
Gender Gap In Science And Technology From An Indian Perspective

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Abstract

The gender gap in science and technology refers to the disparities in representation, opportunities, and outcomes between men and women in these fields. There are inspiring women scientists and technologists in India who are making significant contributions.

Keywords:- Gender Issue, Gender Gap, Science, Technology and Indian Perspective.

Introduction

Despite progress in recent decades, significant gender imbalances persist, and women remain underrepresented in many STEM (Science, Technology, Engineering, and Mathematics) disciplines. Gender bias in India's STEM workplaces is a complex issue with various underlying causes. These causes often intersect and reinforce each other, contributing to an environment where women may face discrimination and unequal treatment.

Causes Of Gender Bias In India's Stem Workplaces:

Underrepresentation

Underrepresentation is one of the major causes of gender bias in India's STEM workplaces. It refers to the low proportion of women in STEM fields, especially in leadership positions. Underrepresentation can have negative impacts on the diversity, innovation, and productivity of STEM sectors, as well as on the aspirations and opportunities of women in STEM.

Following facts illustrate the underrepresentation of women in India's STEM workplaces:

According to a 2019 World Bank report(101 Reporters, 2021), about 43% of STEM graduates in India are women, which is the highest in the world, but their share in STEM jobs is a mere 14%(Drishti The Vision, 2023).

Women constitute only 14% of the 280,000 scientists, engineers, and technologists in research and development institutes in India(Drishti The Vision, 2023).

There are only two openly queer/trans people in faculty positions in India(Drishti The Vision, 2023).

In March 2021, the Indian Academy of Sciences released a book, Founders of Modern Science, which featured 15 cisgender men and only one woman among the 16 names(Drishti The Vision, 2023).

In 2014, the Supreme Court of India ruled that transgender people should be treated as the third category of gender, but in 2019, Parliament enacted Transgender Persons (Protection of Rights) Act, which was criticised by many activists and experts for being regressive and violating the rights of transgender people(Chakrabarty, 2022).

Societal Stereotypes

Societal stereotypes are another cause of gender bias in India's STEM workplaces. They refer to the widely held and often inaccurate beliefs or assumptions about the characteristics, abilities, and preferences of women in relation to STEM fields. Societal stereotypes can influence the perceptions, expectations, and evaluations of women in STEM education and careers, as well as their own self-concept and motivation.

Following facts illustrate the impact of societal stereotypes on gender bias in India's STEM workplaces:

According to a 2017 study(Parekh & Puthillam, 2017), Indian participants had a strong bias for associating men with science, and men had a stronger bias than women did. This implicit bias can affect how women are viewed and treated in STEM settings, as well as how they view themselves and their potential.

According to a 2020 report(Andaleeb, 2020), gender stereotypes need to change as they will prevent talented students from pursuing a career in the discipline. The report found that socio-economic status is a key factor, with boys of a lower status more likely than comparable girls to achieve minimum proficiency levels in math in most countries at both upper primary and secondary levels. This suggests that girls face more barriers and discouragement from pursuing STEM subjects than boys do.

According to a 2021 article(Sarkar, 2021), despite producing such a large percentage of STEM graduates, the share of women actually employed in the scientific research and development sector in India is a mere 14%, far behind the US, for example, where women make up 50% of the overall STEM workforce. The article attributed this gap partly to the prevailing social norms and expectations that favour men over women in STEM fields.

According to a 2016 article(Singh, 2016), 81% of women in STEM in India perceived a gender bias in performance evaluations and a large proportion felt that their companies would not offer them top positions. The article also stated that women in STEM jobs are highly ambitious and driven, but gender bias and hostile work cultures make them feel stalled and hasten their decisions to quit sooner than their male counterparts.

Occupational segregation

Gender bias in India's STEM workplaces is also influenced by occupational segregation, where women are unevenly distributed across different STEM roles due to factors like education, preferences, discrimination, and stereotypes. This segregation can adversely affect women's wages, career prospects, and overall well-being.

Following facts illustrate the extent and effects of occupational segregation in India's STEM workplaces:

According to a 2020 study(Agrawal, 2016), the extent of gender segregation in India is higher in urban areas than that in rural areas. Most of the observed segregation in rural labour markets originates from educational outcomes, whereas in urban markets it is due to occupational profile of individuals(Agrawal, 2016).

According to a 2019 article (Chauradia, Sripada, & George, 2019), women are underrepresented in STEM occupations such as engineering, manufacturing, construction, and information technology. Women account for only 20% of engineers, 25% of computer professionals, and 15% of architects and designers in India (Chauradia, Sripada, & George, 2019).

According to a 2023 study (Agrawal, 2021), occupational segregation by caste and gender is prevalent in India. The study found that women from lower castes face more barriers and discrimination in accessing STEM occupations than women from upper castes or men from any caste group (Agrawal, 2021).

According to a 2016 article (Rammohan, Goli, & Reddy, 2017), occupational segregation contributes to wage differentials between men and women in STEM fields. The article estimated that about 30% of the gender wage gap in India can be explained by occupational segregation (Rammohan, Goli, & Reddy, 2017).

Male-Dominated Work Culture

Male-dominated work culture in Indian STEM workplaces perpetuates gender bias by favouring men and creating a hostile environment for women, leading to discrimination, harassment, and exclusion. According to a 2018 report (Funk & Parker, 2018), women are underrepresented in STEM occupations such as engineering, manufacturing, construction, and information technology. Women account for only 20% of engineers, 25% of computer professionals, and 15% of architects and designers in India (Funk & Parker, 2018).

According to a 2018 report (Funk & Parker, 2018), women in STEM jobs are more likely than their male counterparts to cite discrimination in hiring and promotions as a major reason why there are not more women working in STEM (48% vs 29%) (Funk & Parker, 2018).

Work-Life Balance Challenges

In India's STEM workplaces, gender bias is exacerbated by work-life balance challenges, including childcare, eldercare, and household duties, which impact women's availability, productivity, well-being, career choices, and opportunities.

According to a 2018 report (Chauradia, Sripada, & George, 2019), women in STEM jobs are more likely than their male counterparts to cite the difficulty of balancing work and family in STEM jobs (40% vs. 28%) as a major reason why there are not more women working in STEM fields (Funk & Parker, 2018).

Progress In The Recent Years

While there are challenges, it's important to note that India has seen progress in recent years. More women are entering STEM fields, breaking barriers, and achieving success in various domains, including space science, medicine, and information technology.

Some examples of women who have made significant contributions and achieved representation in STEM fields in India:

Asima Chatterjee: Asima Chatterjee was a chemist who specialized in organic chemistry and phytomedicine. She was the first woman to earn a Doctorate of Science from an Indian university and the first woman to be elected as the General President of the Indian Science Congress. She was also awarded the Padma Shri, one of the highest civilian honours in India, for her pioneering work on the medicinal properties of plants.

Kalpna Chawla: Kalpna Chawla was an Indian-American astronaut and the first woman of Indian origin in space. Kalpna Chawla, who was chosen by NASA in December 1994, reported to the Johnson Space Centre in March 1995 as a candidate for the 15th Group of Astronauts. She flew on two space shuttle missions, STS-87 and STS-107, and logged more than 30 days in space. She died in the Columbia space shuttle disaster in 2003. Her achievements in aerospace engineering and space exploration continue to inspire young women in India to pursue careers in science and technology.

Dr. Tessy Thomas: Dr. Tessy Thomas, known as the "Missile Woman of India," is a scientist and engineer who played a crucial role in the development of India's Agni-V ballistic missile in DRDO. She is the first woman scientist to lead a missile project in India and is a symbol of women's achievements in aerospace and defense technology.

Anuradha TK: Anuradha TK is a scientist and engineer who is the senior-most woman officer at the Indian Space Research Organisation (ISRO). She is the Geosat Programme Director at ISRO Satellite Centre and has been involved in several satellite projects, such as GSAT-12, GSAT-10, GSAT-6, and GSAT-29. She is also an inspiration for many young girls and women who want to pursue careers in space science and technology.

Dr. Ritu Karidhal: Dr. Ritu Karidhal, often referred to as the "Rocket Woman of India," played a significant role in the successful Mars Orbiter Mission (Mangalyaan). She served as the deputy operations director of the mission and was instrumental in its execution, highlighting the role of women in India's space program. She served as the mission director for the Chandrayaan 2. She recently led Chandrayaan-3, which is another significant accomplishment in her career.

Dr. Soumya Swaminathan: Dr. Soumya Swaminathan is a renowned Indian pediatrician and clinical scientist. She served as the Deputy Director-General of the World Health Organization (WHO) and Chief Scientist at WHO, contributing to global health and research, particularly in the context of infectious diseases and public health. Only 30% of scientists in the world are female researchers, according to UNESCO. Even less of them participate in positions of leadership and decision-making. The WHO Nursing and Midwifery Global Community of Practise (NMGoP) organised a Person in the Spotlight session with Dr Soumya Swaminathan, the organization's chief scientist, to promote this crucial goal.

Arati Prabhakar: Arati Prabhakar, an engineer, and entrepreneur, became the first woman to lead the U.S. Defense Advanced Research Projects Agency (DARPA). Although she is based in the United States, her Indian heritage is a source of inspiration for aspiring Indian women in STEM fields.

Kiran Mazumdar-Shaw: Kiran Mazumdar-Shaw is a prominent biotechnology entrepreneur and the founder of Biocon, a leading Indian biopharmaceutical company. Her success in the biotechnology sector has made her a role model for women in science and business in India.

Kalpana Kalahasti: Kalpana Kalahasti Associate Project Director, Chandrayaan-3 born in Bengaluru, Karnataka. As the Chandrayaan-3 mission's deputy project director, Kalpana Kalahasti diligently handled the delicate intricacies of the project, contributing significantly to its success. Even in the face of difficulties caused by the pandemic, her unwavering commitment enabled the continuation of the mission. She has previously worked on the Mangalyaan mission and the second lunar mission. Kalpana is one of the many women scientists who have made significant contributions to ISRO's space missions. This serves as an inspiration to young girls aspiring to careers in science and technology.

Initiatives For Change

Numerous organizations, institutions, and governments are actively combating gender disparities in science and technology. Their efforts encompass mentorship programs, diversity policies, and STEM education promotion for girls. In India, the government has taken several steps to bolster women's involvement in STEM fields, aiming for a more diverse and inclusive workforce. Key government initiatives include:

Beti Bachao, Beti Padhao (BBBP): Launched in 2015, this nationwide campaign promotes girl child survival and education, challenging gender stereotypes and fostering STEM education.

Pragati Scholarship Scheme: Administered by the All India Council for Technical Education (AICTE), this program offers scholarships to female undergraduates pursuing technical education, empowering women in STEM.

Udaan Scheme: Another AICTE initiative, Udaan provides mentoring and financial support to girls pursuing engineering education, aiding them in cracking entrance exams.

INSPIRE Scholarship for Higher Education (SHE): The Department of Science and Technology (DST) offers SHE scholarships to women studying natural and basic sciences, encouraging careers in science.

Women Scientist Scheme (WOS): DST's WOS offers research grants to women scientists and technologists returning to work after family responsibilities.

KIRAN Division: DST's KIRAN division focuses on reducing gender disparity in the science and technology sector through various programs and initiatives.

Gender Advancement for Transforming Institutions (GATI): GATI is a pioneering project promoting gender equality in STEM through a comprehensive charter and framework.

Rashtriya Avishkar Abhiyan (RAA): RAA promotes science, math, and tech education, encouraging all students, including girls, in STEM-related activities.

Women in Engineering, Science, and Technology (WEST): Part of the I-STEM initiative, WEST supports women with STEM backgrounds, fostering their participation in science, tech, and innovation. I-STEM serves as a national platform for research resource exchange and various initiatives promoting R&D partnerships.

These government endeavours strive to create an inclusive STEM environment by addressing gender disparities, offering financial aid, and providing mentorship opportunities.

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