the leak. Educators have the power to inspire the next generations to overcome stereotypes and take charge. Schools such as Stevenson need to focus on maintaining STEM interest in girls to decrease the gender gap in the STEM fields. As we delve further into the Digital Age, it becomes apparent that technology is the future, and with this comes a demand for more engineers and scientists to change our perspective on the world as we know it today.

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