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Women, Girls, and STEM: A General Overview of the State of Affairs

Over the past few years, the media has presented growing evidence that the gender gap in STEM is decreasing. The numbers they use as evidence involve items such as the growing representation of women in fields like life science, but are these numbers truly proof that the gender gap in STEM professions is lessening? Even though women now outnumber men in some fields, these fields still demonstrate gender bias by underestimating the performance of women in these fields (Bloodhart et. al 2). Women in both STEM industries and STEM majors experience a multitude of barriers that men do not. This includes the aforementioned constant underestimation of women in STEM, toxic workplace climates towards women in STEM (Keller), and the warmth vs. competence issue that leads to women getting less leadership options in STEM careers (Saucerman and Vasquez 57). These barriers contribute to statistics such as women having higher dropout rates from STEM majors (Herrmann et. al 258), only 30% of women with engineering degrees still working in engineering careers 20 years later (Keller), and 61% of women stating that they repeatedly need to prove themselves in order to get the same recognition and respect as their male colleagues (Keller). Despite the media claiming that the gender gap in STEM is lessening, women in STEM still face unique barriers in their careers and education that can ultimately lead to them leaving the industry. This is an issue because so few girls and women are interested in STEM in the first place. Increasing girls' interest in STEM and educating both them and boys in STEM about the barriers girls face can help combat these stereotypes.

Increasing diversity in STEM industries is important for a multitude of reasons. The biggest reason is that diverse viewpoints lead to innovation that is well-thought out and appeals to as many people as possible. An excellent example of a product that was developed without a diverse team is Apple's Health App. Originally, the Health app was released without a function that allowed menstrual cycle tracking (Albrechtsen). This is a function that would appeal to around half of the world's population, but the team creating the app overlooked it. If women had greater voices in the app's creation, this function likely would have been included in the first version of the app, rather than a later update. Often women value different things when using a product as well. When the car was first introduced, women were the ones who pushed for the development of seatbelts (Albrechtsen). Allowing input from as many different people as possible allows for products to become safer, better, and more unique. It is important that industries get diverse opinions on products in order to ensure they appeal to as many groups as possible, which is even more important in STEM industries that are full of innovation.

One of the biggest issues cited by women who leave the STEM industry is the work environment. 30% of women who leave engineering careers cite work environment as the reason they left the industry (Keller). An issue that may tie into the issue with the STEM work environment could be the warmth vs. competence ideology. This is the idea that women can be kind and incompetent or competent and frigid, with there being no in between (Saucerman and Vasquez 57). This ideology contributes to the lack of leadership consideration for women in STEM. Women who are warm will be passed over for promotions because there is a male who is more competent. Women who are competent will be passed over for promotions because she is considered lacking in the interpersonal skills necessary for the position (57). This points to another issue that is often cited by workers. 58% of workers believe their companies do not have

enough growth opportunities to entice them to stay (Keller). Even more women in STEM must feel like this is true, because they are given even fewer promotional opportunities. Women in STEM industries face a multitude of issues, even after making it through schooling.

At the college level, it has been proven that women in STEM majors are seen as less intelligent than men in their majors (Bloodhart et al. 7). This occurs in both majors where women outnumber men and where women outperform men (7). This proves that there is an implicit bias against women in STEM, regardless of gender. Both in college and in the STEM industry there is a phenomenon called "chilly climate" which is defined as an environment that is unwelcoming to women (Jensen and Deemer 96). The effects of a chilly climate on women in STEM are extremely negative. Women who experienced a chilly climate in their STEM mejor experienced higher levels of emotional exhaustion, higher levels of cynicism, and lower levels of academic efficiency (96). Implicit bias and chilly climate are just two of the many barriers that women in STEM face in college.

Barriers from STEM for girls are presented at a young age. Stereotypes that boys are better at STEM than girls are internalized around 8th grade (Saucerman and Vasquez 54), but even before that young girls are discouraged from entering STEM by both parents and their elementary school teachers. Parents tend to give scientific explanations to their sons more than their daughters, despite both initiating a similar number of interactions. This leads to young girls going into preschool with less exposure to science compared to the boys (48). Once in school, teachers tend to unconsciously discourage girls from STEM, specifically mathematics. Elementary teachers often lack confidence in math skills. When female teachers experience this math anxiety, it can cause "lower mathematical achievement among female students" (48). This phenomenon does not occur among male students. Parents and teachers affirm each other's

opinions, creating a loop of discouragement. Teachers evaluate "girls' math ability as lower than boys' ability," despite both genders performing at "roughly the same level" (49). When boys do well in math, teachers attribute their performance to high ability more than when girls do well. These subtle notions affect girls' self-efficacy and "girls' beliefs about mathematical ability predict their later achievement" (49). Early on in girls' STEM interests, parents and teachers can present barriers discouraging them from pursuing their interest.

The media can also have an effect on girls with stem interests, as men outnumber women in television 2:1 (Marotti). This statistic is higher than the actual ratio of women to men in STEM industries, but the media should show what could be rather than perpetuating old stereotypes. More importantly, 43% of characters in STEM fields sacrifice their personal life to work in STEM and 30% of films and episodes portray STEM professions as not family-flexible (Marotti). Women and girls tend to value personal life and family more than men. They are less likely to be willing to be fully dedicated to their career. While some people in STEM careers do choose to sacrifice their personal life for their work, there are still possible ways to be successful in STEM without sacrificing all other aspects of life. So, when girls see these characters, they are less likely to be interested in STEM because they wish to have a personal life in the future.

Another barrier that girls and women in STEM face is called a stereotype threat. A stereotype threat is "the name for a decrease in performance that occurs with ingroup stereotypes" are activated in the brain (Saucerman and Vasquez 53). Stereotype threats occur in many situations. An example is when girls have to indicate their gender before taking a STEM related test. Girls who have to indicate their gender perform worse on STEM tests than girls who did not have to indicate their gender (54). Checking off the box for females triggered the stereotype that girls are worse at STEM than boys, which causes girls to do worse on STEM

tests. It is believed that this stereotype is internalized around 8th grade. This is because 8th graders did worse mathematically after being reminded that math is a historically male dominated subject, however 5th graders performed the same (54). Adolescent girls who are interested in STEM can be discouraged through the creation and presentation of stereotype threats.

In order to overcome the gender gap in STEM, there are many barriers that must be dissolved. Girls and women have a difficult time pursuing STEM interests because there are barriers such as discrimination, implicit bias, and sterotypes. At every stage of school there are different barriers for girls who are interested in STEM. Each barrier needs to be fought against in its own way. It is important that all parties who are currently discouraging girls from STEM, intentionally or subconsciously, recognize the effects they have on girls in STEM and actively try to encourage girls rather than discourage them. In order for girls to become more interested in STEM these barriers must be fought against.

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