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# Exploring Acceptability and Resistance to Feminization in STEM Fields: An Empirical Perspective from Higher Education

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**Abstract**
The main purpose of the study is to analyze and explore acceptability and resistance to feminization in science, technology, engineering, and mathematics STEM fields through an empirical perspective from higher education. Female not only face challenges in their education after education, but they also face challenges in their career. Females who have confidence and speak for their rights are facing stereotypes and are considered to be outspoken by others. Parents also restrict their daughters and provide only a few opportunities to them. Hence, this study has been based on qualitative research, grounded in an extensive review of published documents on the topic of feminization in STEM education, specifically acceptance and resistance. A total of 101 research documents have been systematically extracted from well-reputed digital databases, and the selection process has been continued until data saturation. The inclusion criteria of the study have required that selected studies explicitly address feminization in STEM education. The thematic analysis technique has been employed to analyze the data. The study findings expose that significant strides have been made in encouraging and reassuring female involvement in STEM fields, particularly at higher educational levels. Exactly, higher education has been deeply entrenched and interwoven with socio-cultural means, gendered prospects, established, and structural barriers. A number of factors often impede the impetus, performance, career determinations, speculative confidence, and job placement of female students in STEM disciplines.

**Keyword:** STEM Disciplines, Feminine, Acceptability, Resistance, Higher Education

## Introduction

Females not only face challenges in their education after education, but they also face challenges in their careers (Chen, Chow, & So, 2022). Problems faced by

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females in their careers are gender inequality, policies, support from coworkers, and balancing their traditional life with their career (Shoaib & Zaman, 2025). Studies found that many females want to start their own business, but they also take a startup but do not become successful due to a lack of support from family and society (Shoaib, Waris, & Iqbal, 2025b, 2025c). Females who have confidence and speak for their rights are facing stereotypes and are considered as outspoken by the people (Shoaib, Waris, & Iqbal, 2025b). Sometimes female has no knowledge about their abilities and they are not confident in their abilities. Studies reveal that females are not interested in STEM subjects due to the difference between the socialization of girls and boys and the toys given to them in childhood (Shoaib, Waris, & Iqbal, 2025a; Shoaib, Waris, & Iqbal, 2025a). Parents also restrict their daughters and provide only a few opportunities to them (Shoaib, Tariq, Rasool, & Iqbal, 2025). Stereotypes about STEM that this field is only for males and not good for females impact the thinking of females and demotivate them to take part in STEM subjects (Shoaib, Tariq, & Iqbal, 2025b). Interviews of girls in Sudan revealed that they were not doing well in the mathematics subject because they are girls. Females get less support from their environment to pursue a higher education (Li, Ji, & Zhan, 2024).

***Main Objective:*** The main purpose of the study is to analyze and explore acceptability and resistance to feminization in science, technology, engineering, and mathematics STEM fields through an empirical perspective from higher education.

## The Data and Methods

This study has been based on an exploratory research design, i.e., qualitative, grounded in an extensive review of research published documents on the topic, i.e., feminization of STEM education, acceptance, and resistance. A total of 101 peer-reviewed research documents have been systematically extracted from reputable digital databases such as Emerald Insight, Web of Science, SAGE, Google Scholar, Springer Nature, Taylor & Francis, and other academic resources available through the academic library. The research documents selection process has been continued until data saturation. The inclusion criteria of the study have required that selected studies explicitly address feminization of STEM education, be conducted within the context of higher education, and be published in well-recognized peer-reviewed national and international journals. Further, the thematic analysis technique has been employed to analyze, identify, and infer patterns across the data. The study findings have been presented and discussed qualitatively in the relevant sections of the study.

## Results and Discussions

The study findings outlined that to get outcomes, it was important that females perform their role in the market after education (Fitzallen & Brown, 2017). Similarly, the study findings examined that to perform well in any field, it was necessary that an individual have a role model (Florence, 2016). Likewise, the analysis of the study reported that females were taking part in the science subject structural changes were also required to increase the number of females (Fussy, Iddy, Amani, & Mkimbili, 2023). Comparably, the results of the study indicated

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DIALOGUE SOCIAL SCIENCE REVIEW

Vol. 3 No. 7 (July) (2025)

that development was connected to the education of individuals. Correspondingly, the study findings showed that gender and motivation influence the performance of the students (Goldschmidt & Bogner, 2016; ). Furthermore, the argument of the study asserted that in Malaysia, female students were also facing problems in higher education in the STEM field (Shoaib, Tariq, & Iqbal, 2025a). The conclusion of the research articulated that career choice also depended on the gender that the individual chose (Greenall, 2014; Abdullah & Ullah, 2016). The study findings defined that society has a high expectation of females that they care for the family (Greenspan, 2017; Abdullah & Nisar, 2024). In the same token, the study findings examined that it is important to encourage females to make their own decisions and change their lifestyle. In addition, the argument of study revealed that every individual has their way of thinking; female also have their perspective, they have the right to do different things that they want (Gust & Schumacher, 1969).

The study findings outlined that many families forced females to choose their traditional roles rather than their higher education (Muhammad Shoaib, Amina Shamsher, & Shamraiz Iqbal, 2025; Abdullah & Ullah, 2022). Similarly, the study findings examined that it was important to give chance to the female that they start their professional career with their family roles (Muhammad Shoaib, Amina Shamsher, & Shamraiz Iqbal, 2025). Likewise, the analysis of the study reported that most of the cultures appear as a barrier in front of females, and their educational way of thinking and acting also depend on the culture (Shoaib, Rasool, Kalsoom, & Ali, 2025). Comparably, the results of the study indicated that at the time, females have easy access to higher education by using different gadgets (Shoaib, Kausar, Ali, & Abdullah, 2025).

Correspondingly, the study findings showed that at modern times, the number of females was increasing in educational institutions, but still there was a major gap in the number of females in male-dominated subjects (Shoaib, Iqbal, & Iftikhar, 2025; Abdullah, Matloob, & Malik, 2024). Furthermore, the argument of the study asserted that the number of females in educational institutions was high; on the other hand, the number of girls in the labor force was not increasing (Shoaib, Ali, & Kausar, 2025). The conclusion of the research articulated that most societies create boundaries for females in education, and only limited subjects were allowed for females (Shoaib, Ali, Iqbal, & Abdullah, 2025). The study findings defined that most of the parents' focus on the education of their son, as they considered them as the future of the parents (Shoaib, 2025a). In the same token, the study findings examined that policy making and government efforts were important at that time to increase the number of females in every place (Shoaib, 2025b). In addition, the argument of study revealed that in most of the countries, educational institutions and governments start work to raise the number of female students in science and technology fields (S. R. Ali, Shoaib, & Kausar, 2025; Abdullah et al., 2024).

The study findings outlined that in most of the cultures, females' education was still impacted by the stereotypes, and most of the females were not ready to face any kind of stereotypes (Islam & Jirattikorn, 2024). Similarly, the study findings examined the education of girls, which is necessary to empower them and is important to make the nation better. Likewise, the analysis of the study reported that females faced an unwelcoming environment at the universities in science subjects (Shoaib, Zaman, & Abbas, 2024; Abdullah, Nisar,

Dialogue Social Science Review (DSSR)
www.thedssr.com

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DIALOGUE SOCIAL SCIENCE REVIEW

Vol. 3 No. 7 (July) (2025)

& Malik, 2024). Comparably, the results of the study indicated that in most of the cultures, coeducation was considered a bad or important factor to make separate places for females (Parson & Ozaki, 2018). Correspondingly, the study findings showed that females get less motivation from their families. Furthermore, the argument of the study asserted that it is important to provide a safe and satisfactory environment to females so that they can get proper education. The conclusion of the research articulated that females start taking interest in higher education when they get more opportunities and scholarships (Abdullah, Nisar, & Ahmed, 2025; Shoaib, Shehzadi, & Abbas, 2024b). The study findings defined that most of the countries facing problems in the curriculum need to make a change in it over time (You, 2011). In the same token, the study findings examined that technology plays a vital role in advanced learning and learning from home (Shoaib, Shehzadi, & Abbas, 2024a). In addition, the argument of the study revealed that educated girls start earning and can improve their life quality, and they support their families (Shoaib, Ali, & Abbas, 2024).

The study findings outlined that educated and degree-holding girls can help their families as well as the economy of the country (Xiaoting, 2001). Similarly, the study findings examined that to reduce the gender inequality in education, it is important to educate and provide awareness to the parents (White & Smith, 2022). Likewise, the analysis of the study reported that by providing education to every gender equally, society reduces all negative activities (Wearing, 1992). Comparably, the results of the study indicated that child marriages were the main hurdles in female education and caused difficulties in society (Watts, 2014). Correspondingly, the study findings showed that by education, countries also reduce the poverty rate and improve their economic condition. Furthermore, the argument of the study asserted that in most countries, gender-based violence was increasing day by day, which was also due to less educated females (Shoaib, 2024e). As the conclusion of the research articulated that most of the females taking interest in the education who know about the past struggles of the females (Shoaib, 2024d). The study findings defined that the income of the family also decides the future of girls. The poor family was more focused on the males' education. In the same token, the study findings examined that businesses were the field which was linked with males, and females were not allowed to start their own business in most of the cultures (Shoaib, 2024b). In addition, the argument of the study revealed that it has been considered that males were more confident and sharper than females (Shoaib, 2024c).

The study findings outlined that educated girls did not want to marry at a young age; they wanted to start their careers first (Shoaib, 2024a). Similarly, the study findings examined that educated females were taking an interest in the income and decision-making process of the family (R. Ali, Zaman, & Shoaib, 2024). Likewise, the analysis of the study reported that the education of females provided power to the economy and moved toward equality (Shoaib, Usmani, & Abdullah, 2023). Comparably, the results of the study indicated that gender quality was important and necessary to provide the skills to females as well. Correspondingly, the study findings showed that females face the problem of the pay gap during jobs, and it was due to the gaps between skills (Shoaib, Shehzadi, & Abbas, 2023). Furthermore, the argument of the study asserted that most of the families were not allowed the female to go to another city where the

ISSN Online: 3007-3154
ISSN Print: 3007-3146



education was far away (Shoaib, 2023b). As the conclusion of the research articulated, mostly in poor families, there was a large number of siblings present, and it was not possible for the parents to provide good education to all (Troutman, 2017). The study findings defined that in developing countries, the literacy rate was low because uneducated females have more children in the population (Shoaib, 2023c). In the same token, the study findings examined that in many countries, females have no opportunities for higher education and have less access to higher education (Shoaib, 2023a). In addition, the argument of the study revealed that increasing the number of female teachers and females in the career field motivates the other students (Titrek, Hashimi, Ali, & Nguluma, 2016).

The study findings outlined that females were considered less dominant in the house and outside; males were responsible for the decision making (Shoaib, Tariq, Shahzadi, & Ali, 2022). Similarly, the study findings examined that females were more expressive and emotional compared to males. Likewise, the analysis of the study reported that females make decisions immediately and make decisions emotionally (Shoaib & Ullah, 2021a). Comparably, the results of the study indicated that most parents think that the education of their son was more beneficial for them (Shoaib & Ullah, 2021b). Correspondingly, the study findings showed that females were taking resources from the educational institution but not returning to the labor market (Taneja-Johansson, 2024). Furthermore, the argument of the study asserted that there was a gap between the number of females in the institute and the number of females in the market (Tamim, 2021). The conclusion of the research articulated that sometimes sociocultural factors force females to do things in which they may not be interested. The study findings defined that most of the parents allow their daughters to go only to those schools where no male students and teachers (Shoaib, Iqbal, & Tahira, 2021). In the same token, the study findings examined that in many traditional societies, education was considered a negative thing, as it provided a bad mindset to the girls (Shoaib, Fatima, & Jamil, 2021). In addition, the argument of study revealed that most of the societies give pressure to females to choose the traditional roles as wives and mothers over a career (Shoaib, Ali, & Akbar, 2021).

The study findings outlined that females face difficulties in managing their traditional and career opportunities together (Stevenson, Szczytko, Carrier, & Peterson, 2021). Similarly, the study findings examined that it was required to give the students a chance to choose subjects. Likewise, the analysis of the study reported that students perform well in the subjects in which they have a personal interest. Comparably, the results of the study indicated that female who has higher education get good pay and more job opportunities (Shoaib, Ahmad, Ali, & Abdullah, 2021). Correspondingly, the study findings showed that education not only helps females in making a good career but also helps in providing good knowledge about their rights (Shoaib, Abdullah, & Ali, 2021). Furthermore, the argument of the study asserted that gender inequality affects females negatively and sometimes damages their mental health. As the conclusion of the research articulated that to reduce the gender inequality, parental education matters a lot, it starts from home (Simon, 2020). The study findings defined that in most societies, a man with no education has more importance than a woman with a good higher education (Shoaib, 2021). In the same vein, the study findings

Dialogue Social Science Review (DSSR)
www.thedssr.com

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DIALOGUE SOCIAL SCIENCE REVIEW

Vol. 3 No. 7 (July) (2025)

examined that the education level of parents impacts the children strongly (Shimizutani & Yamada, 2024). In addition, the argument of the study revealed that in Saudi Arabia, the education level of mothers was influenced by the education of daughters and the aspirations of daughters.

The study findings outlined that in most of the countries, males contributed more to family income, and they became more dominant in decision making (Shen, Lee, Tsai, & Chang, 2016). Similarly, the study findings examined that females need more financial and emotional support from other females as compared to males (Shaw, Nakhla, & Soans, 2023). Likewise, the analysis of the study reported that parental perspective in most countries where children spend time in schools increases their income in the future. Comparably, the results of the study indicated that parents get more benefit from the education of their son (Shafiq, Toutkoushian, & Valerio, 2019). Correspondingly, the study findings showed that it is important to start making investments in female education and to make improved policies. Furthermore, the argument of the study asserted that the markets of many countries require the welcome of females into higher education and job careers. As the conclusion of the research articulated, it's a time of online market and important to provide the skills to the females so they can contribute to the market (Schreiber, 2014). The study findings defined that females needed to work harder to prove themselves (Schabort, Sinnes, & Kyle Jr, 2018). In the same vein, the study findings examined that females were more sensitive and not suitable for labor work. In addition, the argument of the study revealed that the income of the parents also impacts the education of children (Salter, 2017).

The study findings outlined that the education of girls has an impact on the overall economy of the nation and helps to build a nation. Similarly, the study findings examined that sometimes cultural expectations negatively impact the education of females (Ahmad, Shoaib, & Shaukat, 2021). Likewise, the analysis of the study reported that most of the females and their parents feel unsafe to send them to an institute. Comparably, the results of the study indicated that the behaviors of teachers also impact the learning and motivation level of females (Ahmad, Ahmad, Shoaib, & Shaukat, 2021). Correspondingly, the study findings showed that it was important to design a safe and friendly environment in universities. Furthermore, the argument of the study asserted that friends were important in life and they help in decision making (Shoaib & Ullah, 2019). The research concluded that most of the females chose the subjects that their friends chose. The study findings defined that social stigma was impacting the females' STEM education and their mental health (Anwar, Shoaib, & Javed, 2013). In the same token, the study findings examined that at this time, most societies are facing the critical challenge of child marriage, which is a barrier to female education. In addition, the argument of the study revealed that in Pakistani societies, females were facing challenges after education in the economic market (Razzaq, 2016).

The study findings outlined that efforts were required to change the misconception in most societies about STEM (Ramos, Nangit, Ranga, & Triñona, 2007). Similarly, the study findings examined that in most of the areas, managing the households was considered the only role of females. Likewise, the analysis of the study reported that most of the families discourage their daughters from going to school (Raheem, Addo, Shaffakat, & Lunberry, 2024).

Dialogue Social Science Review (DSSR)
www.thedssr.com

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ISSN Print: 3007-3146

DIALOGUE SOCIAL SCIENCE REVIEW

Vol. 3 No. 7 (July) (2025)

Comparably, the results of the study indicated that most of the nations have limited resources, which did not match the number of students (Rahalkar, Sheppard, & Salek, 2022). Correspondingly, the study findings showed that STEM required more space and labs, which were difficult to provide in developing countries. Furthermore, the argument of the study asserted that in most developing countries, there were no proper labs for the students to perform their practical tasks. The conclusion of the research is that most of the females need support from their siblings in education (Shoaib, 2024a). The study findings defined that sometimes female students face difficulties in a university environment, and they have no experience with coeducation. In the same vein, the study findings examined that in developing countries, education was going to be expensive day by day, which was problematic for poor families (Shoaib, 2024c). In addition, the argument of the study revealed that most of the students choose STEM for their bright future and a secure job.

The study findings outlined that institutional and departmental systems were effective for the achievement of students (Dhillon, McGowan, & Wang, 2008). Similarly, the study findings examined that most of society required a separate institute for female students (Gill, 2021). Likewise, the analysis of the study reported that most of the families did not allow their females to take admission in co-educational institutions. Comparably, the results of the study indicated that removing the gender inequality from the educational institutes and promoting justice (Gorski & Parekh, 2020). Correspondingly, the study findings showed that female personal characteristics and institutional support impact their future achievements (Hadjar, Haas, & Gewinner, 2023). Furthermore, the argument of the study asserted that females who were mature and made decisions on their own were more confident and successful in life (Shoaib, 2025b). The conclusion of the research articulated that most of the females have no knowledge about the struggles of females in the STEM field (Huber & Traxl, 2018). The study findings defined that young students idealize their teachers and follow their behaviors. In the same token, the study findings examined that there were less number of female of female students in STEM due to their socialization process (Shoaib, 2025a). In addition, the argument of the study revealed that peer groups of students provide benefits to them in their studies and career choices.

The study findings outlined that more experienced female teachers support the female students in academic and practical life (Akbari & Tajik, 2012). Similarly, the study findings examined female teachers who also face challenges in balancing their jobs and their homes (Alamri, 2015). Likewise, the analysis of the study reported that the perspective of most of the females was to choose teaching as a career (Azman, 2013). Comparably, the outcomes of the study indicated that teacher has a solid association with students and the personality of teachers' impact on the behavior of students (Black, 2021). Correspondingly, the study findings showed that the environment of the workplace impacts the number of careerist femininity. Furthermore, the argument of the study asserted that the economic status of females was linked with their higher education (Garza & Garza Jr, 2010). The conclusion of the research articulated that there was a gender difference in teachers' feedback. The study findings defined that teachers explore the perspective of students about career opportunities and decision making (Hedlin & Åberg, 2013). In the same vein, the study findings

ISSN Online: 3007-3154
ISSN Print: 3007-3146



examined that the academic achievement of students depends on the support they get from their family members (Kebede, 2023). In addition, the argument of the study revealed that students evaluate the support of teachers, which helps in their future struggles. The study findings outlined that increased self-efficacy in females about STEM courses (Kinkopf & Dack, 2023). Similarly, the study findings examined that female gender identities were challenged for the females in higher education. Likewise, the analysis of the study reported that females were facing challenges in the male-dominated subjects in higher education (Meierdirk, 2017).

## Conclusion

The study concludes that the feminization of STEM higher education is shaped by a complex and multifaceted interplay of acceptability and resistance. The findings indicate that significant strides have been made in motivating and encouraging female participation in STEM disciplines, particularly at the tertiary level. However, higher education remains deeply embedded in and influenced by socio-cultural norms, gendered expectations, and persistent institutional and structural barriers. These dimensions continue to shape the dynamics of acceptance and resistance experienced by female students in STEM fields. Notably, factors such as gender-responsive policies, gender sensitization efforts, supportive family environments, peer influence, faculty engagement, and increasing socio-cultural receptivity have contributed positively to enhancing female acceptability and inclusion in STEM higher education. Similarly, parental encouragement, personal motivation, community-level advocacy, institutional initiatives, and structural support networks that promote inclusivity have played a pivotal role in bolstering female participation and retention in STEM fields. Conversely, resistance continues to manifest in both subtle and overt forms. These include a persistent lack of female role models, gender stereotyping, peer-based biases, and the dominance of male-centric norms in many technical domains. Such factors often impede the motivation, performance, academic confidence, career aspirations, and job-oriented trajectories of female students in STEM higher education.

## Future Implications

It comprises an amalgamation of gender equality and equity-based policies, developing comprehensive and inclusive learning environments, integrating gender based responsive tutoring, promoting mentorship programs, and leadership opportunities for females in STEM fields.

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DIALOGUE SOCIAL SCIENCE REVIEW

Vol. 3 No. 7 (July) (2025)

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