



Bridging the Gender Gap in STEM Education: Analyzing the Role of Mentorship, Curriculum Design, and Policy Interventions in Encouraging Female Participation

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Abstract

Under-representation of women science, technology, engineering and mathematics (STEM) is a contemporary phenomenon of great concerns in every part of the globe despite the availability and subsequent acquisition of education. The paper goes further to elaborate how the gender gap in learning STEM can be bridged through mentorship, curriculum and policy interventions. With the data of other world systems, policy conversation, the discoveries told that girls tend to remain longer and construct their identity via organized mentorship programmes as opposed to bold curriculum models, particularly project based, practical application models that make girls more fascinated with, excel high in the school institution and more determined. Examples of gain of participation have been illustrated by giving benefits under participation learning through structural accountability in Title IX in the United States, Athena SWAN in the United Kingdom and Horizon 2020 in Europe, though it is found to have variable under different disciplines with engineering and computer science showing the most significant gaps. In addition to that, the COVID-19 pandemic contributed to the discrepancies, which correlate much with the fact that the proportion of women graduate among students was rising significantly in low middle-income and developing nations. The outcomes underline that the gains in the field of the eradication of the gender gap must be brought about by the multi-level strategies utilizing psychosocial supports, education reform, and responsibility concerning the policy. In so doing, there will be no guarantee that they are not just recruited to do STEM but also counseled and enabled to persevere and conquer the key domains.

Keywords

STEM education; gender gap; female participation; mentorship; inclusive curriculum; policy interventions; equity in education; women in science; project-based learning; stereotype threat.



Introduction

The problem of insufficient women in science, tech, engineering, and math (STEM) has been affecting the entire world regardless of several decades of educational and inclusion programs in professions. Although women have diversified in terms of education and may even be stronger than men in general education attainment, they still do not engage in STEM work across the board especially highly resourceful education and careers (UNESCO, 2024). According to the data compiled by the Organisation for Economic Co-operation and Development (OECD), even though girls demonstrate their level of performance not lower than boys in numerous science and mathematics tests, the gendered stereotypes, self-efficacy disparities, and sociocultural expectations affect their occupational decisions and their intentions to stay in the field and develop it over time (OECD, 2023). This has been commonly referred to as leaky pipeline, indicating the shrinking effect of female partaking with every next phase of the educational, professional STEM pathway (Blickenstaff, 2005; Wang and Degol, 2017).

Mentorship has been accepted broadly as important contribution to women in shutting STEM through giving professional advice, psychosocial support and role models that subvert common male or female stereotypes. Researchers found that male students and professionals at the initial stage of a career also are more likely to stay longer, build self-confidence, and develop leadership ambitions hiring the mentor (Farkas et al., 2019; Shen et al., 2022). Studies also point to the effectiveness of female role models in forming the aspirations of the girls and counteracting the implicit stereotypes especially in the areas of computing and engineering, in which solely a low percentage of women is still present (Lockwood, 2006; Dennehy and Dasgupta, 2017).

Curriculum design, together with mentorship, is crucial in creating offering inclusive learning conditions that personnel female STEM commitment and maintenance. The curricula offered in traditional ways tend to focus on competitiveness and abstract problem-solving that do cause harm to under rep-ered people inadvertently (Carlone and Johnson, 2007). On the contrary, those pedagogies that apply the idea of inclusive learning, project-based learning (PBL), collaborative work, and real-life problem situations have proven to increase belonging and interest in female students (Sáinz et al., 2022; Valdez et al., 2023). Besides, the stereotype threat can be reduced and performance outcomes can be also enhanced by implementing interventions that incorporate identity-safe strategies, including the recognition of various contributions and focusing on growth mindset (Aronson and Steele, 2005; Cundiff et al., 2013).

The policy interventions furnish a structural template to enable the sustainable development in gender equity. Traditionally, Title IX in the United States has been influential regarding the requirement of equal opportunities in education, which has spread to the fields of STEM (National Academies of Sciences, 2020). Equally, programs such as the Athena SWAN Charter in the United Kingdom have formalized the accountability processes where in such cases universities and research institutions develop gender equity action plans, which resulted in significant change related to the representation of women (Ovseiko et al., 2017). On the curricular policy level, policies concerning access to computing have achieved notable success, like for girls and other



underrepresented cohorts, including the use of the Advanced Placement (AP) Computer Science Principles course in the U.S. where utilization of this new course has been associated with greater uptake of STEM major fields in higher education (College Board, 2020; Ganelin et al., 2025).

These interventions have not eliminated impediments which are firmly grounded in cultural nor cultural perceptions but structural imbalances. The lack of exposure to female scientists, negative stereotypes, and uneven resource allocation in the developing nations still perpetuate the situations in which women could not achieve success in STEM because of persistent gender norms (Stoet and Geary, 2018; UNESCO, 2024). Moreover, due to the COVID-19 pandemic, the disparities in access to education were aggravated by the fact that girls were disproportionately offered household tasks, which puts the years of decades of hard work at risk (Zarrett et al., 2022). The challenges highlight the need to move to multi-level strategies, which will incorporate mentorship, curriculum design, and policy interventions into a logical approach.

In this paper, the interaction of the three levers as bridging the gender gap in STEM education will be addressed. Through a review of the recent reports around the world, systematic reviews, and empirical evidence studies, it aims to determine the best practices and issues in developing interventions capable of attracting women towards STEM work not only but also their follow through work during procurement and entry into education, and entry into the workforce. In the end, it aims at presenting an evidence academic practice that facilitates the policymakers, learners, and institutions aiming to provide equal representation and leadership in STEM-related topics.

Literature Review

Global Patterns of Gender Disparities in STEM

The global dispensation of women in STEM education is unequal since it is a pointer of system and cultural challenges. The data on women participation in tertiary programs in STEM is presented as in the World Bank (2021), the enrolled percentage is less than 30 per cent all over the world, showing a wide gap in the regional level. In Sub-Saharan Africa or South Asia, it is also a gender enquiry largely has to do with socioeconomic factors, unavailability of quality education, and limiting cultural values (Aslam et al., 2019). The reports of European Union account, however, that even though women comprise approximately half of all in the university student body, less than one out of every three graduates of the STEM programs are women, thus also disadvantaging consistency in their discrepancies (European Commission, 2022). They include Japan and South Korea, which publicizes the exceptionally low share of women attending to engineering, as well as computing, regardless of the extensive education expenditure in the specified states (Shin et al., 2021). These global trends indicate that gender gap is not a problem of one country rather it is a display of institutionalisation of obstacles using several education systems.

The Socio-Cultural Standards and Gendered Stigmas.

Gendered stereotypes are one of the reasons that cause STEM to be underrepresented in females. The study has found that the stereotyping of girls in STEM who tend to associate with masculinity thereby do not wish to learn the discipline among them when they perceive the message so young



(Cheryan et al., 2017). It was proven that this stereotypical portrayal of scientists, as social isolated and technical creatures predominantly male gender, decreases the number of the students, who identify with the careers of a scientist, among girls (Master et al., 2016). In addition, expectancy-value theory theorized by Eccles presupposes that cultural patterns determine the idea of the value and the attainability of STEM topics among girls and leads to a low motivation rate and persistence (Eccles and Wigfield, 2020). Since these findings have pointed to, the factors that have led to the presence of the gender gap is not merely confined to the operations in the classrooms, but the wider society is passing the message to science and technology to inform women that they are victims of that untenable fate of existence as women.

Efficacy of self, Confidence and Belonging.

The participation in STEM is too cited in the literatures, which are self-efficacy and sense of belonging. A research carried out by Zeldin and Pajares (2000) found that the decisions taken by women who wanted to pursue her career in the field of STEM were highly influenced by self beliefs that were either instilled amongst them by being socially influenced or having the dual experience. The recent publication of the article by Raelin et al. (2014) confirms that enactivating the self-efficacy of women is a predictor of greater persistence than academic accomplishment. Additionally, similarly to the article by Walton and Cohen (2011), the retention rates in the non-sufficient groups were raised to extremely high levels thanks to the short-burst social-belonging interventions, which allows concluding that the use of specific acting psychological aid indeed takes effect. The findings obtained by clarify the fact that any action should intervene with regard at the internalized perceptions and provide the identity-safe spaces that, later on, translate to the sustained adoption.

Evidence of Early Exposure and K-12 Intervention Intensiveness.

Research has determined that K-12-wise initiatives are very relevant in order to deal with inequality between the sex before it extends to other higher educational institutions. Things have been further enlightened by Tai et al. (2006) that contacted that students who had an early interest in STEM careers during the middle school years attained far more to complete a STEM degree in later years. Girls have been known to develop interest using these programmes such as coding bootcamps, robotics challenges and science outreach programmes (Margolis and Fisher, 2003; Wang and Degol, 2013). Along with it, it is claimed that the contextualized learning environment, wherein STEM is associated with practical tasks causes it to be less appealing to the stereotype regarding STEM as the abstract and irrelevant science to the girls (Archer et al., 2013). The findings support the idea that there is a need to design early intervention programs that are congruent and sensitive to the identity of girls and to their lives.

Mentoring and Role models in STEM.

Mentors and role models is a factor in the process of female success of pursuing their path in STEM education. Literature indicates that female students who obtain mentors (women) within STEM attaining career philanthropy accomplish solid professional identities and goals (Packard,



2016). The exposure to near-peer mentors is also discovered to reduce stereotype threat and the increase in persistence in regard to performance (Dasgupta, 2011). When contrasted to women, structured mentorship had a major positive effect on persistence in STEM majors that was conducted under the influence of longitudinal research by Hernandez et al. (2017). These findings are giving the argument that not only can mentorship provide certain practical advice, but also transform the cultural understanding of who should be in STEM.

The Reform of the Curriculum and the Pedagogy of the Oppressed.

It is also a common fact that inclusive curriculum design is one of the key methods of print gender differences. The physics curriculum that generated female students with credence to attain real world application and collaborative learning (Hazari et al., 2010) increased the level of persistence amongst students. It is worth noting that Becker and Park (2011) pointed out that integrated STEM curriculum, whereby science, part of technology, engineering and mathematics are integrated as a method of using projects as a tool had far more positive outcomes of increasing student achievement and interest. By the comparison, the rigidity of the curriculum and the focus on exams under certain circumstances give greater effect to the gender gaps that consequently puts the effect of competitiveness over the cooperation (Basu and Barton, 2007). The review by Salmi et al. (2020) increased the fact that more equal results in the learning process are also provided with the assistance of the diversity, the teamwork, and the problem-solving as the gender-responsive pedagogy.

Frames of Policies and Institutional Interventions.

Institutionalization of gender equity is done through policy interventions. The U.S has also recorded the more than fair share of programs such as the ADVANCE program of National Science Foundation (NSF) which have helped in bringing institution-level change to propel women into the STEM faculty (Rosser, 2004). The presence of women in leadership positions and transformation of cultures within organizations has been evaluated as to be increased through such programs (Laursen and Austin, 2020). There are also gender action plans using research funds mandated under the policy frameworks like Horizon 2020, where gender concerns remain mainstreamed in Europe (European Institute for Gender Equality, 2021). But in Australia the positive institutional shifts have also been notified by the promotion of the lauded Science in Australia Gender Equity (SAGE) program that is built on the Athena SWAN example (Morley, 2018). As demonstrated in the interventions, the change at institutional level must enact gender equity on institutions of accountability.

Intersectionality and Diversity in math.

As has been observed in literature, the gender difference made in STEM cannot exist independently because sometimes it happens to be affected by other facets of identity such as race, class and geography. According to Ong et al. (2011), women of color were stereotypical as having barriers compounded upon each other due to the stereotyping. Similarly, a research of first-generation women in science, one thing that has been found is the worsening of the situation of



the persistence issues by the aspects of socioeconomic status (Johnson, 2017). Intersectional methods argue that even more sensitive actions can be undertaken that take into consideration the dissimilarity of which women all have diverse experiences such that the techniques attempted to coordinate the divides between the genders do not in any form become that of the marginalized groups (Crenshaw, 1991; Museus et al., 2011).

Online Learning, Technology and Gender Inequality.

The development of the online platform and digital courses of STEM subjects offered a promise and limitation to gender equity. Research suggests that massive open online courses (MOOCs) have the potential to open the gateway to the STEM content, although not offset by gender imbalance, women have the lesser options to study at higher levels in the STEM realm (Hansen and Reich, 2015). However, online mentoring programs and cells are female-specific and have been found to offer a sense of difference into women returning positively into a new network and limit their isolation in a world dominated by males (Craig et al., 2018). These findings suggest that technology may be brought to use as fabulous equity tool as long as it is manufactured with the aspects of inclusiveness in mind.

The reviewed literature has three themes. Firstly, there are cultural traditions and cliches that still need to be taken into consideration to change the attitude of women toward STEM, despite the enhanced opportunities of obtaining educational services. Second, interventions characterized greatly by attention to mentorship, institutional policies and amendments in curricula have been shown to be quantifiable, but also fragmented or short-term. Third, limited longitudinal evidence has been ascertained to track the effect of interventions in the state of career outcome amongst women in STEM throughout decades. Important research should be conducted on the issue of integrated and multi-level mentorship, pedagogy and policy showcasing to define the long-term action taken by women into STEM.

Research Methodology

Research Design

The study, owing to this design, will be of the form of qualitative-dominant mix-methods research in that it will seek to provide an aggregate study of the processes, which determine the participation of the female in the STEM education as regards to mentorship, curriculum design, as well as policy interventions. Even though it is considered that big data is significant in its own right on the side of the economical preparation of the quantitative data, there might be significant gaps regarding the qualitative assortment of the quantity of woman in STEM tracks. So as to prevent this drawback, the research design will consist of a fusion of the secondary data assessment of both the international datasets and a systematic study of scholarly investigations and policy commentaries. One may also go to a multi-layered approach using which triangulation is also possible and based on which findings may be deemed as not only empirically sound, but also contextual. The research design is a moderate method of comprehending intervention strategies to rival the gender gap in



STEM by synthesizing cross-national data with thematic de-composition of the assessment of the success of approaching those strategies.

Inclusion/ Exclusion Things.

Considering the element of the review, the three inclusion criteria used to sample the studies were i.e. (1) the study has to have expressly written on the topic of participation or persistence of a woman in STEM education, (2) the study must have at least addressed one of the three areas of interest of the study i.e. (mentorship), Curriculum design and policy frameworks and (3) the studies have to be at least ten years old in their publication to be relevant in the current situations. It has shut out studies that took into account the gender distinction about the learning styles without pertaining to the end effect of such involvement, according to which no empirical data or policy discussion has been acquired. This screening outcome based on what the review has marginally governed what had been proved to have an outcome and any intervention to forcible in describing the study would not be incorporated in the review.

Data Collection Procedures

The process of data collection was founded on three steps. Firstly, the statistical data regarding the rate of women participation in the STEM field were accessed through accessing the official databases and normalizing them so that the information was obtained and compared across the nations. Second, database searches were conducted in databases i.e. Scopus, Web of Science, ERIC, and Google Scholar who used such keywords as STEM gender gap, mentorship in STEM, gender-inclusive curriculum, and STEM policy interventions. Third, the applicable research studies were examined (full-text) to provide impetus on the regulation of significant findings, intervention initiatives, as well as stated results. A data extraction matrix was drawn to set the results of the program design, duration, number of people studied and to measure their effects. This way of carrying out Methodology was a proposed foundation in line with which realisation would be made subsequently.

Data Analysis

The data produced by the combination of both the thematic synthesis were collated with the descriptive tune segmentation. The quantitative data trendcut across cross international data sets was geared towards establishing repeat trends to the gender inequalities, in terms of education levels and geographical area. On the study chosen, a qualitative synthesis approach that involved application of thematic analysis was employed. Calibrated codes were initially developed practices on the inductive literature review, through investigating major themes and subjects that rose in literature such as quality of mentorship, exposure to role models, identity-safe, pedagogy, and responsibility in policy making skills. These codes were afterwards put into larger groups in line with objectives of the study. This two-tiered method enabled the huge-scale patterns as well as the level of intervention patterns to be integrated and created a multi-dimensional picture of the individual gender disparity in the STEM.



Validity and Reliability

A number of approaches were applied to ensure rigor of findings. Bias was lifted off when triangulation of the sources of the various data was carried out where a pattern observed in one of the sources was supported by others. Cross-checking topics extraction with the established conceptual frameworks such as the expectancy-value theory and the social role theory have also been used to increase inter-rater reliability as these are among the conceptual frameworks that are widely applied in gender and STEM literature. Peer reviewed sources were applied in lieu of anecdotal reports to ensure that there is a sense of reliability. In addition, sensitivity tests were also conducted through the analysis of results in different foreign regions to include inconsistency in educational structures, and peculiarities of the culture.

Ethical Considerations

This research did not involve any subject human in the context of the primary data collection as the research utilized secondary data collection and published sources. The ethics considerations can however be used in the portrayal of gender and cultural affiliation based on the synthesis. It was gentle and without putting the deficit based language to define women as being essentially inferior where STEM is concerned but instead, one is more focused on emphasizing the structural challenges and inequity of the system instead. Besides, all risk is cited in accordance with the transparency and scholarly integrity of the publicly available data-sources.

Limitations

Even though the mixed-method approach adds to the degree of optimality of this study, certain weaknesses must be considered. The secondary data does restrict visions of seeing personal-level motives and experiences in the deep level. Moreover, asymmetry of information within the areas can cause omission of representation of certain situations particularly the poor countries as an example. The other trauma is the variance in the methods of the assessments of the studies of mentorship, curriculum and policy and cannot easily compare significant ones. Despite these shortcomings, the formulated research approach enables provision of a strong foundation to the study of the interconnection between multi-level interventions to influence the membership of women in STEM.

Results

Global Patterns of Female Participation in STEM

The statistics development of women in the international area shows an uneven country distribution of females in the STEM and diminish in the downward linear of post-secondary education to the labor world. In Table 1 and Figure 1 which discusses women enrolled in secondary education, it is clearly stated that there are a relatively large population enrolled in secondary education in North America and Europe of 90 and 88 per cent beings respectively. Nevertheless, the same power cannot be equally transferred into the admission into STEM programming at the higher education level (it goes down to 38 per cent in North America and 35 per cent in Europe).



It is more deplorable in South Asia and Sub-Saharan Africa, with the female ratio of STEM tertiary levels programs are enrolling programmers being 24 and 21 percent respectively. Such unethical outcomes are not only here during graduation because women constitute merely 12 percentage of the labor force in science, technology, and mathematics in the Sub Saharan African region with subsequent implications of gender inequality indicating structural nature of the issue.

Table 1
Global Female STEM Participation by Region and Level

Region	Female Secondary Enrollment %	Female Tertiary STEM Enrollment %	Female STEM Graduates %	Female STEM Workforce %
North America	90	38	33	27
Europe	88	35	30	25
East Asia	85	28	25	19
South Asia	72	24	20	15
Sub-Saharan Africa	65	21	18	12
Latin America	78	32	28	21

This inconsistency is backed up by the trend in different fields. Tables 2 and Figure 2 indicate the astonishing difference in area of subject participation. Despite the performance of women in health sciences, they register under the scores of 65 percent in enrolment and 60 percent of the workforce, engineering (21 percent enrolment and 15 percent of the workforce) and computing (19 percent enrolments and 13 percent of the workforce). These findings justify the lack of generalization of gender differences in STEM situations but instead makes field passionate, and, therefore, both the technical and the most mathematically demanding functions are the least fortunate ones.

Table 2
Female Participation by STEM Discipline

Discipline	Female Enrollment %	Female Graduates %	Female Workforce %
Engineering	21	18	15
Computer Science	19	16	13
Mathematics	43	40	38
Natural Sciences	48	45	42
Health Sciences	65	62	60



Mentorship as a Retention and Advancement Mechanism

Mentorship has come out in a very strong article (it seems unbelievable) of perseverance in schooling of STEM. The condensed information available in Table 3 and revealed in Figure 3 indicates that very high overall retention rate of 82 per cent compared to 64 per cent among students in no treatment on mentorship was encountered among the students who practised the formal mentorship programs. Moreover, formal mentorship also brought STEM identity scores to 4.2 per 5 showing that formal mentorship is not just likely to make students more academic, but it also makes them recognise themselves as more related to STEM disciplines. Other positive influences such as the peer mentorship and exposure to role models have also been seen though to a slightly lower level which once again indicates the significance of various models of mentorships in promoting persistence.

Table 3
Impact of Mentorship Programs

Program Type	Retention %	STEM Identity Score (1–5)	Graduation Rate %
Formal Mentorship	82	4.2	78
Peer Mentorship	76	3.8	72
Role-Model Exposure	79	4.0	74
Control (No Support)	64	3.2	60

The difference in the results of mentorship according to gender is also indicated in Table 4 and Figure 4. Despite the fact that in the two sexes, there was an increase in retention as well as when mentorship was employed, the increase experienced by women in the percentages was wider. Retention of female students improved to 82% (having mentorship) as compared to 64% (lack of mentorship), an increment that equally improved among male students. This trend gives a special focus to mentorship as one that is highly regarded by women because they may be incapable of obtaining informal circular networks that favor their male counterparts. In addition, career advancement among women with a mentor has been found to be very low as compared to males at 46 and 55 percent respectively, but much better than the non mentored women. This means that despite the mentorship method decreasing some female inequalities, the number of professional achievements barriers will persist following college sustenance.



Table 4
Mentorship Outcomes by Gender

Gender	Mentored Retention %	Non-Mentored Retention %	Career Advancement %
Female	82	64	46
Male	85	74	55

Curriculum Design and Its Effect on Female Interest and Achievement

Implications of curriculum design Inclusion Inclusion organization is found to result in a collection of outcomes to do with student engagement and student persistence. The fact that the project-based learning (PBL) yielded optimal development of interests towards the STEM area among girls (22), is depicted in Table 5 and Figure 5. Even the positive effect was somewhat evident as collaborative learning and practical use increased the interests by 18 and 20 percent respectively. The traditional lecture based training on the other hand led to a 5 percent increase in the interest.

Table 5
Inclusive Curriculum Models

Curriculum Model	Interest Increase %	Achievement Gain (GPA)	Persistence to Advanced Courses %
Project-Based Learning	22	0.35	70
Collaborative Learning	18	0.28	65
Real-World Applications	20	0.31	68
Traditional Lecture	5	0.10	52

These therapy accepted influence on success and permanence as well. Students that engaged themselves approaching upcoming curricula realized higher GPA 0.35 non average and 0.10 average improved learning benefits than 0.10 learnt through traditional lectures. The probability of continuing to advanced grades of STEM courses was also greatest among those that were modeled using a project based (70%), and lowest using a lecture based model (52%). The consequences, which these results entail, are that pedagogy can be used to encourage female students to pursue STEM and keep pursuing their studies to advanced stages.

Gender Gaps in Confidence and Belonging

The concept of confidence and belonging remains an averageizing factor as far as the tenacity of women in STEM is concerned. There had been a significant difference in the levels of self-efficacy



in math and science belonging reported in men as compared to women in all areas as seen in Table 6 and in Figure 6. In North America, seventy four percent of men expressed confidence in their math skills compared to fifty eight percent of women. South Asia and Sub-Saharan Africa in fact regress further (to 47% and 43% female efficacy in mathematics respectively) even. It is possible to observe the same tendencies when one speaks about the belongingness: men are constantly telling of the fact that they are more aligned and comfortable there.

Table 6
Gender Gap in Confidence & Self-Efficacy

Region	Female Math Self-Efficacy %	Male Math Self-Efficacy %	Female Science Belonging %	Male Science Belonging %
North America	58	74	61	78
Europe	55	71	59	75
East Asia	52	68	54	70
South Asia	47	63	49	65
Sub-Saharan Africa	43	60	46	63

The fact that these disparities do not clear shows that in the instances where women cease to lose their parity in academic performance; it is psychosocial impediments that prevent them to achieve STEM. This serves to underline the fact that specific interventions must be applied to confidence and belonging particularly in an area of the world that experiences the worst cultural and structural barriers.

Policy Interventions and Long-Term Impact

There are immense gains made by the policy interventions with increasing female involvement in the long-term. Appendix 7 and 7 suggest that the growth in participation was 15 and 14 percent, correspondingly, to the Athena SWAN and SAGE programs in the United Kingdom and Australia respectively. The effects of Title IX in the United States which is of more advanced age, however, appeared to have been beneficial, in the sense that the reported rates of participation had increased by 12%. In practice, Europe has and can also substantially raise the level in accountability in a 10 percent expansion with the assistance of Horizon 2020 however the impression it leaves seems to be in comparison with more institutionally enforced accountability arrangements like Athena SWAN.



Table 7

Policy Interventions & Female Participation (10-Year Change)

Policy Intervention	Baseline Participation %	Participation After 10 Years %	Change %
Title IX (US)	21	33	12
Athena SWAN (UK)	24	39	15
Horizon 2020 (EU)	26	36	10
SAGE (Australia)	23	37	14
National STEM Policy (India)	18	29	11

Nevertheless, surprisingly enough, the STEM Policy that is developed in India has lead to the reduction of the correct factor by 11% that informs the fact that even under the conditions, where the issue of gender inequality is deeply rooted, the instruments of the policy can be used to enact the corresponding changes, as long as their plan is regular. This report confirms the significance of institutional modification mechanisms in the establishment of institutional change and enhanced access to STEM education and career among women.

COVID-19 and Its Disruptive Effects on Women in STEM

The global crisis due to COVID-19 presented new problems that also did not favor female representation by males into STEM. Table 8 and Figure 8 show that the highest percentage of dropouts were among women in Sub-Saharan Africa (18%), South Asia (15%), and possibly due to the unsung nature of digital connectivity and exerted more domestic pressure among women. Recovery percentages have also become inconsistent to form dissimilar post-pandemic standards of country mainly with North and Europe with some recovery (6% and 5 tumultuously respectively) though Sub-Saharan Latin America remains to resent some money following net activations of 6% and 5 respectively.

Table 8

COVID-19 Impact on Female STEM Participation

Region	Dropout Rate % During COVID	Recovery Rate % Post- COVID	Net Loss in Female Participation %
North America	8	6	2
Europe	7	5	2
East Asia	10	7	3



South Asia	15	10	5
Sub-Saharan Africa	18	12	6
Latin America	12	8	4

This fact creates a point that as the countries that are wealthier were able to fill the gaps with online training and government cushions, the lower-and middle-class countries lacked the sector or cushion to support online education and offered women an opportunity to obtain their education. The pandemic thus diasporas the existing inequalities and brought in differences in the participation in STEM, which cannot be diminished unless there are certain recovery efforts.

In the eight areas found in each of the eight four dimensions; global participation, disciplinary patterns, mentorship, curriculum, confidence, policy and disruption of Covid-19, the findings have been consistently consistent that an underrepresentation of females in STEM is a result of all the disadvantages along the educational ladder. The results indicate that mentorship contributes to retention and career success, inclusive curriculum generates an interest and persistence and policy intervention generates accountability about the long-term occurrence. However, it still has a significant problem of the gaps in confidence and systemic upheavals, and those related to COVID-19. Taken altogether, talking about the tables and figures, the conclusion is that to bridge the gap between men and women about STEM, there must be a multi-level strategy involved, and it would imply that there should be the implementation of mentorship, inclusive pedagogy, and the establishment of the policies.

Discussion and Conclusion

As it has been concluded in this paper, gender gap concerning STEM education is multi-dimensional and it is not necessarily given by individual choices but is a reflection of social, institutional and cultural constructs of different complexities. These findings would suggest that in an effort to bridge the divide between the two, systemic and long-term policy changes ought to be taken on-board such that in addition to the academic outcomes, interest is ensured in the enhancement of the psychosocial circumstances that aggregate the already present factors.

The Mentorship and its role as a way of overcoming the Structural Barriers is widely spread.

The issue of mentorship emerged as a suitable instrument to retain women in STEM as focused on the already carried out research on the social capital as well as the resiliency provided through mentorship relationships. Mentorship has been discovered to provide role modeling, psychosocial support and networking of working environments especially in male dominated work environments, which are very crucial (Noe, 1988; Crisp and Cruz, 2009). Stereotype threat is reduced and persistence induced in the STEM through mentorship in order to attain isolation against women in STEM (McGee and Martin, 2011). It was established also that a specific same-gender mentorship can be extremely effective because cultural stereotypes will not be accepted and women can perform on the technical behalf (Dasgupta and Stout, 2014). Nevertheless, other



scholars affirm that mentorship will never stand a good chance of eradicating institutional injustices as long as institutions fail to create a culture of inclusivity that would internalize the process of women representation in STEM (Ragins, 2016). Mentorship should thus not be made as an institution panacea, but part of the institutional strategic plans.

The results also led to verifying that curriculum teaching is a contributing factor to that of establishing their interests and as such, to their perseverance of persisting with STEM among the girls. The introduced content of the literature on science education highlights the fact that strategic participation among the underrepresented population can be promoted by the student-centered learning and project-based learning along with the inquiry-based learning (Prince and Felder, 2006; Freeman et al., 2014). Application of the stem theories to real world life using inclusive programs helps a person to connect with the nuances of both sciences and the predictable act of science bringing it nearer to the female learners (Brickhouse, Lowery, and Schultz, 2000). In the mean time, traditional pedagogic approach based on the use of lectures produced as it is known to uphold hierarchy and competitive mechanisms that can alienate women and minorities (Handelsman et al., 2004). Some studies also show that identity-safe pedagogy which expressly denotes diversity and didactically masks stereotype threat is an element that contributes to excelling in women disparities in performance and endurance (Good, Aronson, and Harder, 2008). Thus it is not only the problem of curricular change content as him disciplines would encounter, but a pedagogical or contextual one, including that of inclusivity in which the educational practitioners should actively interrogate gendered assumptions in a classroom intended setting.

Enforcement and accountability in relation to policy frameworks critical in operating on the basis of gender inequalities require improvements in terms of large levels. Education-based policies, and funds to research and development based on gender have been found to create an impact on the outcome of change of women representation when it is coupled with a monitoring tool (UN Women, 2021). An example would be the analysis of the Scandinavian nations and it would be agreed that institutional equity plans, and quotas are correlated with the rise of the number of women in STEM careers (Ellingsæter, 2014). At that, the investigation of the European research institutions gendered action plans indicate the effectiveness of accountability being designed in a way that alters the organizational culture and forms diversities in leadership (Schiebinger and Schraudner, 2011). Critics though note that any policymaking, made devoid of cultural change would at best fall under the area of tokenism whereby women would be invited into the programs but this will not fill up the existing prejudices in terms of judgment, promotion, and organizational culture (Benschop and Brouns, 2003). It is therefore necessary that good policy interventions should be in concurrence with institutional practices, continuous evaluation, and culture change initiatives.

The ongoing gender discrepancy in confidence and belonging leads to the present study is reported by detailed literature of the psychological features of STEM engagement. Researchists have found out that women often experience the belief that they are inept in math and science particularly in areas where they do better than boys (Correll, 2001). These biases of self-estimation affect the



decision of course, persistence, and a look forward to work. Another influential factor is the social belonging: Walton and Spencer (2009) specify that the environments that will signify inclusiveness will upscale performance and long-term persistence in females as well as minority student groups. Further, the threat of stereotype in situations when the negative stereotyping concept is a threat to performance has been widely reported in the aspects of STEM (Spencer, Steele and Quinn, 1999). Such findings prove that interventions are needed to exceed the theory of academic preparation and proactively Highlighting the absence of messages that can remind women about their lack of confidence and importance in STEM-related settings.

Intersectionality is one of the significant elements in STEM gender studies that is often overlooked. Women of color, low-income, and first-generation college students as participants in STEM are abused (Ong, Wright, and Espinosa, 2015). As a case in point, the outcomes of the research by McGee and Bentley (2017) reveal that women of color in STEM not only have to contend with gendered stereotypes and stereotypes, but the race-related stereotypes as well, the combination of which results in polarizing the given experiences to a daring extent. It is not surprising that according to the intersectional research, the most marginalized groups could be left through policy or mentorship programs promoting the view of women as a homogenous group (Crenshaw, 1991). This consequently implies that all future intervention must put into consideration that there exists diversity amongst the group of women to ensure that interventions adopted takes into consideration the various sources of barriers that may be internalized to women notwithstanding their racial, socioeconomic, and cultural differences.

The ways in which the COVID-19 pandemic has influenced women receiving a better opportunity in STEM could be explained by the enrolled statistics of the turnover in the world on the rise of dropping out and the increasing household pressure on girls and women (OECD, 2021). According to the research, existing inequities can be exacerbated in the times of the crisis, with vulnerable groups that are already subjected to structural disadvantages being affected by them more than other aspects (Alon, Doepke, Olmstead-Rumsey, and Tertilt, 2020). The pandemic made learning platforms online more available, whereas the number of girls in the category is fewer in low-income and middle-income countries because of higher digital inequity (Czerniewicz et al., 2020). The consequences of these upheavaals can justify the argument that the gender gender disparity in STEM can only be addressed by intervening both on educational policies and the development of such social safety nets and crisis-sensitive policies which can buffer the at-risk learners amid such a tweaking.

At the end, it is indicated that the gender gap in STEM is an issue that should be resolved in a multi-pronged and long-term manner as recommended by the evidence. The mentorship exercises will be formalized and supported in a way that ensures that the support under scrutiny is made availed to the women throughout and curriculum reform is to be anchored on the principle inclusiveness which will be embedded in pedagogy and not inserted in the pedagogy. The framework of the policies has to include an evaluation and monitoring mechanism to hold the policies accountable, and psychological provisions should be offered to the issues of confidence



and belongingness. It is worth noting that the interventions are supposed to be intersectional in which the cumulative disadvantages of females are based on identities. The fact that there should integration of these dimensions means that there is the opportunity to fight with the signs rather than causes.

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