Accounting for Gender Inequality in STEM: A Pre-training Study of University Faculty in India

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Abstract

The underrepresentation of women in STEM (science, technology, engineering, and math) fields is a global concern, particularly rapidly developing countries like India. Despite concerted efforts in education, government, and civil society to promote women's participation in STEM, a significant gender gap persists. While more women in India are earning STEM degrees, they remain a minority in STEM employment, especially in leadership positions. Established factors that contribute to this inequality include societal expectations, gender stereotypes, and cultural norms that significantly impact the choices and opportunities available to women pursuing scientific fields. This paper builds upon a previous study exploring gender distribution, hiring, and promotion in Indian University STEM departments. It investigates the overt and subtle obstacles women face in academia. The study uses resumes from an institutional website and an exploratory survey of faculty members from a top-rated Indian university to shed light on this phenomenon. Key findings highlight the stereotype that women are more represented in certain fields, like life sciences and non-STEM departments. Additionally, women in STEM fields face challenges in balancing professional and domestic responsibilities, leading to mid-career breaks that hinder their career development. Understanding these biases is crucial for designing effective interventions, including gender-sensitization training programs, to foster gender equality and diversity in STEM fields.

Keywords: Gender, Academia, Gender Sensitization, Indian Context, STEM
1. Introduction

The relatively low representation of women in sciences, technology, engineering, and math (STEM) is an international concern, especially in countries like India with rapidly growing and evolving economies and an enormous population with more access to education than ever before. It has garnered attention at virtually every level of society and across multiple sectors. Concerted efforts have been made in educational institutions, government, and civil society to foster girls’ and women’s participation in STEM both academically and within industry. However, there is still a significant gap worldwide; as of 2020 data, the global proportion of women employed in STEM fields is 31.2%, with an even more extreme proportion in India (UNESCO, nd).

Many reports have been produced looking into the topic from various governments and the United Nations. These resources offer a critical lens, emphasizing women's complexities in science and the need for comprehensive understanding to guide interventions. Within India, even though more women are earning scientific degrees, they remain a minority in STEM field employment. Data points out a stark discrepancy; while 42.7% of all STEM graduates in India are women (World Bank, 2020), merely 14% of all employed scientists, engineers, etc. are women (Varma, Falk, & Dierking, 2022). Given that India has more than 280,000 STEM job opportunities annually (Kaushik, 2021), there is both a need and scope for effective policy changes. Women’s underrepresentation in STEM fields in India is exacerbated by the extremely large gender gap in workforce participation – while 56.8% of men are employed, only 22% of women are (Ministry of Statistics & Programme Implementation, 2021). It is important to note that women in academia are a global issue – not just within the STEM fields. While globally women constitute 44% of the faculty (World Bank, 2020), they are underrepresented in leadership positions, which decreases the likelihood that women’s employment in these fields will grow or that academia becomes more welcoming and accountable to women’s needs.

This paper is an extension of a study published in A Braided River: The Universe of Indian Women in Science (Coley et al., 2022), which explores variables such as gender distribution, hiring, promotion, and other relevant details in top-tier Indian University STEM programs. The results of that study indicate several issues that required further investigation. This paper takes up this important topic and seeks to articulate how women experience overt and subtle obstacles within the STEM field, specifically within academia. Utilizing findings from a sample of resumes publicly available on an institutional website, along with an exploratory survey of faculty from a top-rated university in India, key insights have been uncovered that help to explain this phenomenon. The more compelling findings include confirmation of the stereotype that women in academia tend to have higher representation in specific fields, especially the life sciences and non-STEM departments.
Further, especially in STEM fields, it was clear that women have a more significant burden in balancing their professional and domestic duties and are more likely to take a mid-career break at a critical time in their career development. This underscores the inherent bias that permeates the professional sector, including academia and perhaps especially in STEM fields, that put women at a fundamental disadvantage. The purpose of this study is to better understand the expressions of these biases to better design interventions, including gender-sensitization training programs.

1.1 Literature Review

The discrepancy between female STEM graduates and those with long-term science careers is attributed to intersecting social, cultural, and infrastructural complications. Invisible biases, inadequate support structures, and societal discrimination pose barriers (Bello et al., 2021; Gupta, 2007; Lawton et al., 2020; Huyer and Westholm, 2007). A review of 470 articles from 1986–2016 (Avolio et al., 2020) identified five key factors: personal, familial, social, educational, and labor-economic. These interdependent factors impacting women’s career progression in science vary by life stage and context (Cronin and Roger, 1999, p. 643), embodying the multidimensional hurdles women confront in achieving gender equality (SDG 5). The complexity broadens against constantly evolving scientific research demands, outpacing education infrastructure and traditional social norms’ adaptation to emerging job types.

There are many issues that must be considered to address these failings. The ‘leaky pipeline’ metaphor (Metcalf, 2010; Xie and Killewald, 2012), while helpful in describing the sequential nature of a scientific career, fails to account for the complexity of individual journeys and the sociocultural pressures and biases present (Cannady et al., 2014). More contemporary approaches, such as the ‘braided river’ analogy (Batchelor et al., 2021; Coley et al., 2022), offer an alternative perspective, viewing career progression as adaptive to individual needs and contexts. This analogy considers individual career paths shaped by unique needs, obstacles, ancontexts. It suggests that interventions should account for the complexity of the decision-making processes and offer comprehensive support, including alternative work arrangements, better childcare facilities, networking, and mentorship to encourage a more women-friendly workplace culture (Cannady et al., 2014). However, the introduction of such changes will require substantial investment. It is also critical to note a dearth of up-to-date, gender-disaggregated data in science (Coley et al., 2022). Without such data, it becomes difficult not just to represent the ground reality accurately but also to formulate effective policies to tackle the persistent gender inequality that exists in the Indian scientific community.
Considering India's social and cultural diversity, insights into career trajectories are crucial for addressing the challenges faced by women in science and devising solutions for greater representation. Data from governmental sources and institutions indicates an upward trend in the proportion of Indian women enrolled in higher education and science-related PhDs (Ministry of Education, 2020). Women's enrolment in prestigious scientific subjects such as chemistry, physics, and engineering is still relatively low compared to life sciences, microbiology, and IT/Computer sciences. This is called “horizontal gender segregation, wherein gender divisions are reinforced within sub-fields and specializations (Tambe, 2019). This demonstrates that gender biases persist. The lack of available data and longitudinal studies on this issue makes it difficult to determine the most successful path forward.

Also noteworthy is the age distribution of women in science, with a majority over 50 years old NITI Aayog’s (2017). Sociocultural factors influencing this dynamic could include the pressure of domestic responsibilities and the societal expectation of motherhood (Coley et al., 2022). Analysis of these issues, alongside the demonstrated institutional barriers, is key to understanding the transition from education to career fulfillment in science for women in India. Equitable access is hindered by social and cultural barriers, including class and caste boundaries that impede access to education (leading to employment opportunities) and cultural and physical barriers to education. Social and cultural barriers also prevent women from participating in the workforce (Kurup et al., 2010; DST, 2013; InterAcademy Panel on WiS, 2016). The immense cultural and ethnic diversity of India necessitates a deep understanding of regional and context-specific factors to address these challenges effectively (DST, 2009).

Numerous women take breaks in their careers after marriage and the birth of their children to assume additional familial duties under family pressure due to increased household chores or for personal or family reasons (NITI Aayog, 2017). Additional studies are required to determine if such family obligations limit men’s careers. Despite the introduction of new government policies and schemes accommodating women’s career breaks (e.g., the KIRAN suite including Women Scientists Scheme-A (WOS-A), Women Scientists Scheme-B (WOS-B), and Women Scientists Scheme-C (WOS-C)), evidence suggests that such career breaks often lead to a complete withdrawal from the workforce (Kaushiva and Joshi, 2020). Further, these breaks tend to happen in the age range of 25-40 which is also a critical time for career advancement, forming yet another disadvantage for women.
Women who pursue scientific education and professions encounter additional cultural barriers and social challenges within the science industry (Kurup and Maithreyi, 2011). A noteworthy study articulating these challenges, with particular emphasis on the Indian context, reveals the stigmas and social pressures women scientists combat daily (Gupta, 2016). Gupta suggests that hiring practices in science and technology fields inherently favor men and that males predominantly hold leadership roles. This results in a lack of female role models in higher positions and a lack of networking opportunities. Even when women successfully overcome these obstacles and enter the science workforce, they face additional challenges in organizations, higher education institutions, and laboratories, such as unconscious gender bias, gendered expectations in professional settings, and exclusionary behavior by peers and superiors. Systemic biases in assessment, teaching, and promotion criteria often deter women from climbing the professional ladder and increase their chances of leaving the profession (InterAcademy Panel on WiS, 2016). In addition to the various social and cultural barriers, safety and accessibility remain significant challenges, especially for women residing in rural locations. The World Economic Forum’s Gender Gap Index (2023) reflects India’s disquieting standing on global indicators for women’s health and safety, despite substantial strides in gender equality. This placement is not without criticism, deemed unrepresentative of the vast nation India is; however, the grim reality persists of violent crimes being perpetrated against women (National Crime Records Bureau, 2018).

Furthermore, the gender pay gap in science and technology, as in many fields, is significant, discouraging women from remaining in the industry, although it has improved in recent decades (Goel, 2018). To address these barriers and biases, some Indian institutions offer women-specific scholarships, awards, and transformative policies such as flexible working hours, career breaks, and childcare facilities, and have started proactive anti-harassment measures (DST, 2013). However, these initiatives can often be seen as tokenism, with little impact on women’s lives and careers.

Overall, the barriers and challenges rooted in society and culture are vast and interconnected. They require multi-level intervention strategies, considering the cultural specificity of different Indian states and regions, to promote greater inclusion of women in the science sector in India. Further, despite the wealth of information and dialogue centered around increasing the proportion of women in STEM, we still do not fully understand the impact of this gender-based inequality on the academic or industrial field, on the outcomes of such research, and on the women themselves. For this, much more research is required.

For decades there have been interventions, policies, and programs introduced to try and curb gender inequality in the workplace, with varying success. In India, women’s equal opportunity is guaranteed in the nation’s constitution, however, in practice there is rarely enforcement or monitoring to ensure this is a reality (Ghosh & Roy, 1997). Conventional approaches in India have primarily included “reservations” (requiring a certain percentage...
of women in hiring or elected office) and government incentives for hiring women. However, evidence suggests that without also addressing cultural stereotypes, especially in management positions and higher up the decision-making ladder, these approaches are hardly sustainable (Deiningeret al., 2020; Wilson, 2003).

One effective means of adjusting professional cultural norms is sensitivity training across all levels of management and organization. This approach has demonstrated some effectiveness within the Indian context (Lahari-Dutt, 2007; Goel, 2017), but there is still a dearth of research and impact evaluation available for replicating such an approach, especially within the Indian context given the extreme diversity and strong cultural traditions. What is needed now is to revise existing gender sensitization materials to be more appropriate for the Indian population and to develop, deploy, and revise such training using a more rigorous and data-driven approach. This is a timely effort as the Indian government and associated education ministries increase efforts to improve gender sensitivity in schools and among teachers. The 2020 National Education Policy (NEP) directly calls for gender sensitization in the classroom, but there are limited examples available of successful approaches that can be easily scaled or applied in higher education contexts (Singh, R., 2023).

This study is meant to improve gender sensitization training by initiating a process within a university setting to identify the main roadblocks and cultural, attitudinal, and behavioral factors preventing more women in STEM (and the professional sector in general). This initial study seeks to establish a baseline understanding of a university’s hiring practices and the general attitudes and perspectives of existing employees. Eventually, the results from this study will be used to structure a gender sensitization training program for faculty, staff, and students, as well as for future policies meant to improve gender equality and equity across the institution. Information gathered here will be used as a baseline for measuring impact and improvements over time, however, more generally, it is hoped that this study provides a proof of concept that could be adopted in similar contexts by similar institutions.

A comparison of faculty, between men and women and between women in STEM vs non-STEM, was conducted and the results are detailed below.

2. Methodology

To explore gender-related variables within the professional STEM community, a two-part study was proposed to explore gender equality within the authors’ institution, a top-ranked private university in India. For the first part of the study, 216 faculty CVs (resumes) publicly available on the University’s website were used to examine the general characteristics of faculty within STEM and non-STEM fields. This is an extension of a similar study as part of the UNESCO publication, A Braided River: The Universe of Indian Women in Science (Coley et al., 2022). In this previous study, the CVs of 220 faculty and
staff from STEM departments in four top-ranked Indian universities were collected and analyzed. The CVs in that study were purposely selected for evaluation based on factors that may indicate gender preference in hiring and/or institutionalized benefits that accrue to male academics and researchers. Findings confirmed that far more men are represented in most STEM departments, that there are more “appropriate” departments for women in STEM (e.g., the life sciences), that more men had access to scholarships and funding early in their careers, and that far more women have a mid-career gap that extends beyond 2 years.

This previous study proved to be an effective way of measuring a university’s gender equality status in a more general way. The indicators chosen helped to identify statistically significant factors that help determine which departments were more gender-equal than others while also marking areas of potential improvement. The present study seeks to extend this and to supplement the more passive CV evaluation to include a survey component to capture more nuance and personal experience of university faculty. Over the period of three months, faculty CVs from a top-ranked university in Kerala, India were studied using a similar evaluation method as in A Braided River. In addition, an exploratory survey was conducted among the same faculty to understand better where this university is succeeding in promoting gender equality and where a proposed Gender Sensitivity Training might address existing issues.

This study was conducted in accordance with the authors’ University Board of Ethics, and measures for ethical research included protecting participant confidentiality, ensuring voluntary participation and ability to opt-out at any time, and provision for debriefing by the researchers.

Table 1 below details the number of CVs collected by the department and the faculty levels of those individual CVs. In total, 301 faculty CVs were evaluated using the same factors as the study in A Braided River (2022):
• Department of employment
• Ph.D. completion year
• Year of first university job (to determine potential career gaps)
• Whether or not they have been a Postdoctoral fellow (and for how many years)
• Number of years between the last promotion received
• Whether or not they studied abroad
• Whether or not they worked abroad
• Whether or not they studied at a top-ranked university for any post-graduation
• Whether or not they received funding, scholarships, fellowships, or other financial support for their studies.

Table 1: CV Data Overview

<table>
<thead>
<tr>
<th></th>
<th>Women</th>
<th>Men</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total in STEM</td>
<td>177</td>
<td>124</td>
</tr>
<tr>
<td>Mathematics/Physics</td>
<td>22</td>
<td>17</td>
</tr>
<tr>
<td>Engineering</td>
<td>46</td>
<td>58</td>
</tr>
<tr>
<td>Computer Science</td>
<td>76</td>
<td>29</td>
</tr>
<tr>
<td>Biology</td>
<td>22</td>
<td>14</td>
</tr>
<tr>
<td>Chemistry</td>
<td>11</td>
<td>6</td>
</tr>
<tr>
<td>Full Professor</td>
<td>11</td>
<td>18</td>
</tr>
<tr>
<td>Associate Professor</td>
<td>10</td>
<td>14</td>
</tr>
<tr>
<td>Assistant Professor</td>
<td>102</td>
<td>71</td>
</tr>
<tr>
<td>Lecturer</td>
<td>54</td>
<td>21</td>
</tr>
</tbody>
</table>

The second part of this study draws from data collected as part of a voluntary survey of faculty, which asked several questions about the faculty’s experience in their field and any potential gender-based discrimination or challenges they might have faced (in this or other institutions where previously employed). The purpose of this phase of the study was to dig deeper into the experiences of faculty and to identify potential differences and similarities between men and women and between women in STEM vs non-STEM departments. In total, 76 faculty participated, representing 6 departments in STEM areas and 8 in non-STEM departments. Table 2 below provides an overview of the demographics of the respondents.
The survey questions are modeled on existing studies from literature, including Coley et al., 2023; Gressel et al. 2020; Sheshadri et al. 2023. The survey questions include basic demographic information such as age, marital status, caste, and socio-economic status. Beyond this, the majority of the survey seeks to understand how vital career and family decisions were made for the individual, their perception of gender-based differences in their personal work and department, as well as reflection questions on their own experience as a professional in academia.

Table 2: Demographics of Survey Respondents

<table>
<thead>
<tr>
<th>Variable</th>
<th>STEM</th>
<th>Non-STEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Women: 22</td>
<td>Women: 25</td>
</tr>
<tr>
<td></td>
<td>Men: 14</td>
<td>Men: 15</td>
</tr>
<tr>
<td>Age</td>
<td>Women: 73%</td>
<td>Women: 43%</td>
</tr>
<tr>
<td></td>
<td>over 36</td>
<td>over 36</td>
</tr>
<tr>
<td></td>
<td>Men: 77%</td>
<td>Men: 75%</td>
</tr>
<tr>
<td></td>
<td>over 36</td>
<td>over 36</td>
</tr>
<tr>
<td>Married</td>
<td>Women: 85%</td>
<td>Women: 52%</td>
</tr>
<tr>
<td></td>
<td>Men: 93%</td>
<td>Men: 47%</td>
</tr>
<tr>
<td>Children</td>
<td>Women: 86%</td>
<td>Women: 32%</td>
</tr>
<tr>
<td></td>
<td>Men: 64%</td>
<td>Men: 20%</td>
</tr>
</tbody>
</table>

3. Results

3.1 Curriculum Vitae (CV) Study Results

Consistent with the findings from the previous study of similar institutions, A chi-square test of independence showed that there was a significant association between gender and faculty positions within STEM, with more men in Engineering and more women in Computer Sciences, $X^2 (4, N = 301) = 17.523, p = .002$. It was also found that more women were in the life sciences like biology and chemistry, while fewer were in math and physics.

Although inconclusive, it is interesting to note that while women in STEM fields were found to be older than their counterparts in non-STEM fields, the women outside of STEM have a higher faculty position. A chi-square test of independence showed that there was a significant association between women’s faculty positions in STEM vs. non-STEM fields, with relatively more women in higher faculty positions in non-STEM fields, $X^2 (3, N = 216) = 10.732, p = .013$. Within the STEM departments, significantly more men occupied higher faculty positions than women, $X^2 (3, N = 301) = 13.518, p = .004$. This could point to women having greater difficulty gaining promotions in STEM fields.
In addition to being relatively younger and with a higher faculty position, a significantly larger proportion of women in non-STEM fields also had international education opportunities, \(X^2 (1, N = 216) = 4.259, p = .044\). Similarly, within STEM departments, a greater proportion of men have had international education experience (\(X^2 (1, N = 301) = 10.712, p = .001\)), further strengthening the argument that women in STEM have less access to career-advancing opportunities.

### 3.2 Survey Results

Comparing Female and Male Respondents: The survey data replicated much of what was found in the literature and the previous study. As expected, far more women have had a career gap in the past compared to men. When asked who took part in the decision-making of whether or not to take a career break, half of the women declared it was a joint decision with their husband while 100% of the men said it was their choice alone. This is a significant difference as it points to a strong likelihood that women do not always have the same freedom of choice to decide their career trajectory and may be encouraged to have a break in their career to care for family duties compared to men in a similar situation.

Further, a chi-square test of independence showed a significant association between gender and who cares for sick children, with more women taking work leave to care for their sick children, \(X^2 (4, N = 76) = 12.601, p = .013\). Even more generally, when asked about which gender struggles to balance work and domestic responsibilities, 68% of women claimed that women struggle more. While 32% of men agreed women struggle more, 64% claimed both struggle equally, \(X^2 (2, N = 76) = 10.004, p = .007\). Interestingly, it was also found that there was a significant association between gender and perceptions of one’s own personal struggles to balance work/family life compared to their colleagues of the opposite gender, with more women feeling they struggle more than their male counterparts, \(X^2 (1, N = 76) = 17.997, p = .000\). These results strongly validate the commonly held stereotype that women have a greater burden in balancing more domestic duties in addition to their professional ones. This conclusion reflects the traditional gender norms that require women to take responsibility for most domestic tasks, but also reflect the growing reality of a two-parent income household. The “double burden” of women is thus demonstrated.
Within the workplace, results were encouragingly positive with few significant differences found between the genders. One exception was a strong association between gender and struggling to secure research funding, with more women struggling than their male colleagues, $X^2 (4, N = 76) = 9.412, p = .052$. However, in response to questions about what to study, whether or not to work professionally and to join their current career, and the decision-making role that the respondents played in these decisions, there were no significant correlations with gender. While not statistically significant, there were some interesting trends found between how men and women generally answered some of the survey questions. For example, in response to “Who took part in deciding what you would study in higher education?” 62% of men said they alone made the decision, while 28% said they decided along with their family. In comparison, only 47% of women made that decision alone, with 34% deciding with their families and 9% with their spouses. A similar trend was found in questions about whether or not to work professionally and deciding which position to apply for. These results can be interpreted to conclude that within Indian academic workplaces, there are selective areas of gender-based discrimination or inequality, largely within the decision-making ability granted to women. We can expect that when more women are able to become heads of department or sit in other decision-making roles within a university, that this trend will start to reverse. One complicated finding to articulate with the given data was that a significant relationship was found between gender and whether or not personal desires were the primary decider in determining whether or to have children, with more men saying their desires were not considered, $X^2 (1, N = 76) = 5.371, p = .020$. This may point to a fascinating cultural reality within India of the extreme pressure for everyone to get married and have children as soon as possible. For men, this could translate into a conflict between the freedom to determine their own career path while still being bound to starting a family of their own.

Comparing women in STEM vs. Non-Stem departments: The survey results provide even more details and interesting results when comparing women in STEM vs. non-STEM departments, as well as between men and women generally in the university. Consistent with the CV data, a chi-square test of independence showed that women in STEM were more likely to be married and have children, as well as to have a Ph.D. or equivalent degree, $X^2 (3, N = 47) = 8.252, p = .041$. Even more interesting, however, were the findings that women in STEM were more likely to have been asked personal marriage/children questions when interviewed for their position, $X^2 (1, N = 47) = 4.288, p = .044$. Much more research is needed to understand better what kind of questions were asked, what weightage or importance such information has to departments, and to what extent answers to these questions impact hiring practices. However, an argument can be made from existing literature that companies and institutions are less likely to hire younger women because of the associated costs incurred when she “inevitably” has to take parental leave to have children. Interestingly, it was also found that women in STEM were more likely to take on more household chores than their husbands,
X2 (2, N = 47) = 9.501, p = .009, regardless of age or number of children at home. This unequal balance of taking on domestic duties between men and women reflects some of the extra challenges that women face in their career development, compared to men.

Another interesting finding that will require more research to understand better is that contrary to expectations, women in STEM were less likely to feel pressure from their families to quit work and stay at home, X2 (1, N = 47) = 6.053, p = .016. Not a single respondent in STEM answered yes to this question, while 24% of non-STEM respondents did. Further, women in STEM were more likely to feel that their department provides enough support to women, X2 (1, N = 47) = 4.727, p = .031. While 9% of STEM respondents felt insufficient support, 36% of non-STEM respondents felt the same. While not a direct contradiction, it does complicate the earlier finding that women in STEM felt they took on far more domestic duties than their spouses. While it is unlikely that women in STEM are somehow better than their non-STEM peers at balancing domestic and academic responsibilities, it may point to a culture in STEM departments that discourages women from complaining about domestic duties while at work. This could be to make themselves appear more competent and capable and less of a burden on the department. Further, many non-STEM departments work in professions and conduct research of a social-science nature, taking on complex social problems of gender, social-norms, and social inequalities. The greater sensitivity and understanding of the historical injustices representing much of conventional gendered power dynamics may contribute to a greater dissatisfaction with the status quo.

4. Discussion

The exploratory data collected in both the CV review and the survey has provided a number of interesting insights into the differences in women's and men’s experience working in university STEM departments. Some of the established gender-based issues were found, including a greater number of men in higher positions, a predominance of men in specific fields and women in others, and some evidence that men have historically more access to funding, scholarships, and career-building opportunities like funding, post-doc positions, and experience abroad. However, it is especially interesting to note that the most significant differences between gender occur in the balance of work and domestic life. It provides some insight into potential reasons why professional experiences tend to differ between women and men.

The traditional family roles seem to be preserved in many cases, based on the survey data, especially in relation to childcare. Perceptions of the burden of domestic duties and the difficulty in balancing work and personal responsibilities were also quite interesting. We found that while men and women both agree that women face more expectations and responsibilities at home, there was a significant number of men who claimed to have an
equal amount of struggle in caring for domestic duties.

While there was not a significantly strong relationship between gender and having an extended career gap, there was a noticeable trend of more women having a career break, and one that negatively impacted their career. Further, it can be inferred that even women who have achieved a high position in their careers are still facing pressure to be the first to handle children’s issues, feel they perform the majority of domestic duties, and face greater challenges in advancing in their careers. Despite the laudable progress women in STEM appear to be making and the generally positive shift towards more gender-equal workplaces, there are still significant challenges and gender-based discriminations that need to be addressed. The subtle, perhaps subconscious discriminatory practices that persist in academia and research fields impact women’s careers.

The unbalanced sharing of domestic duties has created a workplace culture that takes for granted the double workload of women and the benefits of having the space to focus more on career development in men. Creating more opportunities for women in research will always be a critical tool in working toward a more equitable society. However, this approach to empowering women will not be as practical without alleviating the burden of “women’s work.” This also requires advocating for social changes where men take up a more equal share of domestic responsibilities.

In regards to the differences found between women in STEM vs non-STEM departments, one possible explanation for the findings is that STEM fields, in general (and especially in India) are more established and have a long history of male leadership. The relatively higher social value of a STEM career may also have a parallel pattern of more traditional or “respectable” social mores and values that people in this field are expected to maintain. In comparison, non-STEM fields such as the humanities, business, and the social sciences have historically taken a less prominent position in the social hierarchy, with relatively fewer programs offered in India, and importantly, take up the study of social norms and even social problems as part of their raison d’être. This could translate into more openness in who is hired into these positions and even who opts into these fields of study in the first place.

It is especially interesting that significantly more women in the STEM fields were asked specifically about their marital status, age, and number of children during their interview process. This is obviously of interest to department leadership and may reflect the national trend of hesitation in hiring younger women due to their “inevitable” marriage and child-bearing that requires extended parental leave. In such a professional culture, women may feel added pressure to overachieve, demonstrate their adherence to traditional family values, and not complain about any difficulties in balancing domestic and professional duties.

As with all sectors, an increase of women in be noted that the selected institution does
have women in many senior leadership positions across departments (both within and without STEM), especially notable in the Indian context where such representation is extremely rare. This could be why so few gender-discrimination issues were uncovered in this study and why this institution has ranked highly in national and international assessments along with social values.

5. Limitations

This study represents an exploratory beginning of a larger program intended to promote gender equality within a university campus. As such, there are some inherent limitations that will be addressed moving forward. From a theoretical perspective, this study would benefit from a more in-depth examination of the experiences of both women and men in their careers. The inclusion of qualitative methods that could tease out the nuances of personal experience, including of the men, would provide a rich, first-person account of gender norms that could ensure the eventual gender sensitization training more accurately reflects the experiences of the target audience. In addition, as with nearly every existing study the authors could find in this field, there is almost no way to capture the experience of those women who graduated from university with a degree in STEM but decided, or were unable, to pursue a career in the same field. It is important to remember that while women make up over 40% of STEM graduates, they only represent 14% of STEM professionals (Varma et al., 2022). By only surveying successful STEM professionals, we have missed out on any possible challenges or barriers that prevented a majority of women from pursuing a STEM career.

Structurally, this study would have benefitted from a wider scope and range of target variables, including longitudinal data collection, qualitative methods, and a comparison of age groups and other demographic markers, and a comparison of the experiences of women in senior faculty or management positions with those lower in rank. While such efforts went beyond the scope of the current project timeline and budget, future studies are planned that include interviews and focus-group discussions, as well as post-gender sensitization training evaluations that can help answer some of the pending questions left by the current study.
6. Conclusion

Scientific advancement is an essential component for the progress and development of any nation. In India, a country known for its rich scientific heritage and vast pool of human resources, it is imperative that we harness the nation’s full potential to excel in these fields. However, despite notable advancements, women remain significantly underrepresented in STEM fields. This gender disparity not only hinders women's individual growth and opportunities but also deprives the nation of their unique perspectives, talents, and contributions. Hence, it is crucial to advocate for the inclusion and empowerment of more women in STEM in India.

The female role models in leadership positions. Consequently, women may face additional barriers while navigating their scientific education and career pathways.

In addition to educational institutions, professional and industrial settings contribute to the gender imbalance in scientific fields. Hierarchical structures, implicit biases in hiring and promotion processes, and lack of work-life balance initiatives disproportionally affect women. These systemic challenges can discourage women from pursuing scientific careers or force them to leave prematurely. To address these, gender sensitization training that is contextually appropriate and addresses the most pressing concerns and existing shortcomings can be a successful approach. To ensure such training is contextually appropriate and can correct existing issues, studies such as the one presented here are essential to better understand the context and nature of current issues. It is hoped that with such measures implemented, a significant contribution to the goal of gender equality can be made.

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