

Female Students' Accessibility in Science, Technology, Engineering and Mathematics (STEM) Disciplines in Tanzania

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Abstract: *The underrepresentation of female students in Science, Technology, Engineering, and Mathematics (STEM) disciplines in Tanzania is a pressing issue that requires targeted interventions. This study aims to explore enabling interventions for increasing female students' access and participation in STEM fields within Tanzania, using secondary data analysis. The research employs a comprehensive review of existing literature, reports, and relevant data sources to identify the factors that hinder female students' engagement in STEM education in Tanzania. Through this analysis, socio-cultural, economic, and institutional barriers, including gender biases, limited resources, and lack of role models, are identified as key challenges. Drawing on the available secondary data, the study investigates existing interventions and initiatives that have been implemented to promote female participation in STEM disciplines in Tanzania. The analysis examines the effectiveness and impact of various interventions, such as scholarship programs, mentorship initiatives, policy reforms, and community outreach efforts. Additionally, the study analyzes secondary data to explore the outcomes and experiences of female students, educators, and STEM professionals in Tanzania. By examining surveys, reports, and existing studies, the research gains insights into the specific barriers faced by female students in accessing and participating in STEM fields, as well as the potential solutions that have been implemented. Based on the findings from the secondary data analysis, this research proposes evidence-based interventions and strategies to increase female students' access and participation in STEM disciplines in Tanzania. The proposed interventions encompass recommendations for policy-makers, educators, and stakeholders, focusing on areas such as curriculum development, mentorship networks, and community engagement. The outcomes of this study contribute to the existing knowledge base on gender equity in STEM education and provide insights for designing effective interventions in Tanzania. By utilizing secondary data, this research offers a valuable perspective on the enabling interventions that have been implemented and their potential for scalability and impact. Implementing evidence-based strategies can pave the way for improved access, increased participation, and enhanced opportunities for female students in STEM fields, fostering a more inclusive and diverse scientific community in Tanzania.*

Keywords: *Gender, Accessibility, Science, Technology, Engineering and Mathematics (STEM) Disciplines.*

Introduction

The science, Technology, Engineering, and Mathematics (STEM) fields have a critical role in driving economic growth and social development. Despite their importance, females are underrepresented in STEM disciplines, especially in developing countries like Tanzania. The government of Tanzania has implemented several policies and initiatives to promote gender equality in education, including STEM disciplines. However, gender disparities still exist in STEM fields and female students face significant challenges in accessing and participating in STEM education. This issue has raised questions about the factors that limit the participation of female students in STEM disciplines and the measures that can be taken to address this challenge. . As a result, there is a pressing need to explore and implement effective interventions that can increase female students' access and participation in STEM disciplines in Tanzania. (Kapinga, 2017).

Globally, according to UNESCO only 35% of STEM students' in high education is women and the gender gap is particularly wide in Sub-Saharan Africa, Arab states and central Asia (UNESCO, 2021). In the United States women earn only 20% of all bachelors' degrees in computer science and physics (National Science Board, 2020). In Japan only 17.6% of STEM university graduates are women (Ministry of Education, Culture, Sports, Science and Technology, 2020) as well as I the European Union women represent only 16% of ICT graduates and only 34% of STEM graduates overall (European Commission, 2020). Also UNESCO report emphasizing that only 30% of female students in Sub-Saharan Africa pursue science, technology, engineering, and mathematics (STEM) fields in higher education, compared to 70% of male students. This gender gap in STEM education is due to various factors such as social and cultural norms, lack of access to resources and role models, and poverty. (UNESCO, 2017). Additionally, a study by the African Development Bank found that only 5% of African women hold careers in STEM fields, compared to 21% of men (African Development Bank, 2021). This highlights the significant disparity in gender representation in STEM careers in Africa (UNESCO, 2021).

According to a report by the UNESCO Institute for Statistics (UIS), Tanzania has one of the lowest rates of female participation in STEM fields in Africa. In 2019, only 4.4% of female students in Tanzania were enrolled in STEM-related programs at the tertiary level compared to 21.6% of male students. Additionally, access to education, especially for girls, is still a challenge in Tanzania. According to a report by the United Nations Educational, Scientific and Cultural Organization (UNESCO), in 2018, the

net enrollment rate for girls at the primary level was 78%, compared to 83% for boys. At the secondary level, the net enrollment rate for girls was 30%, compared to 37% for boys (UNESCO, 2018).

In Tanzania, a study by Kapinga (2017) found that the underrepresentation of women in STEM fields could be due to factors such as limited access to resources, lack of female role models, and cultural biases. The study also found that female students' participation in STEM fields could be increased through mentorship programs and career guidance initiatives.

For instance, a study by Abdullahi et al. (2021) found that cultural and societal norms, lack of role models, and gender biases in STEM education and workplaces are some of the factors that limit the participation of female students in STEM courses in Tanzania. Similarly, a study by Msoffe et al. (2019) found that female students face challenges such as low self-esteem, lack of support from family and friends, and inadequate resources and facilities in STEM education.

A study by Mbwilo et al. (2019) identified lack of role models, limited access to STEM resources, and gender stereotypes as the major barriers to female students' participation in STEM fields. Similarly, a study by Kafanabo et al. (2020) found that female students' low self-efficacy and lack of support from family and peers were major obstacles to their participation in STEM programs.

Furthermore, Komba et al. (2020) found that cultural beliefs and social norms that limit women's educational opportunities, lack of role models and mentorship, and limited access to resources and opportunities were among the main barriers to women's participation in STEM fields in Tanzania. Similarly, a study by Msanjila and Nkwera (2018) identified a lack of support and encouragement from family, peers, and teachers, as well as limited access to funding and scholarships, as significant challenges facing female students in STEM fields in Tanzania.

In response of to this problem, the government of Tanzania has implemented several policies and initiatives to promote gender equity in education, including STEM fields. For example, the government introduced the National Gender Policy in Education in 2000, which aims to promote gender equity in education and eliminate gender-based violence (Ministry of Education, Science and Technology, 2000). Additionally, Tanzania has implemented the Science, Technology, and Innovation Policy of 2018, which aims to increase the number of females in STEM disciplines (URT, 2018). Despite these policies and initiatives, gender disparities still exist in STEM disciplines and female students face significant challenges in accessing and participating in STEM education.

The aim of this study is to explore enabling interventions for increasing female students' access and participation in STEM. Also this study will contribute the importance of women to use their knowledge gained in STEM fields into socio-economic development in the country.

Importance of Women in Participation in Stem

Overall, the studies suggest that women's participation in STEM is crucial for improving innovation and economic growth, addressing societal challenges and promoting gender equality. The participation of women in STEM (Science, Technology, Engineering, and Mathematics) fields is crucial for both societal and economic reasons. Numerous studies have shown that diversity in STEM fields enhances creativity, innovation, and problem-solving abilities, leading to better outcomes in research and development. Moreover, STEM careers tend to have high job security, growth potential, and compensation. However, women are often underrepresented in STEM fields due to various socio-cultural, educational and systematic barriers.

According to a report by the National Science Foundation, women represent only 28% of the science and engineering workforce in the United States. A study by UNESCO shows that less than 30% of all female students select STEM-related fields in higher education globally. These statistics demonstrate the urgency of encouraging and supporting women participation in STEM fields.

The study also suggests that gender diversity in STEM fields can lead to more significant breakthroughs and better decision-making. A study published in PNAS (Proceedings of the National Academy of Sciences) found that gender diversity positively impacts scientific research, as teams with more women tend to produce more influential research. Additionally, a report by McKinsey & Company found that companies with a higher representation of women in leadership roles to tend to have higher financial performance and better organization health.

Women's participation in STEM fields is vital for creating a diverse and inclusive workforce, enhancing innovation and creativity, and improving economic outcomes. It is imperative to address the barriers that prevent women from pursuing and thriving in STEM fields and to create a more equitable and inclusive environment for all.

Statement of the Problem

Despite the efforts to address the low participation of female students in STEM disciplines in Tanzania, there is still a significant gender gap in STEM fields. According to a report by the Tanzania Commission for Science and Technology (COSTECH),

women account for only 28% of students in STEM fields in Tanzanian universities (COSTECH, 2020). This low representation of women in STEM fields has significant implications for Tanzania's economic and social development, as STEM fields are critical drivers of innovation, growth, and development. Therefore, there is a need to explore effective enabling interventions that can increase female students' access and participation in STEM disciplines in Tanzania.

This paper seeks to explore these interventions and provide recommendations for addressing the gender gap in STEM fields in Tanzania.

The study was guided by the following objectives:

1. To examine the factors that hinder female students' access and participation in STEM disciplines in Tanzania.
2. To explore the enabling interventions that can increase female students' access and participation in STEM disciplines in Tanzania.
3. To find the consequences of gender gap in participation in STEM fields.

Empirical Review

One study conducted by Ceci et al. (2014) analyzed data from over 1.6 million students in the United States to investigate gender differences in academic achievement and interest in STEM fields. The study found that there were no significant gender differences in academic achievement in STEM fields, but there were gender differences in interest in STEM fields. Specifically, the study found that girls and boys had similar levels of interest in STEM fields in elementary school, but girls' interest in STEM fields declined more rapidly than boys' interest in STEM fields as they progressed through middle and higher school (Ceci et al, 2014).

Another study by Stoet and Geary (2018) analyzed data from 67 countries to investigate gender differences in academic achievement and interest in STEM fields. The study found that there were no significant gender differences in academic achievement in STEM fields, but there were gender differences in interest in STEM fields. Specifically, the study found that girls had lower levels of interest in STEM fields than boys in most countries, with the largest gender differences in countries with greater gender equality.

Mgaya and Machumu (2020) at the University of Dar es Salaam. The study aimed to explore the factors that contribute to the low participation of women in STEM courses. The study used a mixed-methods approach, involving interviews and surveys with students and faculty members. The study found that cultural and societal stereotypes were major barriers to women's participation in STEM courses. For example, women were often discouraged from pursuing STEM courses because they were considered to be "masculine" subjects. The study also found that lack of role models and mentorship programs, as well as inadequate support from family and friends, contributed to the low participation of women in STEM courses.

Also Wang et al. (2013) investigated the factors that influence female students' interest in STEM fields. The study found that parental encouragement, positive attitudes towards STEM subjects, and having female STEM role models were positively associated with female students' interest in STEM fields. The study also found that negative attitudes towards STEM subjects and lack of exposure to STEM subjects were negatively associated with female students' interest in STEM fields.

Another study was conducted by Makwetta and Luhanga (2019) at the University of Dodoma. The study aimed to investigate the factors that influence female students' enrollment and performance in STEM courses. The study used a qualitative approach, involving focus group discussions with female students in STEM courses. The study found that financial constraints, lack of career guidance, and negative attitudes towards STEM courses were major barriers to women's participation in STEM courses. The study also found that the lack of female role models and inadequate support from academic staff contributed to the low participation of women in STEM courses.

Kapinga, Sanga, and Mmari (2019) examined the challenges that female students face when pursuing STEM degrees in Tanzanian public universities. The study found that gender stereotypes, lack of role models, and cultural barriers were among the significant obstacles that prevent female students from pursuing STEM education. The study suggested that interventions such as mentorship programs and awareness campaigns could help address these challenges.

Furthermore, a study by Nkumbi and Mahenge (2020) investigated the impact of a STEM-focused extracurricular program on female students' academic performance in a Tanzanian public university. The program aimed to enhance students' understanding of STEM subjects through practical activities and competitions. The study found that the program significantly improved female students' academic performance in STEM fields.

Theoretical Framework

Definitions of Concepts

Introduction

There are some concepts should be defined such as STEM, Gender, Women Participation, Women empowerment.

STEM

STEM stands for Science, Technology, Engineering, and Mathematics. This term refers to a group of academic disciplines that are related to science and technology, and emphasizes the importance of these fields in driving innovation and economic growth. STEM careers are often well-paying and in high demand, but historically have been dominated by men. According to the National Science Foundation (NSF), women are underrepresented in many STEM fields, particularly in computer science, engineering, and physics (NFS, 2020).

Women Participation

Women's participation refers to the involvement of women in various aspects of society, including the workforce, politics, and social life. This term emphasizes the importance of gender equality and women's empowerment, as well as the benefits of greater diversity and inclusion. According to the World Economic Forum, women's participation in the global labor force is still lower than men's, with only 55% of women participating compared to 78% of men (WEF, 2021).

Gender

Gender refers to the social and cultural differences between men and women, rather than biological differences. Gender is a socially constructed concept that includes expectations, roles, and behaviors that are associated with being male or female. Gender is important in understanding the experiences of men and women in society, and in addressing issues related to gender inequality and discrimination. According to the United Nations, gender refers to "the socially constructed roles, behaviors, activities, and attributes that a given society considers appropriate for men and women" (UN Women, 2021).

Women Empowerment

Women's empowerment refers to the process of enabling women to have greater control over their lives and to achieve greater equality in society. This term emphasizes the importance of women's agency and decision-making power, as well as the need to address systemic barriers and discrimination that prevent women from reaching their full potential. According to the United Nations, women's empowerment means "expanding the choices and opportunities available to women so that they can participate fully in all spheres of life" (UN Women, 2021).

Theories of STEM Disciplines

Introduction

Various theories have been used to explain STEM disciplines. These theories includes Social Cognitive Career Theory (SCCT), Stereotype Threat Theory and Feminist Standpoint Theory.

Social Cognitive Career Theory (SCCT) is a theoretical framework that posits that career choice is influenced by personal factors (e.g., self-efficacy, outcome expectations), contextual factors (e.g., social support, role models), and learning experiences (e.g., skill development, exposure to STEM fields). SCCT was developed by Robert Lent, Steven Brown, and Gail Hackett in the 1990s as an extension of Social Learning Theory, which emphasizes the importance of observational learning and reinforcement in shaping behavior.

Assumptions of SCCT:

1. Career choice is an active and ongoing process that involves the interaction of personal, contextual, and learning factors.
2. Individuals have the capacity to influence their own career development through their thoughts, behaviors, and beliefs.
3. Self-efficacy efficacy beliefs play a central role in career choice, as they influence individuals' sense of competence and confidence in their ability to succeed in a particular career domain.
4. Social support and role models can serve as sources of information, feedback, and encouragement in the career development process.

Characteristics of SCCT:

1. **Personal factors:** Personal factors refer to individual characteristics, such as self-efficacy beliefs, outcome expectations, interests, and values that influence career choice. According to SCCT, individuals who have high self-efficacy beliefs and positive outcome expectations for a particular career domain are more likely to pursue careers in that domain.
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2. **Contextual factors:** Contextual factors refer to the social and environmental factors that shape career choice, such as family background, socioeconomic status, and cultural norms. SCCT emphasizes the importance of social support and role models in career development, as individuals who have access to supportive networks and positive role models are more likely to pursue careers in STEM fields.
3. **Learning experiences:** Learning experiences refer to the opportunities that individuals have to develop their skills, knowledge, and interests in a particular career domain. SCCT suggests that exposure to STEM fields and hands-on learning experiences can increase individuals' self-efficacy beliefs and outcome expectations, and thus increase their likelihood of pursuing careers in these fields.

Evaluations and criticism of SCCT:

Evaluation of SCCT is based on the extent to which it can explain and predict career choice in STEM fields, as well as its practical implications for STEM education and career development. Research has shown that SCCT can explain gender differences in career choice in STEM fields, as women tend to have lower self-efficacy beliefs and outcome expectations than men in these fields. However, some studies have also found that SCCT may not fully account for the complex and dynamic nature of career choice, as individuals may face a range of obstacles and opportunities that are not fully captured by the theory.

Critics have also argued that SCCT may not fully account for the structural and systemic barriers that can limit access and opportunity for marginalized groups in STEM fields. For example, women and individuals from underrepresented groups may face discrimination, bias, and lack of access to resources and opportunities that can hinder their career development, regardless of their self-efficacy beliefs or social support networks.

Overall, SCCT provides a useful framework for understanding the complex and multifaceted nature of career choice in STEM fields, but it should be considered alongside other theoretical frameworks and empirical evidence to develop more comprehensive and equitable approaches to STEM education and career development.

Stereotype threat theory

Stereotype threat theory is a social psychological theory that proposes that when individuals are aware of negative stereotypes associated with their group membership, they may experience anxiety and self-doubt that can impair their performance in situations that are relevant to the stereotype.

Assumptions:

The theory assumes that negative stereotypes exist and are widely known within a society or culture. Additionally, it assumes that individuals who belong to stigmatized groups are aware of these stereotypes and may worry about being judged according to them. The theory also assumes that individuals who are aware of these stereotypes may experience a psychological burden that can interfere with their cognitive abilities and lead to underperformance in certain situations.

Features:

Stereotype threat can have a variety of effects on individuals' behavior and performance. For example, it can lead to increased anxiety, reduced motivation, and diminished cognitive resources. It can also result in self-handicapping behaviors, such as deliberately performing poorly to avoid confirming the stereotype, or misidentifying with the relevant domain or activity altogether. Stereotype threat can affect individuals' performance in a variety of domains, including academic tests, athletic competitions, and professional settings.

Evaluation:

Stereotype threat theory has received substantial empirical support over the past few decades. Numerous studies have demonstrated that stereotype threat can have a significant impact on individuals' performance in a variety of domains. However, some researchers have raised questions about the theory's scope and generalizability. For example, some have argued that stereotype threat effects may be more pronounced in laboratory settings than in real-world contexts. Others have suggested that stereotype threat may be more or less influential depending on the individual's level of identification with the relevant group or domain.

Criticisms:

Stereotype threat theory has also been subject to criticism from some scholars who have questioned its assumptions and methods. For example, some have argued that the theory overemphasizes the role of stereotypes in shaping individual behavior and performance, while neglecting other important factors such as motivation, ability, and social context. Others have criticized the theory's reliance on experimental manipulations and laboratory studies, arguing that these may not accurately reflect real-world

dynamics. Finally, some researchers have raised concerns about the replicability of stereotype threat effects, noting that some studies have failed to find significant effects or have produced inconsistent results.

Feminist Standpoint Theory:

Feminist Standpoint Theory posits that knowledge is situated in particular social contexts and that marginalized groups (e.g., women) may have unique perspectives and insights into the nature of social phenomena. Feminist Standpoint Theory assumes that women's experiences in STEM fields can provide valuable insights into the nature of these fields and their potential for social change. In this theory, evaluation is based on the extent to which STEM fields incorporate diverse perspectives and engage in critical reflection on their social and political implications.

Research Methodology

This study used secondary data to analyze enabling interventions for Female Students' accessibility in Science, Technology, and Engineering and Mathematics (STEM) disciplines in Tanzania. The secondary data include government reports, such as those provided by the Tanzania Education Authority and the Ministry of Education, which offer insights into policies, initiatives, and interventions aimed at increasing female students' participation in STEM disciplines. In addition to that, published books, online journals and other types of research papers were used to provide scholarly perspectives on interventions and their outcomes. Program evaluations conducted by governmental and non-governmental organizations offered insights into the impact and effectiveness of specific interventions.

Results and Discussion

Factors that hinder female students' access and participation in STEM disciplines

According to the findings, the participation of female students in STEM (Science, Technology, Engineering, and Mathematics) disciplines is still low. The analysis of secondary data reveals several factors that hinder female students' access and participation in STEM disciplines. These factors can be broadly classified into societal, cultural, educational, and institutional factors. The following key findings emerged from analysis:

- 1. Societal Stereotypes and Gender Bias:** Societal stereotypes and gender biases are significant factors that contribute to the underrepresentation of women in STEM disciplines in Tanzania. Cultural norms, such as associating STEM with masculinity, discourage girls from pursuing STEM fields (Msanjila et al., 2018). Girls may internalize these stereotypes, leading to reduced confidence, self-doubt, and less interest in STEM subjects. Also according to a study by the National Science Foundation (NSF), girls as young as six years old associate intelligence with boys and consider boys more likely to excel in STEM fields (NSF, 2020). Similarly, a report by the American Association of University Women (AAUW) found that traditional gender roles and biased cultural norms often discourage girls from pursuing STEM subjects, leading to self-doubt, lack of confidence, and reduced interest (AAUW, 2015)
- 2. Lack of Female Role Models:** The absence of female role models in STEM fields negatively impacts girls' aspirations and career choices in Tanzania. Research suggests that exposure to successful female STEM professionals increases girls' interest and confidence in pursuing STEM careers (Msoffe et al., 2019). The limited representation of women in STEM fields in Tanzania contributes to the perception that these disciplines are male-dominated, discouraging female students from pursuing STEM education and careers.
- 3. Limited Support Networks:** The lack of supportive environments and networks can impede female students' progress in STEM disciplines in Tanzania. Isolation, stereotype threat, and limited mentorship opportunities contribute to reduced access and retention of women in STEM (Kapinga et al, 2019). Female students in Tanzania often face challenges in finding mentorship and support networks, which are crucial for their academic and professional development in STEM fields.
- 4. Lack of Resources and Infrastructure:** Limited resources and infrastructure in Tanzanian schools and universities pose challenges for female students in STEM education. Insufficient laboratory equipment, inadequate textbooks, and outdated teaching methods disproportionately affect girls' access to quality STEM education (Kapinga et al., 2019). The lack of resources further widens the gender gap in STEM participation.
- 5. Societal and Cultural Norms:** Societal and cultural norms play a significant role in shaping perceptions and expectations regarding gender roles and careers in Tanzania. Traditional gender stereotypes often discourage girls from pursuing STEM subjects, leading to a lack of interest and reduced confidence (Mbwilo et al, 2019). Cultural beliefs that associate STEM fields with masculinity further contribute to the underrepresentation of women in these disciplines.
- 6. Educational Barriers:** Inequities in educational resources, curriculum design, and teaching approaches pose significant barriers for female students in STEM. Research by Hazari et al. (2017) found that limited access to quality STEM education, gender-biased curriculum content, and stereotypes within educational settings contribute to the underrepresentation of women in STEM fields.

It is essential to create an environment that promotes gender equity and inclusivity, including addressing stereotypes and cultural attitudes that reinforce gender inequalities. The university should also develop programs and policies that encourage and support female students' participation in STEM, including providing scholarships, mentorship programs, and other forms of support. Finally, addressing the resource challenges faced by female students in STEM disciplines will require the provision of adequate resources and facilities, including laboratories and learning materials and promoting equal access to these resources regardless of gender

Enabling Interventions for Female Students' Access and Participation in STEM Disciplines in Tanzania.

Findings of the study revealed that there are several interventions that have been implemented in Tanzania to promote the participation of female students in STEM disciplines. These interventions include:

- 1. Increased Female Enrollment:** The interventions implemented in Tanzania have shown promising results in increasing female enrollment in STEM disciplines. The data revealed a steady rise in the number of female students enrolling in STEM-related programs over the past decade. This suggests that initiatives such as scholarship programs, mentorship initiatives, and outreach campaigns have positively influenced female students' interest in STEM fields. (Kafanabo, 2018)
- 2. Reduction in Gender Disparities:** The interventions have contributed to a reduction in gender disparities within STEM disciplines. The data indicated a decrease in the gender gap in enrollment, particularly in fields like computer science, engineering, and mathematics. This demonstrates the effectiveness of targeted interventions in addressing gender imbalances and promoting equal opportunities for female students. (Ishengoma, et al, 2021)
- 3. Academic Performance and Retention:** The interventions have also shown positive effects on the academic performance and retention of female students in STEM disciplines. The data revealed an improvement in the average grades of female students, indicating enhanced learning outcomes. Additionally, retention rates have increased, suggesting that interventions have created a supportive and inclusive environment that encourages female students to persist in their STEM studies. (Kabyemera, 2018)
- 4. Empowerment and Confidence Building:** The interventions have played a crucial role in empowering female students and building their confidence in pursuing STEM careers. Qualitative data highlighted the transformative impact of mentorship programs and skill-building initiatives on female students' self-belief and aspirations. Many participants reported increased confidence, improved problem-solving skills, and a greater sense of belonging within STEM disciplines. (Mosha, et al, 2018)

The results of this study demonstrate the positive impact of enabling interventions on female students' access and participation in STEM disciplines in Tanzania. The findings align with the broader international efforts to address gender disparities in STEM education and promote women's empowerment.

The increased female enrollment in STEM programs suggests that interventions have effectively captured the interest of female students and created an enabling environment. By providing scholarships and implementing outreach campaigns, barriers to access have been reduced, enabling more girls to pursue STEM education.

The reduction in gender disparities within STEM disciplines indicates that interventions have been successful in challenging societal stereotypes and biases. Creating a supportive ecosystem that promotes gender equality and inclusivity has been instrumental in encouraging female students to actively engage in STEM disciplines.

Improved academic performance and retention rates among female students emphasize the importance of interventions in creating conducive learning environments. The provision of mentorship programs, skill-building workshops, and supportive networks has helped female students thrive academically, leading to increased persistence and completion rates.

Furthermore, the empowerment and confidence-building outcomes reported by female students reflect the transformative power of interventions. By instilling self-belief, enhancing problem-solving skills, and fostering a sense of belonging, interventions have nurtured the potential of female students, paving the way for their future success in STEM careers.

Overall, the enabling interventions implemented in Tanzania have contributed to increasing access and participation of female students in STEM disciplines. However, there is still a need for continued efforts to address gender disparities in STEM education and careers to ensure that women have equal opportunities to contribute to the field and benefit from its advancements.

Consequences of gender gap in Participation in STEM fields.

The gap in participation in STEM (science, technology, engineering, and mathematics) fields has been a long-standing issue. Despite efforts to promote gender equality in these fields, women remain underrepresented in STEM-related jobs, education, and research.

The consequences of the gender gap in STEM are many and varied, and they impact individuals, communities, and society as a whole. Here are some of the key consequences:

1. **Reduced diversity:** When women are underrepresented in STEM fields, it leads to a lack of diversity in these industries. This can limit the range of perspectives and ideas that are brought to the table, which in turn can stifle innovation and progress.(Woolley et al, 2010)
2. **Missed opportunities:** When women are discouraged from pursuing STEM careers, they miss out on the many benefits that these fields offer. STEM careers tend to be well-paid and offer good job security, and they often provide opportunities to make meaningful contributions to society.(Ceci et al, 2009)
3. **Economic impact:** The gender gap in STEM can also have an economic impact. By limiting the pool of talent in these fields, it can lead to a shortage of skilled workers in industries that are vital to economic growth, such as healthcare, technology, and engineering.(OECD, 2017)
4. **Social impact:** Women who are discouraged from pursuing STEM careers may feel undervalued or marginalized, which can have a negative impact on their self-esteem and well-being. Additionally, the lack of female role models in STEM fields can perpetuate gender stereotypes and limit girls' aspirations.(National Science Board, 2018)
5. **The loss of talent and innovation.** Women make up half of the world's population, and by excluding them from STEM fields, we miss out on the diverse perspectives and ideas they can bring. Additionally, research has shown that diverse teams are more innovative and productive than homogenous teams.(Welter et al, 2018)
6. **STEM also perpetuates gender stereotypes and biases,** which can have long-term consequences for women's career trajectories. These stereotypes can lead to women being undervalued and underestimated in their abilities, leading to lower pay, fewer promotions, and limited opportunities for career advancement.(Cheryan et al, 2017)

Addressing the gender gap in STEM participation in Tanzania requires a concerted effort to address gender bias and stereotypes, provide more opportunities for girls and women to participate in STEM fields, and support women who do choose to pursue careers in these areas. This can lead to greater gender equality, innovation, and progress in Tanzania's STEM fields. The government, civil society organizations, and private sector players can play a critical role in promoting the participation of girls and women in STEM fields in Tanzania.

Conclusion and Recommendations

In conclusion, exploring enabling interventions for female students in STEM disciplines in Tanzania is a critical step towards addressing gender disparities and promoting equitable opportunities in these fields. Secondary data analysis reveals significant challenges and opportunities for enhancing female participation in STEM education and careers. While progress has been made, barriers such as cultural norms, limited resources, and lack of role models persist. However, several promising interventions have emerged that can contribute to a more inclusive and supportive environment for female students in Tanzania. Through the analysis of secondary data, key findings have emerged. Firstly, there is a need for targeted interventions that address cultural and societal norms regarding gender roles and expectations. It is crucial to challenge stereotypes and promote the value of STEM education for both genders. Secondly, access to quality STEM education and resources must be improved. This includes providing adequate infrastructure, laboratories, and educational materials that are accessible to all students, regardless of their geographic location or socio-economic background. Thirdly, mentorship programs and networking opportunities can play a crucial role in supporting female students' engagement and persistence in STEM disciplines. By connecting female students with successful women in STEM fields, they can gain inspiration, guidance, and practical advice for navigating their educational and career paths.

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