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GENDER GAP IN STEM EDUCATION IN INDIA: CAUSES AND POLICY SOLUTIONS

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ABSTRACT

The gender gap in STEM (Science, Technology, Engineering, and Mathematics) education in India remains a significant challenge despite progress in female literacy and educational enrollment. While women increasingly participate in higher education, their representation in STEM fields—particularly in engineering and technology—remains uneven. This paper examines the major causes of the gender gap in STEM education in India, including socio-cultural norms, economic barriers, institutional challenges, and psychological factors. It also evaluates policy measures and proposes solutions to enhance women's participation and retention in STEM education and careers.

KEYWORDS:- Gender gap in STEM, STEM education in India, Women in STEM India, Gender inequality in education, Female participation in STEM, STEM gender disparity

INTRODUCTION

STEM education plays a crucial role in economic development, innovation, and global competitiveness. India, with its rapidly growing economy and technological advancements, requires a strong and inclusive STEM workforce. However, gender disparity continues to hinder the full utilization of human capital.

Although women have made progress in education, their participation in STEM remains disproportionately low. Studies indicate that women constitute only a fraction of the STEM workforce and are underrepresented in technical and leadership roles. (The Times of India) This gap highlights systemic inequalities that begin at the educational level and persist throughout career pathways.

EXTENT OF THE GENDER GAP IN STEM EDUCATION

India has achieved near gender parity in general education, but disparities remain within STEM disciplines. Women are better represented in life sciences and medicine but significantly underrepresented in engineering, physics, and technology fields.

Globally, women account for only about 35% of STEM graduates, reflecting a persistent imbalance. In India, the problem is compounded by the “leaky pipeline” phenomenon, where women drop out at various stages—from education to employment—resulting in lower workforce participation.

Furthermore, only a small proportion of women hold academic or faculty positions in STEM institutions, indicating structural barriers within higher education systems.

CAUSES OF GENDER GAP IN STEM EDUCATION

1. Socio-Cultural Norms and Gender Stereotypes

One of the primary causes of the gender gap is deeply rooted societal norms. Traditional expectations often assign women the role of caregivers, discouraging them from pursuing demanding STEM careers. Early socialization reinforces stereotypes that associate STEM fields with men, influencing subject choices from a young age.

Family pressure, safety concerns, and mobility restrictions further limit opportunities for girls, particularly in rural areas.

2. Economic Barriers

Socioeconomic status plays a significant role in shaping educational opportunities. Families with limited resources may prioritize boys' education over girls', especially in costly STEM fields such as engineering.

Financial constraints also affect access to coaching, technology, and quality institutions, reducing girls' competitiveness in STEM entrance examinations.

3. Institutional Challenges

Educational institutions themselves can perpetuate gender inequality. Lack of female faculty, inadequate mentorship, and gender-insensitive infrastructure discourage female participation.

Research shows that women constitute a very small percentage of STEM faculty, limiting role models for aspiring students.

Additionally, curricula and teaching practices often fail to address gender biases, further alienating female students.

4. Psychological Factors and Confidence Gap

Studies indicate that girls often exhibit lower confidence in their mathematical and technical abilities despite performing equally well or better than boys.

This “confidence gap” discourages them from pursuing STEM subjects and contributes to higher dropout rates. Social conditioning and lack of encouragement exacerbate this issue.

5. Transition from Education to Workforce

Even when women complete STEM education, many do not enter or remain in STEM careers. This disconnect is attributed to workplace challenges such as gender bias, unequal pay, and lack of career advancement opportunities.

The absence of supportive policies for work-life balance further leads to attrition, reinforcing the gender gap.

POLICY SOLUTIONS AND RECOMMENDATIONS

1. Promoting Gender-Inclusive Education Policies

Government initiatives should focus on increasing access to STEM education for girls through scholarships, reservations, and financial aid. Targeted programs for underprivileged communities can help reduce socioeconomic barriers.

Recent initiatives such as scholarships for women in STEM demonstrate the potential of financial support in increasing participation.

2. Encouraging Early STEM Exposure

Interventions at the school level are essential to challenge gender stereotypes. Curriculum reforms should promote gender-neutral learning and encourage girls to pursue STEM subjects through interactive and practical approaches.

Programs such as science camps, coding workshops, and mentorship initiatives can help build interest and confidence among young girls.

3. Strengthening Institutional Support

Educational institutions must create inclusive environments by:

- Increasing female faculty representation
- Providing mentorship and networking opportunities
- Ensuring safe and supportive campus infrastructure

Gender-sensitization training for educators can also help reduce bias in classrooms.

4. Bridging the Confidence Gap

Policies should address psychological barriers by fostering self-confidence and leadership skills among female students. Career counseling and role models can play a significant role in motivating girls to pursue STEM careers.

Highlighting successful women in STEM can challenge stereotypes and inspire future generations.

5. Improving Transition to Workforce

To address the “leaky pipeline,” policies must focus on retention as well as recruitment. This includes:

- Flexible work arrangements
- Maternity and childcare support
- Equal pay and promotion opportunities

Collaboration between academia and industry can ensure smoother transitions from education to employment.

6. Data-Driven Policy Making

Regular collection and analysis of gender-disaggregated data can help identify gaps and monitor progress. Evidence-based policymaking ensures that interventions are targeted and effective.

CONCLUSION

The gender gap in STEM education in India is a multifaceted issue rooted in socio-cultural, economic, institutional, and psychological factors. While progress has been made in increasing female enrollment, significant challenges remain in ensuring equal participation across all STEM fields and career stages.

Addressing this gap requires a holistic approach involving government policies, institutional reforms, and societal change. By promoting gender-inclusive education, supporting women throughout their academic and professional journeys, and challenging traditional norms, India can unlock the full potential of its female workforce in STEM.

Bridging the gender gap is not only a matter of social justice but also a strategic necessity for national development and innovation. A more inclusive STEM ecosystem will contribute to economic growth, technological advancement, and a more equitable society.

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