



# Women in STEM: Impact of Gender Stereotypes

Ritu Dhingra, Prajwalit Shikha

Department of Physics, Maitreyi College, Delhi University, Delhi, India

**Abstract :** Gender and ability stereotypes have a detrimental impact on the retention of women in STEM disciplines and careers. Despite the existence of biologically rooted gender differences in abilities and interests, these differences are often wrongly emphasized as a primary reason for the significant gender gap in science, technology, engineering, and mathematics. However, recent accomplishments by women in the science and technology fields underscore the profound influence of culture and learning environments in shaping abilities and interests.

It's noteworthy that women frequently underestimate their capabilities in comparison to their male counterparts. The biographies of female scientists reveal a troubling trend of women being systematically guided away from science and mathematics during their educational journeys. This diversion restricts their opportunities, readiness, and access to engage in these critical fields. Demonstrated instances underscore the incontrovertible potential of women to assume pivotal roles in advancing global progress and sustainability when empowered with educational and occupational avenues in science, technology, and innovation.

Research indicates that female scientists contend with heightened levels of work-related stress, an inadequate work-life balance, and instances of sexual harassment. However, strategies that prioritize a female-friendly work environment, such as inclusive management policies, flexible work arrangements, and equitable performance evaluations, have shown promise in alleviating stress and enhancing work-life equilibrium for women within STEM fields. These measures consequently contribute to heightened productivity among female professionals in STEM.

*Index Terms:* Gender, stereotypes, women, under representation, STEM

## I Introduction

Common gender stereotypes often unfairly link high-level intellectual abilities such as brilliance and genius to men rather than women. These biases can discourage women from pursuing prestigious careers, resulting in their underrepresentation in various fields. Addressing these stereotypes is essential for promoting gender equality and enabling women to contribute fully to diverse professional domains [1].

Despite comprising half of the global population, women remain underrepresented in higher education and professional roles within the STEM fields. **STEM** stands for Science, Technology, Engineering and Math which was introduced in 2001 by the US National Science Foundation [2]. The disparity is evident in the limited number of research papers published by women in STEM disciplines

[3]. This gender imbalance has broader economic implications, as countries experience significant losses due to the shortage of female researchers in STEM, highlighting the urgency of addressing this issue to ensure a more inclusive and prosperous future.

## II Methodology

The study involves the following:

1. Surveyed data analysed in various research reports regarding the lesser representation of women as compared to men in STEM
2. Studied the research reports depicting the conditions of women in STEM jobs
3. Collected information regarding the problems faced by female scientists in past
4. Proposed solution to this problem.

### 2.1. Striking Disparity and Under representation

According to a study by Niti Aayog [4], more males pursue post doctoral research as compared to females. A considerable proportion of women researchers, following the completion of their doctoral studies, either choose not to continue in scientific careers or face interruptions in employment shortly after beginning their jobs. This ongoing trend underscores the significant underrepresentation of women in the field, emphasizing the need for comprehensive efforts to address and rectify these. Since Marie Curie's 1903 Nobel Prize win, a mere seventeen women have clinched Nobel Prizes in physics, chemistry, or medicine, whereas 572 men have achieved this honor. Regrettably, the contributions of these women often receive inadequate representation in esteemed journals. Moreover, women frequently encounter obstacles in terms of promotions. The gender gap is further evident in the number of STEM graduates, with fewer women than men. According to the World Bank, globally, only 18% of girls pursue STEM studies in contrast to the 35% of boys. This underscores the pressing need for systemic change to achieve gender parity in STEM fields.

According to a UNESCO report less than 30% of world researchers are women [5].

Women are notably underrepresented in academic pursuits such as computer science, mechanical engineering, and electrical engineering. Merely 22% of women make up the professionals in artificial intelligence, and only 28% of engineering graduates are female. Female researchers often contend with shorter and less financially rewarding careers, highlighting a pervasive issue in the academic and professional landscape.

### 2.2. Case Study

Analyzing case studies from history involving various female scientists [6] exposes the pervasive influence of gender stereotypes across societies worldwide, prompting the need for improvement.

**2.2.1 Emmy Noether** (1882-1935) could not teach at University of Göttingen because of being a woman [7]

**2.2.2 Cecilia Payne** (1900-1979) studied science at Cambridge University and was able to attend major scientific conferences, but failed to graduate because Cambridge did not give degrees to women (prevalent till 1948).

**2.2.3. Marthe Gautier** (1925-2022) The credit for her work was taken by the Jérôme Lejeune team at the Trousseau Hospital in Paris.

**2.2.4. Henrietta Swan Leavitt** (1868-1921) At the beginning of the twentieth century women were prohibited from working with telescopes; so she had a hard time working in the field of astronomy.

**2.2.5. Marie Curie** (1867-1934) Higher education was not available for girls in Poland. The Nobel Committee was going to give prizes only to Pierre Curie and Henri Becquerel. However, Pierre insisted that Marie must be honored, hence she was honoured with a Nobel Prize.

**2.2.6. Rosalind Franklin (1920-1958)** She was sidelined, ridiculed and wronged just because she was a woman in a male-dominated field and she had never even been considered for a Nobel Prize.

As recently as 2005, economist Lawrence Summers, who was then the president of Harvard University, made a public assertion that the scarcity of women in the sciences was attributed not to discrimination but rather to "biological differences" between genders. However, the rich legacy of countless pioneering women scientists throughout history stands as a testament to their remarkable contributions to the world of science. This legacy firmly underscores the reality that the gender gap within STEM fields is not significantly influenced by inherent biological disparities between men and women. Instead, it emphasizes that achieving genuine gender equality in these domains requires recognizing and addressing the complex barriers that women face, paving the way for a more inclusive and balanced scientific landscape

Despite the growing percentage of women in the college educated workforce over the last decade, the underrepresentation of women in certain fields has remained persistently steady.

### 2.3. Careers In STEM and Research

The insufficient retention of women in STEM careers becomes apparent due to the heightened challenges they often encounter in comparison to their male counterparts when demonstrating their capabilities.

Although women are well-represented in higher education, their presence significantly diminishes as career progression advances, which is evident from the following data.

The 2009 American Community Survey conducted by the Census Bureau [8] brings to light a concerning disparity: while women make up 48 percent of the U.S. workforce, their representation in STEM fields stands at just 24 percent. This underrepresentation becomes more evident as one examines the trajectories of their careers. Research indicates that women in STEM fields often experience shorter and less lucrative careers compared to their male counterparts.

This imbalance extends to the realm of academic recognition. The presence of women's work in high-profile journals remains limited, and they frequently find themselves overlooked for promotions that could further their careers [9]. The issue of gender bias is also reflected in the allocation of research funding, with women typically receiving smaller grants than their male colleagues.

Furthermore, although women constitute 33.3 percent of all researchers, their presence in the upper echelons of the scientific community remains disproportionately low. Only 12 percent of members within national science academies are women [10], indicating that systemic barriers persist in preventing women from attaining the recognition and opportunities they rightfully deserve.

Gender bias is evident not only in the workplace but also in the academic sphere. This bias extends to peer-review processes and scientific conferences, where a notable disparity exists. Men are invited to speak on scientific panels at a rate that is twice as frequent as that of women. This discrepancy underscores the systemic challenges that women face in achieving equal representation and recognition within scientific circles. 43% of STEM graduates are women out of which 34% are from the United States, 31% are from Canada and 38% are in the UK [11].

### 2.4. Indian Scenario

In India, there has been a noticeable rise in female enrollment in STEM courses, spanning undergraduate, Master's, and PhD programs, particularly in STEM courses. This enrollment has grown from 10,02,707 in the academic year 2017-18 to 10,56,095 in 2019-2020.

Despite this positive trend, a concerning disparity remains evident: a mere 14% of Indian women pursue careers as scientists, engineers, and technologists. This statistic underscores the need for further efforts to bridge the gender gap and enhance female representation in these critical fields.

### **Why low women participation in STEM?**

Stereotypical gender roles, deeply ingrained patriarchal attitudes, and rigid societal norms have long constrained women's advancement, particularly in fields such as science, technology, and innovation. Often burdened with traditional household responsibilities, women face additional stress related to marriage and childbirth, further impeding their career growth. Biases and social discrimination further exacerbate these challenges, subjecting women to unequal treatment and limited opportunities. In such an environment, the weight of expectations can be overwhelming, leading many talented women to be held back from realizing their full potential. However, it's crucial to recognize that women possess the capability to play pivotal roles in driving global progress and sustainability. Empowering women through education and employment opportunities in the realms of science, technology, and innovation can catalyze positive change, not only for individual women but for the advancement and sustainability of the world as a whole. Breaking down these barriers is an essential step towards fostering a more equitable and prosperous society.

### **Steps to bridge the gap**

Implementing female-friendly management policies is a critical step towards addressing gender disparity in the workplace. Offering flexible working hours, for instance, can accommodate the diverse needs of women, enabling them to balance their professional responsibilities with personal commitments. Moreover, ensuring fair and unbiased appraisals is essential, as it provides equal opportunities for recognition and advancement, regardless of gender. These solutions stand as effective measures to tackle the prevailing gender gap, promoting a more inclusive and equitable work environment where women can thrive and contribute their fullest potential. More participation from females will create a larger productive STEM workforce pool which will boost the potential productive capacity of the economy and to generate an increase in GDP per capita.

### **Conclusion**

It is crucial to acknowledge and address the underrepresentation of women in science, and the additional obstacles women scientists face because of their gender.

In conclusion, the stark underrepresentation of women in STEM fields reflects a concerning pattern of disparity, where opportunities for women to excel are often curtailed. Despite their significant contributions, women's work frequently goes unrecognized, and they are disproportionately excluded from research initiatives and awards. Addressing this issue requires a concerted effort to dismantle gender-based barriers, such as biases in hiring and promotions, and to create a more inclusive and level playing field. By implementing targeted initiatives that provide mentorship, equal opportunities, and recognition, we can pave the way for a more equitable future where women in STEM not only flourish but also play an indispensable role in shaping innovation, research, and progress on a global scale.

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