

THE GENDER GAP IN STEM: A HISTORICAL PERSPECTIVE AND CURRENT CHALLENGES

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Abstract. *This article explores manifestations of gender discrimination in science and engineering in the past and how it affected the system in the present. Moreover, it explores reasons behind the low numbers of girls choosing to pursue STEM careers, how stereotypes and gender bias has a significant impact on girls' career choices and how they might affect their perception of success in STEM fields. It also highlights the importance of diversity in STEM, how it affects big companies, both women's and men salary and why it may lead to the growth of economy. Also, it brings a list of actions that can be implemented in order to create a more inclusive and innovative future for everyone.*

Keywords: *discrepancy, discrimination, gender gap, inequality, sexism.*

Introduction

Despite an increase in the number of women in science and engineering, men continue to outnumber women overall, particularly at the upper levels of these fields. Girls and boys take nearly the same number of math and science classes in elementary, middle, and high school, and about the same number of girls and boys graduate from high school prepared to major in science or engineering in college. But fewer women than men choose to major in these fields.

Women are substantially less likely than men to say they want to major in science, technology, engineering, or math when they are first entering college (STEM). According to the National Bureau of Statistics of the Republic of Moldova, compared to boys, girls are five times less likely to choose a career in science and engineering and ten times less likely to choose a career in IT [1]. Analyzing the trend of recent years, we can observe that fewer women are studying exact sciences. Their share decreased with 1% compared to 2019, from 11.09% to 10.09% in 2021 [2]. By the time they graduate, men outnumber women in almost all fields of science and engineering, and in some, like physics, engineering, and computer science, the difference is dramatic, with women earning barely 20 percent of the total [3]. So, the question that appears is: why do so few girls choose a STEM career?

The unknown history of women in STEM

In order to understand why in the present times there is such a considerable gender gap in science and engineering, it is important to take a look back in history.

Globally, women's contributions to science have historically gone unnoticed and unappreciated. Shockingly, only 0.5% of women history is recorded [4]. This minimal representation of women in recorded history isn't because they didn't make major contributions; rather, it's because their achievements haven't been given enough credit!

The history of women in STEM dates back centuries. During the ancient times, women played a significant role in medicine, using their knowledge of herbal remedies and healing to treat the sick. In this case, it is important to mention Merit-Ptah, a physician in ancient Egypt and the first woman recognized in the field of sciences [5]. However, as science became more formalized, women's contributions were increasingly ignored.

In the 18th and 19th centuries, women began to make their mark in STEM fields. Nonetheless, they did not fit in the common image of a scientist, since the idea of "lone male genius" was persistent. For that reason, women were unnoticed and ignored as they lived in a world full of injustice, where

men took credit for all of women's work and discoveries. Caroline Herschel, an astronomer from the 19th century, sits in the shadow of her brother William. Lise Meitner, a physicist, did not get the 1944 Nobel Prize for her discovery of nuclear fission, but Otto Hahn, her junior collaborator, did. Even Marie Curie faced criticism in the press for allegedly claiming credit for her husband's research [6].

Unfortunately, in the mid-20th century, women were still victims to sexism. For example, Rosalind Franklin, a British chemist and X-ray crystallographer, made critical contributions to the discovery of the structure of DNA, but her work was overshadowed by her male colleagues, Watson and Crick [7]. Universities or research institutions often excluded women from scientific societies, organization and discussions. Katherine Johnson, a mathematician that helped NASA send astronauts to the moon and return them safely home, faced in her career gender discrimination and segregation. Despite her role as a key contributor to the NASA missions, she was not allowed to attend some meetings or briefings simply because she was a woman, and she was sometimes excluded from important discussions and decisions [8].

Regardless of the increasing number of women in STEM fields, the 21st century continues to present significant challenges. Women remain underrepresented in many STEM fields, and they continue to face significant barriers such as discrimination and bias. In addition to this, there is a negative impact on women's and girls' career development, since the gender gap is still much a present issue in science, engineering, mathematics and technology.

The gender gap in STEM

By now, we have all heard about low numbers of girls in science, technology, engineering, and math (STEM). There are some possible causes of the large gender gap, such as:

- *Lack of role models*

Young women have fewer role models and examples to follow since they witness few women pursuing careers in science, technology, engineering, and math. The majority of young people discuss their experiences discovering someone they look up to and admire and choosing a career path as a result of them. Mentoring and role models are highly crucial for anyone seeking a degree, looking to improve skills, and looking to secure a job [3]. When girls don't see women who look like them in positions of influence or authority in STEM fields, it can be challenging to imagine themselves in those roles. Moreover, without female role models, girls may lack the guidance and support they need to navigate the challenges they may face as they pursue careers in STEM.

- *Stereotypes*

Firstly, the notion that men are mathematically superior and innately better suited to STEM fields than women, remains a common belief, with an abundance of articles addressing cognitive gender differences as an explanation for the small numbers of women in STEM. Female and male brains are physically distinct, but how these differences translate into specific cognitive strengths and weaknesses remains unclear [9].

Secondly, due to misconceptions, the majority of youth encounter gender discrimination at school and in their families. In addition, girls are typically expected to choose a gender-stereotype career, such as teaching, nursing or being a secretary, while boys are supposed to handle "the heavy" career paths, such as technology, engineering, science. Due to gender norms that tend to restrict and prevent children's options and accomplishments, their future growth is constrained.

- *The fear of not succeeding*

Women in STEM fields may experience imposter syndrome, which is the feeling that they are unworthy of their accomplishments [10]. Consequently, it can lead to a fear of not succeeding and a lack of confidence in their abilities. Another struggle that girls face is a lack of support from their peers. Here it is crucial to consider that girls are more likely to internalize mistakes and criticism, which can make them feel isolated and lead to a lack of motivation and a feeling of not belonging. Moreover, the lack of representation can create a perception that STEM fields are not for them or that they are not capable as their male counterparts.

- *Sexism*

Gender bias in STEM can be manifested both in school and the workplace. In the classroom, girls can experience unfairness, with teachers calling on boys more often, giving them more challenging assignments, or assuming they are more knowledgeable about STEM topics. Along the same lines, women in STEM careers often earn less than men, even though they have similar qualifications and experience. According to statistics, women earn approximately 82 cents for every dollar earned by a man [11]. In addition to this, many women have experienced harassment and discrimination, particularly in male-dominated fields, which includes unwanted advances and derogatory comments that are frequently tied to an assumed lack of professional skills and capabilities.

Breaking Down Barriers

There are several strategies that can be implemented to help solve the issues that girls face when choosing a STEM degree. Some of them are:

- *Encourage and support girls from an early age*

To encourage girls, schools and parents can provide access to STEM programs and resources, such as science kits, coding camps, and robotics clubs. They can also encourage girls to participate in science fairs and other competitions, where they can showcase their skills and connect with other like-minded students [3]. Eventually, all of these actions allow girls to explore their potential in these fields and increases their confidence.

- *Provide female role models*

When girls see women who have succeeded in STEM careers, they can visualize themselves in those roles and understand that it is possible for them to achieve their goals and succeed as well [3]. Schools and universities can invite women in science, engineering, technology or math fields to speak to students, create mentorship programs, that can match girls with female professionals in the mentioned fields who can provide guidance and support, and provide internships and job-shadowing opportunities.

- *Address stereotypes*

Teachers and parents should actively work to address stereotypes and encourage girls to pursue STEM degrees. One effective way to reduce gender bias is by providing equal opportunities to both boys and girls, highlighting the achievements of women in STEM to show that success is possible for anyone, regardless the gender, and encouraging critical thinking when gender stereotypes arise in media, communities or even classroom. As well, it is crucial to provide education and training to teachers, parents, and other influential adults to help them recognize and challenge gender stereotypes. All of these measures will build a more inclusive environment in which girls feel valued and supported.

- *Celebrate achievements*

One way to make this possible is by showcasing women's work, creating awards and recognition programs, and displaying the success stories of women in STEM fields, which helps to raise awareness of the important contributions that women are making in these fields and help to increase the visibility of women in STEM, to ensure that they are recognized and respected for their work [9].

- *Provide resources and support*

There are many cases where girls have fewer female peers or role models in their classes, which can create feelings of isolation and limit their sense of belonging in the field. This is why girls may need extra support and resources when pursuing a degree in science, engineering, technology or math that will help them to overcome challenges and gender stereotypes. This may consist of tutoring, mentorship programs, student organizations that focus on providing opportunities for girls to network, gain experience and learn from one another [12].

Why more women are needed in STEM?

Diversity is crucial in any field, and this is especially true in engineering, science, technology, and math. Encouraging diversity in STEM fields, particularly for girls, can have a significant impact on the field's innovation, creativity, and productivity.

Having a diverse team means that people with different backgrounds, experiences, and perspectives can come together to solve problems. Diversity and inclusion foster creativity and innovation by encouraging individuals to bring their full selves to the table. This allows for the exchange of ideas and the sharing of different viewpoints, which can lead to discoveries and approaches to problem-solving. Research teams with greater diversity tend to publish more articles and obtain more citations than teams with greater homogeneity. This is because a diverse workforce is better equipped to understand and meet the needs of a diverse customer base, and can develop new products and services that are tailored to a wider range of people.

Furthermore, gender diversity can lead to economic growth. This can be understood by the following: encouraging more women to enter STEM fields help address the skills gap and high demand for professionals in industries that are experiencing rapid technological change.

Generally speaking, having more women in the workforce increases both men's and women's salaries and productivity. According to a study by a professor of economy at the University of Akron, for every 10% of the increase in women working between 1980 and 2010, there was a pay rise of 5% [11].

Conclusions

The underrepresentation of women in STEM fields is a complex issue that requires a multifaceted approach to address. While progress has been made in recent years to close the gender gap, there is still a long way to go to achieve true equality in these fields. Girls encounter a variety of difficulties, due to societal pressure and gender norms, which can lead to self-doubt and lack of confidence. However, we can develop a more welcoming environment that values and encourage girls and women in STEM, by changing our attitude, and being more open-minded and supportive. It is crucial to continue to work towards closing the gender gap in STEM and ensure that women have equal opportunities to pursue their passions and make valuable contributions to the field. Only by empowering and supporting women in STEM, we can fully realize the potential of these fields to create a better and more equitable future for everyone. And never forget, everyone has the right to choose their career path. Don't be intimidated by society's stereotypes, choose your passion, believe in yourself, and follow any of your dreams.

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