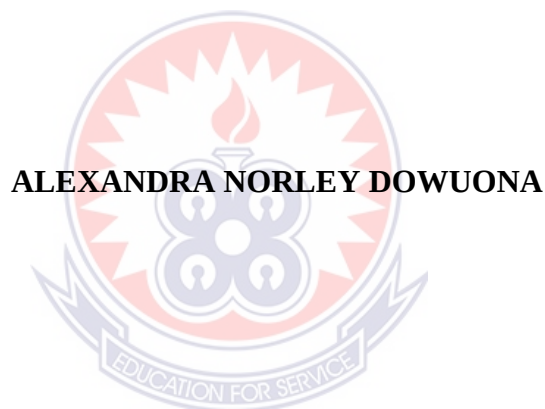


UNIVERSITY OF EDUCATION, WINNEBA

FACULTY OF SCIENCE EDUCATION

**Investigating factors that contribute to the under-representation of girls' in stem
fields and its implications in the Effutu Municipality**



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MASTER OF PHILOSOPHY

JANUARY, 2025

UNIVERSITY OF EDUCATION, WINNEBA

**INVESTIGATING FACTORS THAT CONTRIBUTE TO THE UNDER-
REPRESENTATION OF GIRLS' IN STEM FIELDS AND ITS
IMPLICATIONS IN THE EFFUTU MUNICIPALITY**

ALEXANDRA NORLEY DOWUONA

The logo of the University of Education, Winneba, is a circular emblem. It features a central torch with a flame, set against a background of a rising sun with rays. The emblem is encircled by a border containing the text 'UNIVERSITY OF EDUCATION, WINNEBA' and 'EDUCATING FOR SERVICE'.

**A thesis in the Department of Science Education, Faculty of Science Education,
submitted to the School of Graduate Studies in partial fulfilment of
the requirements for the award of the degree of
Master of Philosophy (Science Education) in the
University of Education, Winneba**

JANUARY, 2025

DECLARATION

STUDENT'S DECLARATION

I, Alexandra Norley Dowuona, declare that this thesis report, with the exception of quotations and references in published works which have all been identified and acknowledged, is entirely my original research and that no part of it has been presented for another degree in this University or elsewhere.

SIGNATURE :.....

DATE :.....

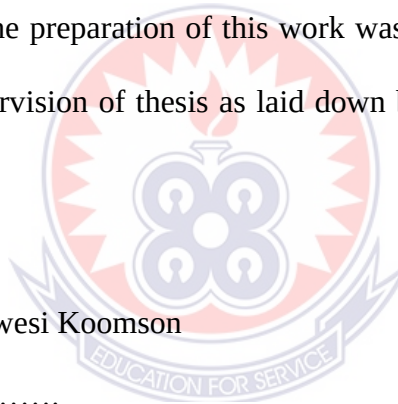
SUPERVISOR'S DECLARATION

I hereby declare that the preparation of this work was supervised in accordance with the guidelines for supervision of thesis as laid down by the University of Education, Winneba.

NAME: Dr. Charles Kwesi Koomson

SIGNATURE:.....

DATE:.....



DEDICATION

This work is dedicated to my family, whose endless love, encouragement, and support have been my foundation throughout this journey. To my Mum, Madam Elizabeth Asibu and daughter Ra-el Agyeiwaa Yankson, who have stood by me with patience and belief, even during the most challenging moments, I am forever grateful.

I also dedicate this research to all those who have inspired me along the way – Dr Nelly Adjoa Sakyi-Hagan, colleagues, and friends – whose wisdom and guidance have shaped my path and fueled my passion for this field.

Lastly, I dedicate this work to those who seek knowledge and strive to make the world a better place through research, innovation, and discovery.



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DEFINITION OF TERMS

STEM – Science Technology Engineering and Mathematics



CHAPTER ONE

INTRODUCTION

1.0 Overview

This chapter discusses the background to the study, problem statement, purpose of the study, objectives of the study, research questions, significance of the study, limitations, and delimitations.

1.1 Background to the Study

In recent years, there has been much discussion about girls' under-representation in Science, Technology, Engineering and Mathematics (STEM) fields. Despite attempts to promote gender equality and inclusion, girls continue to encounter obstacles to their participation and success in STEM disciplines. This under-representation not only limits girls' chances, but it also has far-reaching consequences for gender equity, workforce diversity, and social growth.

According to the United Nations Educational, Scientific and Cultural Organization (2018). Globally, gender gaps in STEM education and jobs remain. Several studies have found that girls are underrepresented in STEM areas across countries and regions. According to the UNESCO Institute for Statistics, women make up only 35% of STEM students in higher education around the world. This gender disparity limits the potential talent pool in STEM disciplines and stymies efforts to address complex global challenges with different viewpoints and new solutions.

Globally, research has discovered a number of variables that contribute to girls' under-representation in STEM courses. Gender stereotypes and socialization have a substantial impact on girls' STEM interest and self-perception (Archer et al. 2013; Nosek et al. 2009). Curriculum bias and inadequate access to resources and opportunity are two educational issues that contribute to the disparity (Sadler et al., 2012; Brotman

& Moore, 2008). According to Denissenko et al. (2019), a lack of female role models and mentors in STEM subjects contributes to girls' under-representation. Understanding these characteristics is critical for designing worldwide initiatives that promote gender parity in STEM.

According to the World Bank (2018), under-representation of girls in STEM courses is a complex issue with specific challenges and ramifications. Despite progress in extending access to education, gender inequalities exist in many African countries' educational institutions. Social and cultural norms frequently reinforce prejudices that hinder girls from choosing STEM careers (Mohamedbhai, 2014). Limited access to excellent education, a lack of resources, and poor infrastructure all contribute to girls' under-representation in STEM education and jobs (UNESCO, 2015).

Many researches in Africa have shed light on other factors that influence girls' engagement in STEM topics. Family and cultural influences have a substantial impact on girls' perspectives and decisions about STEM education (Ampadu-Boakye et al. 2019). Girls are discouraged from entering STEM disciplines due to societal expectations and gendered divisions of labour. Addressing these impediments is critical for unlocking Africa's human capital potential, fostering gender equality, and fulfilling the continent's long-term development goals.

In Ghana, the under-representation of girls in STEM courses is a critical issue that demands attention and remedy. Ghana has made gains in enhancing educational access, although gender discrepancies continue in STEM subjects (Ghana Statistical Service, 2018). Cultural norms and societal expectations frequently deter girls from pursuing STEM education and careers by cultural stereotypes and societal expectations (Ampadu-Boakye et al. 2019). Girls' participation in STEM education is further

hampered by a lack of resources, which includes subpar laboratory space and restricted access to technology (UNESCO, 2015).

Ghanaian research has shown how critical it is to address particular issues affecting girls' interest in STEM fields. According to Ampadu-Boakye et al. (2019), the lack of female role models and mentors as well as perceptions of female scientists have an impact on the gender gap in STEM education. Furthermore, stereotype threat and implicit prejudice are common in STEM learning contexts, which can have a negative effect on girls' performance and confidence (Robnett et al. 2018). It is imperative to comprehend these contextual aspects in order to formulate customized interventions and policies aimed at advancing gender parity and enabling girls in Ghana to pursue STEM education and jobs.

1.2 Statement of the Problem

In an ideal situation, there would be equal representation of girls and boys in Science, Technology, Engineering, and Mathematics (STEM) subjects, ensuring a diverse and inclusive learning environment. Girls would have equal access to resources, opportunities, and support systems to pursue their interests and talents in STEM fields. Gender disparities and biases would be eliminated, and girls would be encouraged and empowered to explore STEM education and careers without facing societal barriers or stereotypes.

However, through anecdotal accounts and personal observation, the current situation reveals a persistent under-representation of girls in STEM subjects. Despite efforts to promote gender equality and inclusivity, girls continue to face numerous challenges and barriers that hinder their participation and success in STEM. This under-representation problem is multifaceted and prevalent across different contexts, including the global, African. A diverse and inclusive learning environment would be ensured if girls and

boys were equally represented in STEM courses. Girls would have equal access to opportunities, resources, and networks of support to follow their passions and aptitudes in STEM professions. Girls would be empowered and encouraged to pursue STEM education and careers without encountering prejudice or social hurdles, and gender inequities and prejudices would vanish.

Still, the data shows that girls are systematically under-represented in STEM fields. Girls still encounter a lot of obstacles and hurdles that prevent them from participating in and succeeding in STEM fields, even in the face of initiatives to promote gender equality and inclusivity. This under-representation issue is complex and pervasive in many contexts, such as the international, African and Ghanaian perspectives.

Global research demonstrates the ongoing under-representation of females in STEM professions. Only 35% of STEM students in higher education worldwide are women, according to the UNESCO Institute for Statistics (UNESCO, 2018). This gender gap restricts the pool of possible talent in STEM fields and impedes attempts to address complicated global issues with a variety of viewpoints and creative solutions.

According to World Bank (2018), the under-representation of girls in STEM fields is a serious issue in the African context. In many African nations, gender differences in educational outcomes endure despite advancements in expanding access to education. Stereotypes that deter girls from pursuing STEM careers are frequently reinforced by social and cultural norms (Mohamedbhai, 2014). Poor infrastructure, a lack of resources, and restricted access to high-quality education all play a part. to the under-representation of girls in STEM education and careers (UNESCO, 2015).

Despite efforts to promote gender equality in education, gender differences still exist in STEM fields in Ghana (Ghana Statistical Service, 2018). Girls are frequently deterred from pursuing STEM education and careers by cultural stereotypes and societal

expectations (Ampadu-Boakye et al. 2019). Girls' participation in STEM education is further hampered by a lack of resources, which includes subpar laboratory space and restricted access to technology (UNESCO, 2015).

Many initiatives have been implemented over time to address the under-representation of females in STEM fields. These actions include the launch of awareness campaigns, programs to support gender parity in education, mentorship programs, and policies designed to lessen gender prejudice in STEM education and job paths. While significant progress has been made as a result of these efforts, the issue still exists, showing the need for further investigation and targeted interventions.

The effects of measures meant to advance gender equity in STEM education have been the subject of numerous researches. Cheryan et al. (2017) conducted a study to determine the efficacy of a media intervention targeted at dispelling gender stereotypes related to computer science. The findings demonstrated that girls' interest in and identification with computer science improved when they were exposed to positive media portrayals of women in the subject. In a similar vein, Wang et al.'s (2018) study assessed how a mentorship program affected girls' persistence and sense of self in STEM. The results showed that girls' confidence and participation in STEM activities had grown dramatically as a result of the mentorship program.

The issue is the continuing under-representation of girls in STEM topics, which has negative consequences on several levels. Individually, girls are denied the opportunity to reach their full potential and follow their STEM-related interests. This limits their future employment opportunities and impedes their economic empowerment. On a larger scale, girls' under-representation in STEM reduces workforce diversity, innovation, and sustainable development. It exacerbates gender disparities and prevents societies from leveraging the entire spectrum of expertise and views required to handle

complex global challenges. Research has demonstrated the long-term consequences of girls' under-representation in STEM professions. Breda and Napp (2019) investigated the effect of gender differences in STEM on labour market outcomes. The results showed that the under-representation of women in STEM careers led to significant wage gaps and limited opportunities for career advancement. This not only affects the economic well-being of women but also hampers overall societal development.

Several reasons contribute to girls' under-representation in STEM fields. Socio-cultural norms and gender stereotypes have a considerable impact on girls' attitudes, interests, and professional goals. Archer et al. (2013) stressed the impact of gender stereotypes on girls' self-perceptions of their STEM skills. The study discovered that girls who saw STEM as a male-dominated profession were less likely to exhibit an interest in pursuing STEM careers. Educational considerations can contribute to girls' under-representation in STEM. Biased curricula, inadequate resources, and a dearth of female role models and mentors all contribute to gender inequities in STEM education. Hazari et al. (2010) looked at how teacher support and encouragement affected girls' physics involvement. The findings showed that girls who received support and encouragement from teachers were more likely to develop positive attitudes towards physics and express interest in pursuing STEM careers.

Furthermore, systemic impediments including cultural expectations and implicit prejudices impede girls' participation and performance in STEM education and jobs. Nosek et al. (2009) demonstrated the existence of hidden biases against women in STEM areas. These biases can influence decision-making processes, such as hiring and promotion, hence perpetuating gender gaps in STEM. The under-representation of girls in STEM courses is a complex issue with several underlying causes. Researchers have looked into the socio-cultural, educational, and psychological elements that contribute

to the problem. These studies looked at the impact of gender stereotypes, family and cultural influences, resource availability, and the role of role models and mentors on girls' STEM engagement.

Eccles et al. (2017), for example, investigated parents and teachers influence on girls' interest and achievement in math and science. The results showed that parental ideas and expectations about gender and STEM had a substantial impact on girls' self-perception and motivation in these areas.

Similarly, Dasgupta and Stout (2014) investigated how gender biases in STEM affected girls' sense of belonging and persistence. The findings revealed that girls who experienced gender prejudices in STEM domains were less likely to continue pursuing STEM education and professions.

However, these limitations include a dearth of extensive research that analyse the individual factors influencing girls' participation in STEM across different contexts, including the global, African, and Ghanaian perspectives. Existing data on girls' under-representation in STEM, knowledge gaps must be addressed. Furthermore, there is a need for research that assesses the efficacy of existing treatments and creates novel techniques to improve gender parity and enhance female representation in STEM fields. This study looked on the under-representation of girls in STEM disciplines in the Effutu municipality.

1.3 Purpose of the Study

The purpose of the study was to investigate factors that contribute to the under-representation of girls in STEM fields and its implications in the Effutu municipality.

1.4 Research Objectives

The following objectives guided the study;

1. To identify the socio-cultural factors that contribute to the under-representation of girls in STEM subjects in Ghana.
2. To examine the educational barriers and challenges faced by girls in accessing and succeeding in STEM education in Ghana.
3. To explore the systemic factors, including implicit biases and societal expectations, that hinder girls' participation and success in STEM subjects in Ghana.
4. To evaluate the effectiveness of existing interventions and policies aimed at promoting gender equity in STEM education in Ghana and identify areas for improvement.

1.5 Research Questions

The following research questions guided the study:

1. What are the socio-cultural factors that contribute to the under-representation of girls in STEM subjects in Ghana?
2. What are the educational barriers and challenges faced by girls in accessing and succeeding in STEM education in Ghana?
3. How do systemic factors, such as implicit biases and societal expectations, hinder girls' participation and success in STEM subjects in Ghana?
4. What is the effectiveness of existing interventions and policies aimed at promoting gender equity in STEM education in Ghana, and how can they be improved to increase girls' representation in STEM subjects?

1.6 Significance of the Study

This study has important policy and implementation implications for STEM education. Policymakers can acquire useful insights into the specific problems that girls experience by understanding the sociocultural, pedagogical, and structural elements that contribute to their under-representation in STEM courses in Ghana. The study's findings will help to shape evidence-based policies that promote gender parity, improve girls' participation in STEM, and foster a more inclusive and diverse learning environment. Policymakers would use the research findings to develop initiatives that address the identified impediments while also encouraging girls' participation and performance in STEM education.

The study's practical value stems from its ability to inform educational methods that promote a more inclusive and supportive environment for girls in STEM education. Evaluating the educational barriers and problems that girls encounter in accessing and succeeding in STEM disciplines, the study can identify areas that need to be addressed. Educators and practitioners can use the data to build methods and interventions that address the special needs of females in STEM education. The findings can help to shape curriculum changes, teacher training programs, and mentorship activities that encourage and assist girls to pursue STEM courses and jobs. In addition, the study will inform resource allocation to ensure that all children have equal chances and access to quality STEM education.

The study's theoretical significance stems from its contribution to the existing body of knowledge on the under-representation of girls in STEM. The study's examination of the socio-cultural, pedagogical, and systemic issues that impede girls' STEM participation and success can provide insights into the underlying mechanisms and processes that perpetuate gender gaps in STEM education. The study will help to

develop theoretical frameworks and models for explaining the complex interaction of factors that influence girls' STEM engagement. Furthermore, the study will offer new theoretical insights by delving into Ghana's and the African region's specific circumstances, broadening our understanding of the under-representation problem beyond Western viewpoints. The findings can stimulate further research and theory development in the field of gender and STEM education.

1.7 Delimitation of the Study

The study focuses on Ghana's Effutu Municipality. It excludes other municipalities and regions in Ghana. As a result, the study's findings and conclusions may not be applicable to regions or contexts other than the Effutu Municipality. The study's research aims and questions may not address all aspects or causes contributing to females' underrepresentation in STEM education in the Effutu Municipality. The study emphasized socio-cultural, educational, and systemic elements based on the aims and issues identified. The study used specific data gathering methods, such as questionnaires, interviews, or observations, depending on the research design and available resources. The methodologies used may be limited in their ability to capture specific nuances or complexities linked to the research issue. The report notes that external variables other than Effutu Municipality, such as national legislation, cultural influences, and economic situations, may potentially contribute to girls' underrepresentation in STEM education. However, these external influences will not be the primary focus of the study, and their impact may not be thoroughly investigated or assessed.

1.8 Limitations of the Study

The study may face several limitations that could impact the generalizability and depth of its findings. Geographically, the research is limited to Effutu Municipality therefore,

the results may not be applicable to other regions of Ghana or internally, where factors influencing girls' participation in STEM may vary.

Additionally, the sample size and demographic diversity within the municipality might be small, potentially limiting the extent to which the findings can be generalized to the broader population. Variations in socio-economic status, cultural backgrounds and educational levels could further influence the outcomes, making it difficult to capture the full range of experiences.

The study may also face constraint in terms of time, resources and focus, which could limit the depth and richness of its findings. Limited funding and time could restrict the scope of data collection and analysis, particularly if extensive field work or qualitative research is required. Focusing on specific STEM disciplines, such as engineering or computer science, may overlook other fields like biology or health sciences, where girls may have different participation dynamics. Measuring the long-term implications of girls' under-representation in STEM could be challenging without baseline data or follow-up studies which would affect the study's ability to assess the broader economic and societal impacts of gender disparities in STEM education. These limitations must be considered when interpreting the study's findings and formulating recommendations for future policies and interventions.

1.9 Organization of the Study

This study was divided into five chapters: Chapter one deals with the introduction to the study such as background to the study, statement of the problem, purpose of the study, objectives of the study, research questions, significance of the study, delimitations, limitations and organisation of the study. Chapter Two deals with the review of related literature. Chapter three consists of the research philosophy, research approach, research design, setting, population, sample and sampling techniques,

research instrument, data collection procedure, data analysis procedure, and ethical considerations. Data presentation, analysis, and discussion were done in Chapter four. Chapter five comprises of the summary, conclusions, recommendations and suggestions for further studies.



CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.0 Overview

2.1 Theoretical Framework

2.1.1 Social Cognitive Career Theory (SCCT)

Social Cognitive Career Theory (SCCT) is a prominent career development theory that explains how individuals' career choices and aspirations are shaped by the interaction of personal factors, environmental influences, and their own self-efficacy beliefs. Developed by Lent et al (1994), SCCT emphasizes the role of observational learning, outcome expectations, and self-efficacy in career decision-making.

The application of SCCT to the study on the under-representation of girls in STEM fields provides a theoretical lens to understand the multifaceted factors contributing to this gender disparity. SCCT acknowledges the reciprocal relationship between individuals and their environment, highlighting the influence of personal factors, social factors, and cognitive processes on career choices and aspirations. By adopting SCCT, the study aims to examine how gender stereotypes, cultural influences, and educational barriers affect girls' self-efficacy beliefs and their decisions to pursue STEM education and careers. Betz and Hackett (1981) conducted a seminal study that supported the role of self-efficacy in career decision-making. They found that self-efficacy beliefs strongly predicted individuals' career interests and choices. In the context of STEM, girls with higher self-efficacy in math and science were more likely to express interest in pursuing STEM careers. Cheryan et al. (2017) conducted a study examining the impact of stereotypes and role models on girls' interest in computer science. They found that exposure to a computer science classroom decorated with stereotypically masculine

objects decreased girls' interest in the subject. However, when the classroom was redesigned to be more gender-neutral, girls' interest levels increased.

Eccles et al. (2006) conducted a longitudinal study examining the impact of family influences on girls' career choices. They found that parental beliefs, expectations, and support were significant predictors of girls' engagement and persistence in math and science. Positive family influences, including parental encouragement and involvement, were associated with greater likelihood of girls pursuing STEM careers. Stout et al. (2011) conducted a study exploring the impact of environmental cues on women's interest in engineering. They found that gender-neutral job advertisements resulted in more women expressing interest in engineering compared to those exposed to gender-stereotyped advertisements. The study highlighted the importance of creating inclusive environments to attract and retain women in STEM fields.

2.2 Concept of Under-Representation of Girls in STEM Subjects

2.2.1 Gender Stereotypes and Bias in Education

Education plays a crucial role in shaping individuals' future opportunities and career paths. However, gender stereotypes and bias persistently affect girls' educational experiences, particularly in STEM subjects. Research has shown that girls tend to face various challenges and barriers in pursuing STEM education, which can be attributed to societal expectations, cultural norms, and media representations (Archer et al., 2013; Nosek et al., 2009). This section provides an overview of the issue and outlines the objectives of the paper.

Societal expectations often reinforce traditional gender roles and stereotypes, which can lead to girls' self-perception being influenced by these stereotypes. Girls may internalize the belief that they are less capable or interested in STEM subjects compared

to their male counterparts (Eccles, 2007). This self-perception can have a significant impact on their confidence and motivation to pursue STEM education.

Cultural norms, such as the perception of STEM as a male-dominated field, can create barriers for girls in pursuing STEM education. These norms contribute to the under-representation of girls in STEM-related activities and perpetuate the notion that STEM is not suitable for girls (Wang et al, 2013). Consequently, girls may feel discouraged from exploring STEM subjects and choosing STEM-related careers. Media representations play a significant role in shaping societal perceptions and can reinforce gender biases. The portrayal of scientists, engineers, and mathematicians as predominantly male in media can reinforce the stereotype that STEM fields are more suitable for boys, further discouraging girls' interest and engagement in these subjects (Cvencek et al., 2011). This gender bias in media representation can contribute to girls' limited exposure to positive STEM role models. Gender stereotypes can create a phenomenon called stereotype threat, where individuals feel anxious about confirming negative stereotypes associated with their gender. In STEM subjects, this threat can negatively impact girls' academic performance and deter them from pursuing further studies in these fields (Spencer et al., 1999). The fear of confirming stereotypes can undermine girls' confidence and hinder their motivation to excel in STEM subjects. Teachers' attitudes and biases can significantly influence girls' interests and choices in STEM subjects. Research has shown that teachers tend to provide more attention and support to boys in STEM-related activities, inadvertently perpetuating gender bias and affecting girls' confidence and engagement in these subjects (Rieggle-Crumb et al., 2012). The classroom environment plays a critical role in shaping girls' perceptions of their abilities and potential in STEM. The scarcity of female role models in STEM fields can limit girls' aspirations and hinder their motivation to pursue STEM careers. The

absence of relatable role models may make it challenging for girls to envision themselves excelling in these fields (Stout et al., 2011). Having access to diverse STEM role models can inspire and motivate girls to overcome barriers and pursue their interests in STEM. Implicit bias, which refers to the unconscious biases individuals hold, can affect teachers' expectations and evaluations of girls' performance in STEM. These biases can create a hostile learning environment and reinforce stereotype threat, leading to decreased motivation and engagement among girls (Moss-Racusin et al., 2012). Addressing implicit biases is crucial in creating an inclusive and supportive learning environment for all students.

Introducing STEM education at an early age and providing equal opportunities for girls to explore and engage in these subjects can help break gender stereotypes and foster girls' interest and confidence in STEM fields (Robinson & Lubienski, 2011). Early exposure can help girls develop positive attitudes towards STEM and increase their likelihood of pursuing further studies in these fields.

Developing a curriculum that includes diverse perspectives and represents the contributions of women in STEM can challenge gender stereotypes and provide girls with role models to aspire to (Archer et al., 2019). Incorporating examples and stories of women scientists, engineers, and mathematicians can help girls see themselves as capable and successful in STEM fields.

Providing professional development and training for teachers can help raise awareness of implicit biases and equip them with strategies to create an inclusive and supportive classroom environment for all students (Beilock et al., 2012). Training programs should focus on promoting gender equity, challenging stereotypes, and providing equal opportunities for girls to participate and excel in STEM education.

Collaboration between educational institutions, industry, and organizations focused on promoting gender equality in STEM can provide mentorship opportunities, scholarships, and resources to support girls' participation and success in STEM education (National Academies of Sciences, Engineering, and Medicine, 2018). Such collaborations can help bridge the gap between education and industry and provide girls with real-world experiences and role models in STEM careers.

Gender stereotypes and bias continue to shape girls' educational experiences and choices in STEM subjects. By understanding the impact of societal expectations, cultural norms, and media representations, we can work towards promoting gender equity in STEM education. Implementing interventions such as early exposure, inclusive curriculum, teacher training, and collaboration with industry can help create a more inclusive and supportive learning environment, empowering girls to pursue their interests and excel in STEM fields.

National Academies of Sciences, Engineering, and Medicine. (2018). Sexual harassment of women: Climate, culture, and consequences in academic sciences, engineering, and medicine. The National Academies Press.

2.2.2 Cultural Influences and Beliefs

The under-representation of girls in STEM fields is influenced by a complex interplay of cultural factors. Cultural beliefs, traditions, and community values significantly shape girls' attitudes, aspirations, and access to STEM education. This section provides an overview of the paper, highlighting the importance of considering cultural influences in addressing gender disparities in STEM fields.

Cultural stereotypes regarding gender roles play a substantial role in shaping girls' perceptions of their abilities and interests in STEM. In many cultures, traditional gender norms assign domestic and caregiving roles to women, while associating STEM fields

with masculinity. These stereotypes can deter girls from pursuing STEM education and careers (Archer et al., 2013).

Parents' beliefs and expectations regarding gender roles and career choices can significantly influence girls' engagement in STEM. Cultural values and expectations may lead parents to encourage their daughters to pursue fields traditionally associated with femininity, rather than STEM. Limited parental support and guidance in STEM-related activities can hinder girls' interest and confidence in these fields (Wang et al., 2013).

Communities and social networks play a crucial role in shaping girls' attitudes and aspirations in STEM. Cultural values and social norms within communities can reinforce gender stereotypes and discourage girls from pursuing STEM education. Peer pressure and societal expectations may lead girls to conform to traditional gender roles and discourage their participation in STEM-related activities (Hachfeld et al., 2019). In many cultural contexts, girls face significant barriers in accessing educational resources necessary for pursuing STEM education. Limited availability of quality education, lack of funding for STEM programs, and inadequate infrastructure in schools can disproportionately affect girls' access to STEM-related opportunities (UNESCO, 2017).

Cultural beliefs and values regarding intelligence and achievement can impact girls' self-perception and aspirations in STEM. Some cultures may associate specific types of intelligence with gender, considering certain fields more suitable for either males or females. These perceptions can affect girls' confidence and motivation to pursue STEM education (Dweck, 2008).

Cultural traditions and practices can create unique challenges for girls' engagement in STEM education. For instance, in some cultures, early marriage or expectations of

familial responsibilities at a young age may limit girls' opportunities to pursue higher education, including STEM fields. Balancing cultural expectations and educational aspirations becomes a critical issue for girls in such contexts (Malhotra et al., 2019).

Developing culturally relevant STEM education programs is essential for promoting gender equity. Adapting curricula to reflect local cultures and traditions can enhance girls' interest and engagement in STEM. Incorporating examples and case studies that highlight the contributions of women from diverse cultural backgrounds can empower girls and challenge stereotypes (Hazari et al., 2010). Collaboration with communities and community leaders is crucial for addressing cultural barriers. Engaging community members in discussions and awareness campaigns can help challenge gender biases and stereotypes. Creating opportunities for dialogue and showcasing successful women in STEM from within the community can inspire and motivate girls to pursue STEM education (Vossoughi et al., 2014).

Access to role models and mentors from similar cultural backgrounds can be instrumental in inspiring and supporting girls in STEM. Establishing mentorship programs and networks that connect girls with successful women in STEM can provide guidance, encouragement, and a sense of belonging. Mentors who share similar cultural experiences can help navigate cultural challenges and provide valuable support (National Science Foundation, 2011). Collaboration between educational institutions and cultural organizations can promote gender equity in STEM education. Partnering with cultural institutions, such as museums or community centers, can provide girls with hands-on experiences, exposure to STEM careers, and opportunities to interact with culturally diverse STEM professionals. Such collaborations can bridge the gap between cultural heritage and STEM education and foster a more inclusive and diverse learning environment (Archer et al., 2014). Cultural influences and beliefs significantly

shape girls' attitudes, aspirations, and access to STEM education. Cultural stereotypes, parental expectations, community influence, and cultural traditions can create barriers for girls in pursuing STEM fields. However, by recognizing and addressing these cultural influences, it is possible to promote gender equity in STEM education. Culturally relevant STEM education, community engagement, mentorship programs, and collaborations with cultural institutions are effective strategies to overcome these barriers and empower girls to pursue STEM. By creating inclusive and supportive environments, we can foster the next generation of diverse STEM leaders.

2.2.3 Parental and Family Influences

The involvement of parents and families plays a crucial role in shaping girls' attitudes, aspirations, and engagement in STEM fields. This section provides an overview of the paper, emphasizing the significance of parental and family influences in promoting gender equity in STEM education.

Parents' beliefs and expectations regarding gender roles and abilities can significantly influence girls' interest in STEM. Traditional gender stereotypes that associate STEM with masculinity and reinforce femininity in other domains may discourage girls from pursuing STEM education (Eccles, 2007).

Parents' educational backgrounds and aspirations can impact girls' interest in STEM fields. Parents who have a STEM background or value STEM education are more likely to encourage their daughters to pursue STEM-related activities and careers. Conversely, parents with limited exposure to STEM fields may inadvertently contribute to the under-representation of girls in STEM (Hill et al., 2010).

Emotional support and encouragement from parents are vital factors in fostering girls' interest and confidence in STEM. Parental encouragement, praise, and positive feedback can enhance girls' self-efficacy and motivation to pursue STEM education

(Wigfield et al., 2015). Access to educational resources and opportunities is crucial for girls' engagement in STEM. Parents who provide access to books, toys, and activities related to STEM can spark girls' interest and curiosity in these fields. Additionally, parents who actively seek out STEM-related programs and extracurricular activities for their daughters contribute to their exposure and engagement in STEM (Brotman & Moore, 2008).

Parent-child interactions and communication patterns significantly influence girls' interest and participation in STEM. Engaging in conversations about science and technology, discussing STEM-related topics, and answering girls' questions can foster a positive attitude towards STEM within the family context (Maltese & Tai, 2011).

Siblings and peers within the family environment can shape girls' attitudes and choices regarding STEM. Positive sibling relationships and exposure to older siblings or relatives interested in STEM can serve as role models and influence girls' aspirations. Conversely, negative sibling or peer attitudes towards STEM can discourage girls from pursuing these fields (Bleeker & Jacobs, 2004).

Educating parents about the importance of STEM education and dispelling myths and stereotypes can encourage their support for girls' participation in STEM. Providing information on the benefits of STEM careers, showcasing successful women in STEM, and organizing parent workshops can help parents understand the value of STEM education and actively support their daughters' interests (Miller et al., 2018).

Creating opportunities for parents to engage in STEM activities alongside their daughters can foster shared experiences and strengthen family support. Organizing family STEM nights, workshops, or science fairs can facilitate parental involvement and provide a platform for parents to actively participate in their daughters' STEM learning (Lynch et al., 2017).

Schools can play a vital role in promoting parental involvement and support for girls' engagement in STEM. Establishing effective communication channels, hosting parent-teacher conferences focused on STEM, and providing resources and guidance for parents to support their daughters' STEM interests can create a collaborative environment between schools and families (Catsambis, 1995).

Parental beliefs, expectations, support, and family dynamics significantly influence girls' interest and participation in STEM education. Recognizing the importance of parental and family influences is crucial for promoting gender equity in STEM fields. By addressing gendered stereotypes, providing educational resources, fostering positive family dynamics, and promoting parental involvement, we can create an environment that empowers girls to pursue and excel in STEM. Collaboration between schools, families, and communities is essential for creating supportive ecosystems that nurture girls' STEM aspirations.

2.2.4 Teacher-student Interactions and Classroom Dynamics

Research suggests that unconscious biases and differential treatment based on gender can influence teacher-student interactions in STEM classrooms. Studies have shown that teachers tend to provide more attention, encouragement, and support to male students, which can negatively affect girls' confidence and participation (Sadler et al., 2012).

The type and quality of feedback provided by teachers play a crucial role in shaping girls' engagement in STEM. Teachers who offer constructive feedback, use inclusive language, and provide encouragement can enhance girls' self-efficacy and motivation to actively participate in STEM subjects (Good et al., 2012).

Creating an inclusive learning environment is essential for promoting girls' engagement in STEM. A classroom climate that values diversity, fosters positive relationships, and

encourages collaboration can enhance girls' sense of belonging and motivation to pursue STEM subjects (National Research Council, 2012).

Peer interactions and collaborative learning opportunities significantly influence girls' engagement and learning outcomes in STEM. Activities such as cooperative problem-solving, group projects, and peer mentoring can promote girls' confidence, teamwork skills, and interest in STEM (Hidi & Renninger, 2006).

Incorporating active learning strategies and hands-on experiences in STEM instruction can enhance girls' engagement and understanding of STEM concepts. Inquiry-based learning, practical experiments, and project-based learning provide girls with tangible experiences that foster their curiosity and problem-solving skills (Kang et al., 2019).

The presence of female role models and representation of women in STEM fields can positively impact girls' motivation and aspirations. Introducing diverse STEM role models through guest speakers, classroom materials, and discussions challenges gender stereotypes and inspires girls to envision themselves pursuing STEM careers (Archer et al., 2013).

Providing teacher professional development programs that address gender biases and promote inclusive teaching practices is crucial. Training teachers to recognize and challenge their biases, adopt gender-responsive instructional strategies, and create equitable learning environments can contribute to girls' success in STEM (Bryan & Simmons, 2016).

Evaluating curriculum and instructional materials for gender biases and stereotypes is essential for promoting girls' engagement in STEM. Ensuring that textbooks, resources, and examples represent diverse genders and cultures can help counteract biases and provide inclusive learning experiences for all students (Scantlebury et al., 2019). Teacher-student interactions, classroom climate, and pedagogical approaches

significantly influence girls' confidence, participation, and performance in STEM. Recognizing and addressing gender biases in teaching practices, fostering an inclusive learning environment, and promoting active learning and representation can create supportive and empowering classroom dynamics. By adopting gender-responsive teaching practices, educators can inspire and nurture girls' interest and success in STEM fields.

Designing an inclusive STEM curriculum involves incorporating diverse perspectives, examples, and contexts that resonate with all students, including girls. By highlighting the contributions of women scientists and integrating real-world applications, the curriculum can challenge gender stereotypes and enhance girls' interest and engagement in STEM (Brotman & Moore, 2008).

Promoting interdisciplinary approaches in curriculum design can foster connections between STEM subjects and real-world problem-solving. By emphasizing the collaborative nature of STEM fields and integrating disciplines such as arts, social sciences, and humanities, girls can see the relevance and applicability of STEM in various contexts (Honey et al., 2014).

Textbooks play a significant role in shaping students' perceptions and attitudes toward STEM. Incorporating gender-neutral language and examples that represent diverse genders and cultures can counteract biases and stereotypes, making STEM content more relatable and accessible for all students, including girls (Halpern et al., 2012).

Ensuring the representation of women in STEM fields within textbooks can provide girls with role models and inspire them to pursue STEM careers. Including profiles of female scientists, engineers, and mathematicians can challenge gender norms and broaden girls' career aspirations in STEM (Metz, 2019).

Using diverse assessment strategies that accommodate different learning styles can promote inclusivity in STEM. Employing performance-based assessments, collaborative projects, and alternative forms of evaluation such as portfolios and presentations can provide girls with opportunities to demonstrate their knowledge and skills beyond traditional exams (Sirin, 2012).

Teacher training programs should incorporate gender-responsive pedagogies that equip educators with the knowledge and skills to address gender disparities in STEM education. Providing training on recognizing and challenging implicit biases, implementing inclusive teaching strategies, and creating a gender-equitable classroom environment can enhance teachers' ability to support girls' engagement and success in STEM (Eddy et al., 2014).

Offering mentoring and networking opportunities for teachers can facilitate knowledge sharing and collaboration in implementing gender-responsive practices. Establishing support networks, connecting teachers with STEM professionals, and providing ongoing professional development can empower educators to create inclusive learning environments that benefit all students (Blickenstaff, 2005).

Educational policies and practices play a crucial role in perpetuating or addressing gender disparities in STEM education. By implementing inclusive curriculum design, updating textbook content, diversifying assessment methods, and providing gender-responsive teacher training programs, educational institutions can promote inclusivity, diversity, and equitable opportunities for girls in STEM. Creating an environment that values and supports girls' participation and achievement in STEM fields is essential for achieving gender equity in STEM education.

2.2.5 Stereotype Threat and Implicit Bias

Gender disparities persist in STEM fields, with girls often underrepresented. Stereotype threat and implicit bias are two significant factors that contribute to these disparities. Understanding the influence of these phenomena is crucial for developing effective strategies to support girls' engagement and success in STEM.

It specifically investigates how the fear of confirming negative stereotypes affects girls' self-perception, confidence, and aspirations. Additionally, it examines the influence of implicit biases held by educators and mentors on girls' experiences and outcomes in STEM education.

Stereotype threat refers to the risk of confirming negative stereotypes associated with one's social group, leading to anxiety and diminished performance. In the context of STEM, girls may experience stereotype threat when they believe that their gender puts them at a disadvantage in math or science. This can negatively impact their self-confidence, motivation, and academic performance (Steele & Aronson, 1995).

Stereotype threat can influence girls' self-perception, leading them to question their abilities and competence in STEM subjects. This self-doubt can undermine their confidence, making them less likely to pursue advanced STEM coursework or careers. Creating an environment that mitigates stereotype threat is essential for empowering girls and fostering their belief in their own capabilities (Shapiro & Williams, 2012).

The fear of confirming negative stereotypes can also impact girls' career aspirations in STEM. Stereotype threat can contribute to a lack of identification with STEM fields, limiting girls' exposure to STEM role models and reducing their aspirations for STEM careers. Addressing stereotype threat is crucial for broadening girls' career options and promoting gender equity in STEM professions (Cheryan et al., 2017).

Implicit bias refers to unconscious attitudes or stereotypes that individuals hold, which can influence their judgments and behaviors. Educators and mentors may unknowingly hold implicit biases that affect their interactions with students, including girls in STEM. These biases can shape their expectations, feedback, and opportunities provided to students, thereby influencing girls' experiences and outcomes in STEM education (Moss-Racusin et al., 2012).

Implicit biases held by educators can result in differential treatment of students based on gender, perpetuating gender disparities in STEM. Biased perceptions of girls' abilities can lead to lower expectations, reduced opportunities for participation, and biased feedback, all of which can hinder girls' progress and engagement in STEM subjects (Burgess et al., 2020).

Mentors and role models play a crucial role in supporting girls' interest and persistence in STEM. However, implicit biases held by mentors can inadvertently undermine their support and guidance. Recognizing and addressing implicit biases is essential for mentors to provide equitable and inclusive mentoring experiences that promote girls' confidence and success in STEM (Dasgupta & Stout, 2014).

Developing an inclusive classroom environment involves promoting a growth mindset, emphasizing effort over innate ability, and fostering a supportive and inclusive culture. Teachers can implement strategies such as providing explicit instruction on stereotype threat, diversifying classroom materials, and encouraging cooperative learning to counteract the negative impact of stereotype threat and implicit bias (Canning et al., 2018).

Providing implicit bias training for educators and mentors can raise awareness of unconscious biases and their potential impact on students. Training programs can offer strategies for recognizing and mitigating biases in teaching and mentoring practices. By

addressing implicit biases, educators and mentors can create an inclusive and equitable learning environment that supports the success of all students, particularly girls in STEM (Devine et al., 2012).

Stereotype threat and implicit bias significantly influence girls' performance and persistence in STEM. The fear of confirming negative stereotypes and the impact of implicit biases held by educators and mentors can hinder girls' self-perception, confidence, aspirations, and experiences in STEM. To promote gender equity and inclusive STEM education, it is crucial to address these factors.

Creating an inclusive classroom environment that promotes a growth mindset and counters stereotype threat is essential. Strategies such as providing explicit instruction on stereotype threat, diversifying classroom materials, and encouraging cooperative learning can mitigate the negative effects of stereotype threat and implicit bias. Additionally, providing implicit bias training for educators and mentors can raise awareness and equip them with strategies to recognize and address their biases.

By addressing stereotype threat and implicit bias, we can foster an environment that empowers girls, enhances their self-confidence, and encourages their pursuit of STEM subjects and careers. Efforts to create inclusive and equitable STEM education will contribute to a more diverse and innovative workforce in the future.

2.2.6 Role Models and Representation

Highlighting historical female STEM role models, such as Marie Curie and Ada Lovelace, can provide inspiration and demonstrate that women have made significant contributions to STEM throughout history. Learning about their achievements can increase girls' awareness of the possibilities within STEM and challenge the notion that these fields are exclusively male-dominated (Gonsalves et al., 2019).

The visibility of contemporary female STEM role models is crucial for inspiring girls and providing relatable figures. Women in prominent STEM positions, such as astronauts, engineers, and computer scientists, can serve as powerful role models who showcase diverse pathways and achievements in STEM. Exposure to these role models can enhance girls' self-efficacy and belief in their ability to succeed in STEM careers (Lockwood, 2006).

Female STEM role models can challenge stereotypes and broaden girls' perceptions of what is possible in STEM fields. By showcasing successful women in STEM, role models help dismantle the notion that STEM is a male domain and inspire girls to envision themselves in similar roles. Exposure to role models positively influences girls' career aspirations, making them more likely to consider and pursue STEM pathways (Denissen et al., 2020).

Role models provide tangible evidence that women can excel in STEM, boosting girls' self-efficacy and confidence in their own abilities. Seeing women who have overcome challenges and achieved success in STEM fields can instill a sense of belief and resilience in girls, reinforcing the idea that they too can succeed in these domains (Stout et al., 2011).

Diverse representation in STEM is essential for challenging stereotypes and biases associated with gender, race, and ethnicity. By showcasing individuals from diverse backgrounds, including women of color and underrepresented groups, representation in STEM can break down barriers and inspire girls who may feel excluded or marginalized. Diverse representation fosters a sense of belonging and demonstrates that STEM is a field for everyone (Diekmann et al., 2017).

Representation plays a critical role in broadening girls' perceptions of STEM possibilities. When girls see individuals who share their backgrounds or interests

succeeding in STEM, it expands their understanding of the field and encourages them to explore STEM-related subjects and careers. Diverse representation provides a range of role models for girls to relate to, increasing their motivation and interest in STEM (Cheryan et al., 2015).

Efforts should be made to increase the visibility and accessibility of female STEM role models. This can be achieved through targeted outreach programs, mentorship initiatives, and media campaigns that highlight the achievements of women in STEM. Providing opportunities for girls to interact with role models and engage in STEM-related activities can inspire and encourage their pursuit of STEM pathways (Beede et al., 2011).

To ensure diverse representation, it is essential to highlight women from various ethnic, racial, and cultural backgrounds in STEM fields. By promoting inclusive representation, educators, policymakers, and media outlets can work together to challenge stereotypes and create a more inclusive and equitable STEM environment. Emphasizing the achievements and contributions of diverse role models provides a more accurate and comprehensive representation of the STEM community (National Academies of Sciences, Engineering, and Medicine, 2018).

The study highlighted the importance of role models and representation in inspiring and empowering girls to pursue STEM fields. Female STEM role models, both historical and contemporary, play a crucial role in shaping girls' career aspirations and self-efficacy. By challenging stereotypes and broadening perceptions of STEM possibilities, role models can encourage girls to envision themselves in STEM careers. Moreover, diverse representation in STEM fields is essential for breaking down barriers, challenging biases, and fostering a sense of belonging for girls from all backgrounds.

To promote role models and representation effectively, it is necessary to cultivate visibility and access to female STEM role models through targeted outreach programs, mentorship initiatives, and media campaigns. Additionally, fostering inclusive representation by highlighting women from diverse ethnic, racial, and cultural backgrounds is crucial for creating a more equitable and diverse STEM community.

By prioritizing the availability and visibility of female STEM role models and promoting diverse representation, we can inspire and empower girls to pursue STEM careers, ultimately bridging the gender gap and fostering a more inclusive and innovative society.

2.2.7 Access to Resources and Opportunities

The availability of STEM-related extracurricular activities, such as robotics clubs, coding workshops, and science fairs, significantly impacts girls' engagement in STEM. Disparities in access to these activities can contribute to the under-representation of girls in STEM fields. Efforts should be made to provide equal opportunities for girls to participate in these activities, fostering their interest and skill development (Archer et al., 2012).

STEM-related extracurricular activities often provide opportunities for girls to interact with role models and mentors who can inspire and guide them in their STEM pursuits. Ensuring diverse representation among these role models and mentors is crucial for addressing the under-representation of girls from different backgrounds in STEM. Mentorship programs can help bridge the gap and provide valuable support and guidance to girls (Adedinsewo et al., 2019).

Enrichment programs, such as summer camps, internships, and research opportunities, can significantly enhance girls' exposure to STEM and provide hands-on experiences. However, disparities in access to these programs based on socioeconomic factors can

limit girls' participation. Efforts should be made to increase the availability and accessibility of such programs, particularly for girls from underrepresented backgrounds (Miller et al., 2018).

Early exposure to enrichment programs is crucial for nurturing girls' interest and confidence in STEM. By providing opportunities for girls to explore STEM fields at a young age, these programs can help overcome gender biases and stereotypes. Initiatives should focus on reaching girls from diverse socioeconomic backgrounds to ensure equal access to early STEM experiences (Hill et al., 2010).

Establishing mentorship networks is essential for providing girls with guidance, support, and role models in their STEM journeys. Mentors can offer insights into career pathways, provide encouragement, and assist in navigating the challenges associated with pursuing STEM education and careers. Efforts should be made to create mentorship programs that connect girls with professionals in STEM fields (Estrada et al., 2018).

Socioeconomic factors can significantly impact girls' access to mentorship networks and support systems in STEM. Disparities in access to networks and resources can perpetuate inequality in STEM education and career opportunities. Initiatives should focus on providing mentorship opportunities and support systems to girls from economically disadvantaged backgrounds, ensuring equal access to guidance and resources (National Science Board, 2020). Access to technology and digital resources is essential for girls' engagement in STEM. Disparities in access to technology, particularly in low-income communities, can limit girls' exposure to STEM learning opportunities. Addressing the digital divide through initiatives like providing internet access, technology resources, and computer literacy programs can promote equal access to STEM education (Beaunoyer et al., 2020).

Access to well-equipped laboratories and resources is crucial for hands-on learning experiences in STEM. Disparities in access to these facilities can hinder girls' ability to engage in practical STEM activities and experiments. Efforts should be made to ensure equitable distribution of laboratory resources, particularly in underserved schools and communities, to provide equal opportunities for all students (Hurt et. al., 2019).

Promoting equal access to educational resources and opportunities is vital for addressing the disparities that hinder girls' engagement in STEM. By ensuring the availability of STEM-related extracurricular activities, enrichment programs, mentorship networks, and access to technology and laboratories, we can foster girls' interest, confidence, and success in STEM fields. Additionally, addressing socioeconomic factors that contribute to these disparities is crucial for creating inclusive environments that support girls from diverse backgrounds. Efforts from educators, policymakers, and stakeholders are necessary to expand access to resources and opportunities, ultimately promoting gender equality in STEM education and careers.

2.2.8 Career Aspirations and Occupational Stereotypes

Occupational stereotypes can create a biased perception of STEM fields as being more suitable for boys or men. These stereotypes can influence girls' beliefs about their own abilities and limit their confidence in pursuing STEM careers. Efforts should be made to challenge these stereotypes and promote the idea that STEM is accessible and rewarding for all genders (Hill et al., 2010).

Limited exposure to diverse STEM careers can hinder girls' understanding of the breadth of opportunities available to them. When girls are primarily exposed to stereotypical portrayals of STEM professionals, it can narrow their career aspirations.

Encouraging exposure to a wide range of STEM role models and diverse career paths is crucial for broadening girls' perspectives (Archer et al., 2013).

Early career guidance can shape girls' career aspirations and provide them with information about different STEM fields. Schools, parents, and career counsellors should provide comprehensive and unbiased guidance, highlighting the potential of STEM careers and addressing any misconceptions or biases. Early intervention can help girls make informed decisions about their educational paths (Hidi & Renninger, 2006). Mentoring and exposure to STEM role models have a significant impact on girls' career aspirations. Mentors can provide guidance, support, and encouragement, while role models can inspire girls by showcasing successful women in STEM. Initiatives should focus on fostering mentorship programs and providing opportunities for girls to interact with diverse STEM role models (Estrada et al., 2018).

Providing engaging and interactive classroom experiences that highlight the real-world applications of STEM subjects can broaden girls' exposure to STEM careers. Incorporating hands-on activities, guest speakers, and real-world projects can help girls see the relevance and excitement of STEM fields, breaking down stereotypes and sparking interest.

Collaborations with industry partners and community organizations can expose girls to diverse STEM careers through internships, workshops, and site visits. These experiences provide girls with first hand exposure to professionals in STEM fields, showcasing the range of career possibilities available to them. Building strong partnerships between schools and STEM industries is essential for expanding girls' career horizons (Burgstahler, 2015).

Career aspirations and occupational stereotypes significantly influence girls' decisions to pursue STEM fields. By addressing occupational stereotypes and providing diverse

role models, we can empower girls to consider and pursue STEM careers. Comprehensive career guidance, exposure to diverse STEM careers, and interactions with mentors and role models are crucial for broadening girls' horizons and challenging gender biases. Efforts from educators, policymakers, and stakeholders are necessary to promote gender equality and create inclusive environments that support girls in their pursuit of STEM careers.

2.2.9 Mentoring and Support Networks

Mentoring relationships provide girls with guidance, support, and encouragement from experienced professionals in STEM fields. Mentors serve as role models, helping girls develop a sense of belonging, self-efficacy, and a positive STEM identity. Mentoring programs have been shown to enhance girls' academic performance, increase their career aspirations, and improve their overall well-being (Johnson, 2012; Karcher, 2008).

Effective mentorship programs incorporate structured activities, regular communication, and goal setting to maximize the impact on girls' development. Mentors can provide guidance on educational pathways, career choices, and skill development. Additionally, mentoring programs that focus on building girls' self-esteem, resilience, and problem-solving skills are particularly effective in supporting their success in STEM (Herrera et al., 2018).

Peer support groups create a sense of community and belonging among girls in STEM. These groups offer opportunities for collaboration, knowledge sharing, and mutual encouragement. Girls can discuss common challenges, exchange ideas, and provide emotional support to one another, fostering a supportive and inclusive environment (Chemers et al., 2011; Wang & Degol, 2017).

Effective peer support programs in STEM provide structured activities, promote inclusivity, and encourage active participation. These programs should focus on building communication skills, teamwork, and problem-solving abilities. By fostering positive relationships and collaboration, peer support groups contribute to girls' self-confidence, motivation, and perseverance in STEM (Koul et al., 2019).

Community engagement initiatives bring STEM professionals and role models into the lives of girls, inspiring and providing valuable insights into STEM careers. Through workshops, panel discussions, and career fairs, girls can interact with professionals who share their experiences, challenges, and successes in STEM, expanding their career aspirations and networking opportunities (Johnson & Meagher, 2017).

Collaborations between schools, universities, and industry partners offer girls access to internships, mentorship programs, and hands-on experiences in STEM fields. These collaborative efforts expose girls to real-world applications of STEM, helping them connect classroom learning to practical career opportunities. By bridging the gap between education and industry, community engagement initiatives enhance girls' confidence and motivation in pursuing STEM (Brotman & Moore, 2008).

Mentoring programs and support networks should actively address implicit bias and stereotypes prevalent in STEM fields. By promoting inclusivity, diversity, and equal opportunities, these initiatives challenge stereotypes and create an environment that supports girls from diverse backgrounds, ensuring their success in STEM (Dennehy & Dasgupta, 2017).

Effective mentoring programs and support networks should consider the intersectional experiences of girls, recognizing the additional challenges faced by girls from marginalized communities. By embracing diversity and promoting equity, these

initiatives can ensure that all girls have equal access to resources, opportunities, and support in pursuing STEM (Maltese et al., 2018).

Mentoring programs and support networks play a vital role in empowering girls in STEM fields. By establishing effective mentorship relationships, peer support groups, and community engagement initiatives, girls can develop self-confidence and resilience, access opportunities, and overcome challenges in STEM education and careers. Mentoring programs provide guidance and support from experienced professionals, while peer support groups foster a sense of community and collaboration. Community engagement initiatives bring STEM professionals and role models into girls' lives, inspiring and providing valuable insights into STEM careers. Overcoming implicit bias and promoting inclusivity are essential for creating an environment that supports girls from diverse backgrounds. By prioritizing intersectionality and diversity, mentoring programs and support networks can bridge the gender gap in STEM and empower girls to thrive in these fields.

2.2.10 STEM Curriculum and Pedagogy

Inclusive STEM curriculum and pedagogy take into account diverse learning styles, recognizing that individuals have unique ways of processing information and engaging with content. Incorporating various instructional strategies such as visual, auditory, and kinesthetic approaches allows girls to access and comprehend STEM concepts in ways that align with their learning preferences (Honey & Hilton, 2011).

STEM curriculum should incorporate a range of topics and activities that cater to diverse interests and abilities. Offering a variety of STEM disciplines, projects, and challenges allows girls to explore topics that align with their passions and strengths, fostering a sense of ownership and engagement (Lindberg et al., 2020). Differentiating

instruction to accommodate varying abilities ensures that all girls can actively participate and succeed in STEM learning.

Integrating real-world applications into STEM curriculum helps girls understand the practical implications of scientific concepts and technological advancements. By connecting classroom learning to real-world contexts and issues, girls can see the relevance and impact of STEM in their lives and communities (Sanders, 2009). This approach enhances motivation and promotes a deeper understanding of STEM disciplines.

Real-world applications provide opportunities for girls to develop problem-solving and critical thinking skills. By engaging in authentic, context-rich challenges, girls can apply their knowledge and skills to address complex problems, fostering creativity, innovation, and analytical thinking (Hmelo-Silver et al., 2007). The integration of real-world applications in STEM curriculum encourages girls to become active participants and contributors in solving real-world issues.

Hands-on activities and experiential learning enable girls to actively engage with STEM content and concepts. Through laboratory experiments, field trips, and project-based learning, girls can explore, manipulate, and observe phenomena firsthand, deepening their understanding and fostering a sense of curiosity (Bell et al., 2009). This approach promotes a learner-centered environment, where girls are actively involved in constructing their knowledge.

Hands-on activities in STEM provide opportunities for girls to engage in collaborative learning experiences. Working in teams, girls can exchange ideas, share perspectives, and solve problems together. Collaborative learning enhances girls' communication skills, teamwork, and social interaction, fostering a sense of belonging and promoting a positive learning environment (Johnson et al., 2014).

Cooperative learning structures, such as group projects and peer teaching, encourage girls to work together towards a common goal. These approaches promote active participation, shared responsibility, and mutual support. Girls can learn from and teach each other, creating a collaborative learning community that fosters a sense of belonging and builds self-confidence (Slavin, 2014).

Incorporating mentoring and role modeling into STEM curriculum and pedagogy allows girls to interact with STEM professionals, inspiring them and providing guidance. Mentors and role models offer support, encouragement, and insight into STEM careers, nurturing girls' aspirations and fostering a sense of belonging in STEM (Argian, 2013). This approach helps girls develop a positive STEM identity and envision themselves as capable and successful in STEM fields.

Promoting girls' interest and success in STEM education requires the design and delivery of inclusive and engaging curriculum and pedagogy. By addressing diverse learning styles, interests, and abilities, educators can create a supportive learning environment that fosters girls' motivation and sense of belonging in STEM. The integration of real-world applications, hands-on activities, and collaborative learning approaches enhances girls' engagement and achievement in STEM. It is essential for educators to be mindful of the importance of inclusivity and to implement effective strategies that promote girls' interest and success in STEM fields.

2.2.11 Psychological Factors and Motivation

A growth mindset refers to the belief that intelligence and abilities can be developed through effort, practice, and perseverance. Girls with a growth mindset are more likely to view challenges as opportunities for growth, embrace failures as learning experiences, and persist in the face of obstacles (Dweck, 2006). Fostering a growth

mindset in STEM education can enhance girls' motivation and self-efficacy, promoting a willingness to take on challenging STEM tasks.

Stereotype threat occurs when individuals are aware of negative stereotypes associated with their social group, leading to anxiety and underperformance in situations that are relevant to those stereotypes. Girls in STEM fields may experience stereotype threat due to pervasive gender stereotypes suggesting that girls are less capable in math and science. Mitigating stereotype threat through supportive and inclusive environments can help girls overcome performance anxiety and enhance their motivation and achievement in STEM (Steele, 1997).

Perceived competence refers to individuals' beliefs about their own abilities and skills in a specific domain. Girls' perceived competence in STEM is influenced by various factors, including prior experiences, feedback, and social comparisons. When girls perceive themselves as competent in STEM, they are more likely to engage in STEM activities, persist in the face of challenges, and pursue STEM-related opportunities (Eccles, 2009). Creating a supportive and encouraging environment that nurtures girls' confidence in their STEM abilities is crucial for fostering their motivation and success. Academic self-concept encompasses individuals' beliefs and evaluations of their academic abilities and performance. Girls' academic self-concept in STEM is shaped by their experiences, feedback, and interactions within STEM learning environments. A positive academic self-concept in STEM is associated with higher motivation, engagement, and achievement (Marsh & Yeung, 1998). It is important to cultivate a positive academic self-concept in girls through targeted interventions and supportive practices, emphasizing their strengths and potential in STEM fields.

Intrinsic motivation refers to engaging in an activity for its inherent satisfaction and enjoyment. In STEM education, fostering girls' intrinsic motivation involves creating

opportunities for curiosity, exploration, and autonomy. When girls find personal meaning and relevance in STEM activities, their intrinsic motivation is enhanced, leading to increased engagement, creativity, and perseverance (Deci & Ryan, 1985). Encouraging hands-on experiences, problem-solving challenges, and open-ended projects can nurture girls' intrinsic motivation in STEM.

Extrinsic motivation involves engaging in an activity to obtain external rewards or avoid punishments. While extrinsic motivators such as grades, rewards, and recognition can initially stimulate girls' engagement in STEM, an overreliance on extrinsic motivators may undermine intrinsic motivation and long-term interest. Balancing the use of extrinsic motivators with a focus on fostering girls' intrinsic motivation is crucial for sustaining their engagement and commitment to STEM (Lepper et al., 2005)

Understanding the psychological factors that influence girls' motivation, self-efficacy, and persistence in STEM education is essential for promoting their interest and success in STEM fields. Developing a growth mindset, mitigating stereotype threat, fostering perceived competence and positive academic self-concept, and nurturing intrinsic motivation are all critical strategies to enhance girls' engagement and achievement in STEM. By addressing these psychological factors, educators, policymakers, and stakeholders can create supportive and inclusive environments that empower girls in their pursuit of STEM education and careers.

2.2.12 Policy Interventions and Initiatives

Developing and implementing gender-inclusive curriculum policies is essential for addressing gender biases and stereotypes in STEM education. These policies aim to ensure that educational materials, teaching methods, and learning environments are free from gender bias and promote equal opportunities for girls in STEM (Archer et al.,

2012). Research suggests that gender-inclusive curriculum policies positively impact girls' interest, engagement, and achievement in STEM subjects.

Affirmative action policies and targeted recruitment initiatives aim to increase the representation of girls in STEM fields by providing preferential treatment or additional support during admission processes or hiring practices. These policies seek to address systemic barriers and biases that hinder girls' participation in STEM (Ceci et al., 2009). Evaluating the impact of such policies is crucial to determine their effectiveness in promoting gender equity in STEM education.

Government initiatives that provide grants and scholarships specifically targeted towards girls in STEM play a vital role in promoting their participation and achievement in these fields. These programs aim to reduce financial barriers and provide support for girls to pursue STEM education and careers. Evaluating the outcomes and effectiveness of STEM education grants and scholarships is essential for refining and improving these initiatives.

Government initiatives that focus on teacher professional development in the context of gender equity in STEM education can have a significant impact. These initiatives aim to equip teachers with the knowledge, skills, and strategies to create inclusive and supportive learning environments for girls. Evaluating the implementation and impact of teacher professional development programs is crucial for ensuring their effectiveness and sustainability.

Awareness campaigns and outreach efforts play a crucial role in challenging gender stereotypes and promoting positive role models in STEM. These campaigns aim to inspire and encourage girls to pursue STEM education and careers by showcasing successful women in STEM fields. Evaluating the effectiveness of media campaigns

and role model initiatives is important for understanding their impact on girls' perceptions and aspirations in STEM.

Collaboration between educational institutions, community organizations, and industry partners is instrumental in promoting gender equity in STEM education. Community engagement initiatives and partnerships provide girls with access to STEM resources, mentorship opportunities, and hands-on experiences. Evaluating the effectiveness of community engagement efforts and partnerships is essential for refining and expanding these initiatives.

The persistence of gender biases and stereotypes poses a significant challenge to the implementation and effectiveness of policy interventions and initiatives. Overcoming societal biases and challenging ingrained stereotypes requires ongoing effort and a multi-faceted approach.

Ensuring the sustainability and long-term impact of policy interventions and initiatives is crucial. Sustainable change requires continuous funding, monitoring, and evaluation, as well as a commitment from stakeholders at various levels, including policymakers, educators, and communities.

Policy interventions and initiatives play a vital role in promoting gender equity in STEM education. National and institutional policies, government initiatives, funding programs, and awareness campaigns contribute to creating inclusive learning environments and addressing the under-representation of girls in STEM. By evaluating the strategies, best practices, and challenges associated with these interventions, policymakers and stakeholders can refine and improve their approaches to foster gender equity and inclusivity in STEM education.

2.2.13 Long-term Implications and Economic Impact

The under-representation of girls in STEM education and careers results in a loss of talent and potential. Research indicates that girls' interest and capabilities in STEM are often overlooked or discouraged, leading to a smaller pool of skilled individuals entering STEM fields. This has economic implications, as it restricts the availability of qualified professionals in sectors critical for technological advancement and innovation.

Gender disparities in STEM contribute to a lack of diversity in the workforce, limiting the range of perspectives and experiences brought to scientific research, product development, and problem-solving. Studies have shown that diverse teams are more innovative and better equipped to tackle complex challenges. By excluding women's talents and contributions, the STEM field may miss out on valuable insights and ground breaking innovations.

The under-representation of girls in STEM perpetuates gender inequalities in society. It reinforces the notion that certain fields and career paths are more suitable for men, limiting opportunities for women and reinforcing stereotypes. Addressing gender disparities in STEM education is essential for challenging these biases and promoting equality and inclusivity in all aspects of society.

The lack of visible female role models in STEM fields can hinder girls' aspirations and career choices. When girls do not see women succeeding and thriving in STEM, they may be less likely to pursue these fields or have the confidence to overcome societal barriers. Increasing the visibility of successful women in STEM can inspire girls and provide them with tangible examples of what they can achieve.

A skilled and diverse STEM workforce is crucial for addressing global challenges, such as climate change, healthcare, and technological advancements. These challenges

require multidisciplinary approaches and diverse perspectives to develop innovative solutions. Gender disparities in STEM limit the talent pool available to tackle these pressing issues effectively.

Promoting gender equity in STEM education can contribute to economic growth and competitiveness. Encouraging girls' participation in STEM fields expands the talent pool, increases productivity, and fosters innovation. Research has shown that gender-inclusive workplaces and diverse teams lead to better business outcomes and improved financial performance.

Implementing gender-inclusive education policies is crucial for addressing gender disparities in STEM. These policies should focus on creating supportive learning environments, promoting equal opportunities, and challenging gender stereotypes. Policy interventions should aim to engage girls in STEM education from an early age and provide ongoing support throughout their academic and professional journeys.

Establishing mentorship and support programs can provide girls with guidance, encouragement, and role models in STEM fields. These programs can help build confidence, foster networking opportunities, and address the specific challenges faced by girls pursuing STEM education and careers.

Gender disparities in STEM education have significant long-term implications for individuals, society, and the economy. The under-representation of girls results in a loss of diverse perspectives, innovation, and talent, limiting economic growth and perpetuating gender inequalities. Addressing these disparities is crucial for fostering a skilled and diverse STEM workforce capable of addressing global challenges effectively. Policy interventions, such as gender-inclusive education policies and mentorship programs, play a vital role in creating an equitable and inclusive STEM ecosystem that benefits individuals, society, and the economy.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This chapter focuses on the procedure used in collecting and analysing the data. The first section looks at the study area and the research design. This is followed by the description of the population, sample and sampling procedure, instruments used for data collection, pre-testing of data collection instruments, validity of the instruments, data collection procedure and data analysis.

3.1 Research Paradigm

The study adopted a positivist paradigm because issues relating to students learning strategy and academic achievement are a matter of behavioral adjustment and self-discipline (Park et al 2020). This adheres to the positivist paradigm, which argues that exploring social reality is based on the idea that one can best understand human behaviour through observation and reason (Alharahsheh et al, 2020). Stated differently, positivists argue that only objective, observable facts can be the basis for science (Ling, 2020). This is akin to empirical evidence that academic achievement can be predicted by observing learning behaviour based on facts. According to the positivist paradigm, true knowledge is based on the experience of senses and can be obtained by observation and experiment (Wang, 2020).

This further buttress the assertion that the level of knowledge attained by students is based on their academic experiences and dictated by their self-discipline and behavioural adjustments to learn. Positivist thinkers lean strongly on determinism, empiricism, parsimony and generality (Holtz et al 2020). Determinism means that events are caused by other circumstances therefore, understanding causal links is necessary for prediction and control. This notion is underpinned by self-determination

theory which focuses on the motivation behind choices that individuals make (Giraldo, 2020). Juxtaposing this on student achievement, it can be argued that the motivation behind students adopting strategies to learn and overcome academic challenges is to perform well in their careers (Bouchard et al, 2020).

On the other hand, empiricism means a collection of verifiable empirical evidence in support of theories or hypotheses because knowledge stems from human experience (Sackmann, 2020). Furthermore, the researcher is seen as being independent of the study and follows a deductive approach (Majeed, 2019). The researcher concentrates on facts rather than human interests, making this approach a deductive one (Giraldo, 2020). Parsimony refers to the explanation of the phenomena in the most efficient way possible. To achieve this, this study adopts a descriptive design to enable the researcher to gather the right data, analyze it and make an accurate description of the situation.

Generality is the process of generalizing the observation of a particular phenomenon to the world at large. This is fulfilled by adopting the right sampling approach which for this study was stratified random sampling. This ensured that the right proportion of participants from each of the six schools in the circuit is selected. And with random sampling, biases are eliminated and each student in each of the six schools has an equal chance of participation. This approach makes the used sample representative of the population and hence accurate for generalizing the research findings. It is for these reasons that the study adopts a positivism paradigm to give the researcher the theoretical and empirical support to make arguments when the findings are compared with other studies in the literature.

3.2 Research Approach

Xie et al (2020) noted that qualitative research focuses on individual cases and subjective impressions. This requires an iterative study design where data collection

and research questions are adjusted according to what is learned. Finally, Nunkoo et al (2020) noted that qualitative studies are done with few respondents and are supposed to provide insights into the setting of a problem, serving as a source of inspiration to generate hypotheses for a subsequent quantitative project. On the other hand, quantitative research deals with numbers and figures (Balne, 2020). It quantifies opinions, attitudes, behaviours, and other defined variables to support or refute hypotheses about a specific phenomenon and potentially contextualize the results from the study sample in the broader population (or specific groups).

The unique feature of quantitative research is that it explicitly specifies what is measured and how it is measured to uncover patterns such as behaviour, motivation, emotion, and cognition (Remler et al, 2021). This makes quantitative data collection much more structured than qualitative methods. Jacobsen (2020) noted that quantitative techniques typically comprise various forms of questionnaires and surveys, structured interviews, and behavioural observation based on explicit coding and categorisation schemes. After data collection, quantitative analysis techniques and statistics can be applied, such as t-tests and ANOVAs, to non-parametric methods (McGill et al, 2021). This often necessitates much bigger sample sizes than qualitative research but allows you to make more solid conclusions backed up with data. This research takes a quantitative approach because it enables the researcher to establish the factors that contribute to the under-representation of girls in stem fields and its implications

Furthermore, the researcher will be able to relate the findings to the challenges that contribute to the underrepresentation of girls in STEM fields and their implications (Bruner et al., 2019). In addition, the quantitative approach would enable the researcher to collect data from more expansive geographical areas and a huge sample size. It is for these reasons that this study used a quantitative approach as its attributes are more suited

to the requirement of the study's objectives. Thus, the right tools can be used to collect the correct amount of data and analysed an interpreter.

Also, by adopting a quantitative approach, the researcher can formulate questions based on measurable variables. This would enable the study to explain, predict, and control the studied phenomena (Mayer, Breugst & Mayr, 2019). Consequently, the researcher gains a better understanding of the problem and thus, can either affirm or decline the research hypothesis and make appropriate inferences. This is akin to Dhiman, Kalbar, and Inamdar's (2019) observations that the quantitative approach gives precision through reliable measurement, giving the researcher the ability to control the sampling and research design. For similar reasons, Pearce and Pons (2019) noted the researcher can produce causality statements using statistical techniques that allow for sophisticated analyses and replicability of the research.

3.4 Research Design

A research design is the overall programme and structure of investigation for obtaining answers to research questions (Amedahe, 2002). Therefore, this study employed the descriptive survey design. This was because the study sought to solicit the factors that contribute to the under-representation of girls in stem fields and its implications.

According to Fraenkel and Wallen (2005), the descriptive survey is often directed towards determining the nature of a situation as it exists at the time of the study. Creswell (2008) added that the descriptive survey design is used to determine individual opinion about a policy issue or programme. The design, according to him, provides useful information for decision-makers since it has the advantage of measuring current attitudes or practices. According to Polit and Hungler (2003), descriptive survey has an advantage of producing a good amount of responses from a wide range of people. Descriptive survey is appropriate when a researcher attempts to describe some

population or aspect of population by selecting unbiased samples of individuals who are asked to complete questionnaires, interviews or tests (Fraenkel & Wallen, 2005).

3.4.1 Population

According to Agyedu et al (2011), population in research was the complete set of individuals (subjects), objects or events with common observable features for which a researcher is interested in studying. It is, also, regarded as the larger group from which individuals are selected to participate in a study. A population is also defined as a group of individuals or people with the same characteristics and in whom the researcher is interested. Kusi (2012, p. 80) also defines population as “a group of individuals that the researcher generalizes his/her findings”.

3.4.2 Target Population

The target population of a study refers to the specific group of individuals to whom the research findings are intended to be generalized. It is clearly define the target population to ensure the study's findings are applicable to the desired group. According to Babbie (2016), the target population is the specific group of people that researchers aim to study and draw conclusions about. The target population should possess the characteristics and attributes that align with the research objectives.

Creswell (2014) explains that the target population serves as the foundation for selecting the appropriate sample in a study. Researchers must define the target population to ensure that the sample adequately represents the population of interest. In the field of public health, the World Health Organization (WHO) emphasizes the importance of defining the target population to guide interventions and policies. The target population helps focus resources and efforts on specific groups that are most likely to benefit from the interventions (WHO, 2014).

In educational research, Fraenkel et al (2015) highlight the significance of identifying the target population to understand the implications of research findings. By clearly defining the target population, researchers can determine the applicability and generalizability of their findings to specific educational contexts. The American Psychological Association (APA) defines the target population as the group to which the researcher intends to apply the study's results. It emphasizes that the target population should be clearly identified and described in the study's methodology (APA, 2020). The target population for this study was all senior high students in the Effutu Municipality.

3.4.3 Accessible Population

The accessible population refers to the subset of the target population that is available and accessible for the researcher to study. It represents the individuals who can be reached and included in the study based on practical considerations and limitations. According to Neuman (2014), the accessible population comprises the subset of the target population that the researcher can actually reach and include in the study. It is determined by factors such as geographical location, time constraints, and availability of resources.

Creswell et al (2017) explain that the accessible population is the portion of the target population from which the researcher can realistically obtain a sample. It may be influenced by factors such as willingness to participate, accessibility, and feasibility of data collection. The National Institutes of Health (NIH) in their guidelines for clinical research emphasize the importance of defining the accessible population. It helps researchers identify and recruit participants who meet the study's eligibility criteria and can feasibly be included in the research (NIH, 2020) also Malhotra and Birks (2017) highlight that the accessible population consists of potential respondents who can be

reached and are willing to participate in surveys, interviews, or other data collection methods. It may include individuals who are easily accessible through specific channels or databases. The United Nations Educational, Scientific and Cultural Organization (UNESCO) stresses the consideration of the accessible population in educational research. It helps researchers determine the practicality of data collection methods and the feasibility of conducting research within specific educational settings (UNESCO, 2009).

Johnson et al (2012) assert that accessible population is the research participants who are available for participation in a given research. The Effutu municipality have two senior high school. Therefore, the accessible population for this research was all the 215 students from the two senior high schools were used.

3.4.4 Sample Size and Sampling Technique

Simple random sampling involves selecting a subset of individuals from a larger population in a random and unbiased manner (Creswell, 2014). In this case, the population consists of all senior high school students. To implement simple random sampling, the first step is to assign a unique identifier or number to each member of the population (Cochran, 1977). For example, each student in the senior high school can be assigned a unique identification number. Once the unique identifiers are assigned, a random selection process is employed. This can be done using a random number generator or a table of random numbers (Cochran, 1977). The random selection process ensures that each student has an equal chance of being included in the sample.

The desired sample size is 215 students, comprising 150 girls and 65 boys. To achieve this, the random selection process is repeated until the required number of students of each gender is reached. This ensures that the sample is representative of the gender distribution in the population. The process of random selection continues until the

predetermined sample size is achieved. This ensures that the sample is representative of the larger population and reduces the potential for bias (Fraenkel & Wallen, 2015). The use of simple random sampling in selecting the 215 students ensures that each student in the population has an equal chance of being included in the sample. This enhances the generalizability of the findings to the larger senior high school student population (Creswell, 2014). By employing simple random sampling, the researchers minimize the potential for bias in the selection process. This enhances the reliability and validity of the study's findings (Kothari, 2004). Random sampling techniques, such as simple random sampling, are widely used in educational research to ensure fairness and representativeness in the selection of participants (Fraenkel & Wallen, 2015).

3.4.5 Instruments for Data collection

The researcher employed questionnaires in collecting data from the sampled population. According to Alhassan (2007), questionnaire is a form of inquiry document which contains a systematically compiled and well-organized series of questions intended to elicit for the information which will provide insight into the nature of the problem under study. Thus, the questionnaire as the instrument used for study was more stable, consistent, uniform, and faster to be filled and completed as compared to other instruments. In this study, the researcher used both closed – ended questionnaires and open-ended questionnaires generated from the research questions. The closed-ended questionnaire is the type where the respondent's choices are limited as the respondents simply selects a response from the options provided whereas the open-ended questionnaires offered the respondents the ability to elaborate on their thoughts. In all, two different questionnaires were developed for students. The questionnaires were of three sections namely A and B. Section A required respondent to supply demographic data such as name of school, class, age and gender. Section B focused on

factors that contribute to the under-representation of girls in stem fields and its implications. The questionnaire was self-administered. This was to provide the researcher the opportunity to clarify issues that the respondents did not understand concerning the instrument and encouraged participants to respond to the items.

3.4.6 Validity of Research Instrument

The instruments (questionnaire) used for the collection of data were validated to determine their accuracy. The validity of the instrument refers to whether it measured what it was supposed to measure and not something else (Schumacher & Mcmillan, 1993). Therefore, validity refers to the results of the test, not the test itself (Nwana, 1996). Attempts were made to achieve face validity and content validity. For face validity, the instruments were given to experts in research to read through to offer constructive criticisms, since validation is based on experts' advice (Best and Khan, 1993). Appropriate modifications were made by the experts and the supervisor to ensure clarity and ambiguity free statements/items in the questionnaire.

3.4.7 Reliability of Research Instrument

The reliability of a research instrument is the consistency of the instrument in producing similar results that gives the same conditions on different occasions. According to Drost (2011) the extent to which a measure adequately represents the underlying construct that it is supposed to measure. It is basically the repeatability and replication of research findings. To reinforce and assess the reliability of the instrument in this research, the questionnaire was subjected to strict supervision of the supervisor of this work.

Piloting was done in Potsin senior high school that was not included in the sample size for the study. Piloting was therefore necessary to find out if the respondents would find

the instruments clear, precise and comprehensive. This was to enhance their reliability. The procedure used was similar to that which was used during the final data collection.

3.4.8 Data Collection Procedure

Having obtained an introductory letter obtained from the Department of integrated science, the researcher sought the permission of the educational directorate before collecting data from the selected schools. The questionnaires could have been administered through email or telephone call. The researcher however opted to administer them personally to the respondents. Even though this approach was time consuming, expensive and stressful, the approach helped the researcher to have a high response rate since the survey instruments were collected immediately after completion. Also, the presence of the researcher provided a lot of assistance to respondents in clarifying the content of the questionnaire and also getting accurate data for the study.

3.4.9 Data Analysis

Following a quantitative approach, data relating to the entire research question were analysed and presented using descriptive statistics such as frequencies and percentages. Data were statistically computed using Statistical product for Service Solution (SPSS). This procedure has to do with interpreting the data collected for the study through the use of analytical and logical reasoning to determine trends and relationships. Orodho (2005), states that, data analysis is the process of systematically searching and arranging interview transcripts, field notes, data and other materials obtained from the field with the aim of increasing an understanding of them and enabling the researcher present them to others. Analysis involves working with data, organizing items, breaking them into manageable units, synthesizing them and searching for pattern.

3.4.10 Ethical Considerations

By way of research ethics, the researcher attached an introductory letter to every questionnaire to explain the purpose of the study and also to seek voluntary participation of respondents. Permission was sought from the school heads before administering the questionnaires in their schools. Participants were assured that the study was strictly for academic purpose. To that extent, no respondent was made to indicate particulars that could trace their identity, such as names or contact numbers. All journals, articles, authors and individuals whose literary works were sourced from to support this study were all duly recognized and cited appropriately.



CHAPTER FOUR

RESULTS AND DISCUSSION

4.0 Overview

This chapter deals with the results and discussion of the data gathered from the respondents. This study sought to investigate factors that contribute to the under-representation of girls in STEM fields and its implications in the Effutu Municipality. In order to address the objective, the study to identify the socio-cultural factors that contribute to the under-representation of girls in STEM subjects in Effutu Municipality, to examine the educational barriers and challenges faced by girls in accessing and succeeding in STEM education in Effutu Municipality, to explore the systemic factors, including implicit biases and societal expectations, that hinder girls' participation and success in STEM subjects in Effutu Municipality, and to evaluate the effectiveness of existing interventions and policies aimed at promoting gender equity in STEM education in Effutu Municipality and identify areas for improvement. The study involved 206 respondents. The data gathered was analysed using descriptive statistics.

4.1 Background Characteristics of Respondents

Data on the characteristics of the respondents were collected to help have an understanding of the background characteristics of the respondents in the study. These characteristics examined the gender distribution and age range of the respondents.

Table 1: Gender Distribution of Respondents

Gender	Frequency	Percent
Males	93	45.1
Females	113	54.9
Total	206	100.0

Source: Field Date, 2024

The data in Table 1 indicate that more than half of the respondents (54.9%) were females. Male students, however, constituted 45.1% of the entire respondents.

Table 2: Gender and Age of Respondents

Age (in years)	Males		Females		Total	
	Freq.	%	Freq.	%	Freq.	%
14 – 15	23	11.2	29	14.1	52	25.2
16 – 17	50	24.3	78	37.8	128	62.1
18 – 19	20	9.7	24	11.7	44	21.4
Total	93	45.1	131	54.9	206	100.0

Source: Field Date, 2024

Table 2 presents the gender and age distribution of students within the Effutu Municipality, based on a sample of 206 students. The majority of students fall within the 16–17 age range, comprising 62.1% of the total sample, with females representing 37.8% (n = 78) and males 24.3% (n = 50). The 14–15 age group accounts for 25.2% of the students, with females making up 14.1% (n = 29) and males 11.2% (n = 23). The 18–19 age group is the least represented, constituting only 21.4% of the total sample, with 11.7% being female (n = 24) and 9.7% male (n = 20). Overall, females constitute a larger proportion of the student respondent, representing 54.9% of the total (n = 131), while males account for 45.1% (n = 93). This gender disparity is particularly notable in the 16–17 age group, where the difference between the number of females and males is the most pronounced.

4.2 Analysis and Discussions

4.2.1 Research Question One (1): What are the socio-cultural factors that contribute to the under-representation of girls in STEM subjects in Effutu Municipality?

The first research question focused on exploring the socio-cultural factors that contribute to the under-representation of girls in STEM subjects within the Effutu

Municipality. This inquiry aimed to understand how various social and cultural dynamics impact girls' participation and success in STEM education, highlighting the ways in which these factors create barriers and perpetuate gender disparities.

The items were measured on a 5-point Likert-type scale (Strongly Disagree-1, Disagree-2, Neutral- 3, Agree-4, and Strongly Agree-5) and composite scores were computed. Data for this research question was analysed using means and standard deviations. A mid-point of 3.0 was used as the baseline for comparison such that mean values above 3.0 indicated that most of the respondents were in agreement with the statement whereas a mean value less than 3.0 showed that most of the respondents were in disagreement with the statement. The details of the results are presented Table 3

Table 3: Socio-Cultural Factors that Contribute to the Under-Representation of Girls in STEM Subjects in Effutu Municipality

S/N	Item	Mean	Std. Deviation
1	Household chores and childcare responsibilities disproportionately fall on girls, limiting their time for STEM activities	3.23	1.433
2	Societal perceptions of STEM as a "masculine" domain negatively impact girls' confidence and interest	3.00	1.440
3	Girls are often discouraged from pursuing STEM subjects due to traditional gender norms and expectations.	2.99	1.377
4	Girls in my school/community have limited access to well-equipped STEM laboratories and resources	2.99	1.430
5	Girls face pressure from their families to focus on domestic responsibilities rather than STEM studies	2.98	1.391
6	There is a prevalent belief in my community that STEM subjects are more suitable for boys than girls	2.96	1.530
7	Cultural beliefs about girls' intellectual abilities hinder their aspirations to excel in STEM subjects	2.94	1.375

8	Families in my community tend to prioritize boys' education over girls' education in STEM fields	2.88	1.418
9	Girls lack positive role models and mentors in STEM fields, which discourages their participation	2.67	1.371
10	Gender stereotypes and biases in the media and popular culture reinforce the notion that STEM is not for girls	2.66	1.473

Source: Field data, 2024, N = 206

The data in Table 3 shows that the mean scores for the 10 items range from 2.66 to 3.23. The highest mean score of 3.23 is associated with Item 1: "Household chores and childcare responsibilities disproportionately fall on girls, limiting their time for STEM activities," with a standard deviation of 1.433. This indicates that the burden of household chores and childcare responsibilities is perceived as the most significant socio-cultural factor contributing to the under-representation of girls in STEM subjects. Item 2, "Societal perceptions of STEM as a 'masculine' domain negatively impact girls' confidence and interest," follows with a mean score of 3.00 and a standard deviation of 1.440, highlighting the impact of societal perceptions on girls' participation in STEM. Items 3 and 4, "Girls are often discouraged from pursuing STEM subjects due to traditional gender norms and expectations" and "Girls in my school/community have limited access to well-equipped STEM laboratories and resources," both have mean scores of 2.99, with standard deviations of 1.377 and 1.430, respectively. These items reflect the challenges girls face due to traditional gender norms and limited access to resources.

Item 5, "Girls face pressure from their families to focus on domestic responsibilities rather than STEM studies," has a mean score of 2.98 and a standard deviation of 1.391, suggesting that family expectations play a significant role in limiting girls' engagement with STEM subjects.

Item 6, "There is a prevalent belief in my community that STEM subjects are more suitable for boys than girls," recorded a mean score of 2.96 with a standard deviation of 1.530, indicating that gender-based community beliefs are a notable barrier.

Item 7, "Cultural beliefs about girls' intellectual abilities hinder their aspirations to excel in STEM subjects," has a mean score of 2.94 and a standard deviation of 1.375, pointing to cultural perceptions as a hindrance to girls' aspirations in STEM.

Item 8, "Families in my community tend to prioritize boys' education over girls' education in STEM fields," had a mean score of 2.88 and a standard deviation of 1.418, emphasizing the impact of familial prioritization on girls' education in STEM.

Items 9 and 10, "Girls lack positive role models and mentors in STEM fields, which discourages their participation" and "Gender stereotypes and biases in the media and popular culture reinforce the notion that STEM is not for girls," have the lowest mean scores of 2.67 and 2.66, with standard deviations of 1.371 and 1.473, respectively. These results suggest that the lack of role models and media influences are perceived as barriers but are seen as less impactful compared to other factors.

The analysis reveals that the disproportionate burden of household chores and childcare responsibilities (Item 1) and societal perceptions of STEM as a masculine domain (Item 2) are viewed as the most significant socio-cultural factors contributing to the under-representation of girls in STEM subjects in the Effutu Municipality. The lack of positive role models and gender stereotypes in the media (Items 9 and 10) are seen as the least significant, though still relevant, factors.

The findings from this study align with existing literature on the socio-cultural barriers that hinder girls' participation in STEM fields. The highest-ranked factor, household chores, and childcare responsibilities, which scored a mean of 3.23, is consistent with the assertions by Archer et al. (2013) that traditional gender roles disproportionately

allocate domestic responsibilities to girls, leaving limited time for academic pursuits, particularly in STEM. This supports the notion that societal expectations related to domesticity directly conflict with girls' engagement in STEM education.

Similarly, the second-highest factor, societal perceptions of STEM as a masculine domain, with a mean score of 3.00, reinforces the findings of Wang et al. (2013), who highlighted how gendered stereotypes undermine girls' confidence and interest in pursuing STEM subjects. The persistence of these stereotypes influences girls' academic choices and career aspirations, confirming the need to address deeply rooted societal biases.

Traditional gender norms (Item 3) and limited access to resources (Item 4), both with a mean of 2.99, reflect the structural and cultural barriers discussed by UNESCO (2017). Limited access to well-equipped laboratories and inadequate funding disproportionately affect female students, further entrenching gender disparities in STEM. These findings underscore the importance of equitable resource allocation in educational institutions to support girls' learning.

Family expectations (Item 5) and community beliefs favoring boys in STEM (Item 6) align with Malhotra et al. (2019), who observed that familial and cultural expectations can significantly restrict girls' educational trajectories. Such socio-cultural constraints often result in the prioritization of boys' education, limiting opportunities for girls.

Cultural beliefs about intellectual abilities (Item 7) and the prioritization of boys' education (Item 8) echo Dweck's (2008) research on fixed mindsets and cultural biases regarding intelligence. These perceptions can negatively influence girls' motivation and aspirations, underscoring the need for interventions that challenge these biases and promote a growth mindset.

Although Items 9 and 10, concerning role models and media stereotypes, scored the lowest, they remain important. Hazari et al. (2010) emphasized the critical role of mentors and positive representation in shaping students' career aspirations. The relatively lower perception of these barriers may reflect a gap in recognizing their cumulative impact on shaping girls' STEM engagement.

4.2.2 Research Question Two (2): What are the educational barriers and challenges faced by girls in accessing and succeeding in STEM education in Effutu Municipality?

The second research question aimed to delve deeper into understanding the specific systemic and institutional factors that contribute to the educational barriers and challenges faced by girls in accessing and succeeding in STEM (Science, Technology, Engineering, and Mathematics) education within the Effutu Municipality. This question sought to identify and analyse how broader, often institutionalized factors affect girls' experiences and opportunities in STEM education.

The items were measured on a 5-point Likert-type scale (Strongly Disagree-1, Disagree-2, Neutral- 3, Agree-4, and Strongly Agree-5) and composite scores were computed. Data for this research question was analysed using means and standard deviations. A mid-point of 3.0 was used as the baseline for comparison such that mean values above 3.0 indicated that most of the respondents were in agreement with the statement whereas a mean value less than 3.0 showed that most of the respondents were in disagreement with the statement. The details of the results are presented Table 4.

Table 4: Educational Barriers and Challenges Faced by Girls in Accessing and Succeeding in STEM Education in Effutu Municipality

S/N	Item	Mean	Std. Deviation
1	Lack of career guidance and mentorship opportunities hinders girls' academic and professional choices in STEM fields	3.29	1.277
2	National policies and regulations do not adequately address the gender disparities in STEM education	3.22	1.434
3	Girls encounter challenges in balancing their STEM studies with other academic and household responsibilities	3.17	1.424
4	Limited exposure to STEM role models and industry professionals discourages girls from pursuing STEM careers	3.16	1.431
5	Girls face safety concerns and cultural restrictions that prevent them from fully participating in STEM activities	3.03	1.345
6	Girls experience performance gaps compared to boys in STEM subjects due to various socioeconomic and cultural factors	2.99	1.314
7	The teaching methods and learning materials used in STEM subjects are not tailored to the needs and learning styles of girls	2.89	1.300
8	School policies and practices, such as tracking and streaming, disadvantage girls in STEM education	2.79	1.377
9	STEM-related extracurricular programs and workshops are often inaccessible or unaffordable for girls	2.78	1.306
10	Girls often feel marginalized and overlooked in STEM classrooms dominated by male students and teachers	2.73	1.362

Source: Field data, 2024, N = 206

From Table 4, the data revealed that the mean scores for the 10 items range from 2.73 to 3.29. The highest mean score of 3.29 is associated with Item 1: "Lack of career guidance and mentorship opportunities hinder girls' academic and professional choices

in STEM fields," with a standard deviation of 1.277. This indicates that the absence of mentorship and career guidance is perceived as the most significant barrier to girls' participation in STEM education.

Item 2, "National policies and regulations do not adequately address the gender disparities in STEM education," follows with a mean score of 3.22 and a standard deviation of 1.434, highlighting concerns about the effectiveness of policies in addressing gender disparities in STEM.

Item 3, "Girls encounter challenges in balancing their STEM studies with other academic and household responsibilities," has a mean score of 3.17 and a standard deviation of 1.424, reflecting the difficulties girls face in managing their time between STEM studies and other responsibilities.

Another significant factor is Item 4, "Limited exposure to STEM role models and industry professionals discourages girls from pursuing STEM careers," with a mean score of 3.16 and a standard deviation of 1.431. This suggests that the lack of visible role models in STEM contributes to the discouragement of girls from entering these fields.

Item 5, "Girls face safety concerns and cultural restrictions that prevent them from fully participating in STEM activities," recorded a mean score of 3.03 with a standard deviation of 1.345, indicating that safety and cultural factors also pose barriers to girls' full participation in STEM.

Item 6, "Girls experience performance gaps compared to boys in STEM subjects due to various socioeconomic and cultural factors," has a mean score of 2.99 and a standard deviation of 1.314, suggesting that performance disparities, influenced by socioeconomic and cultural factors, are also a concern.

Item 7, "The teaching methods and learning materials used in STEM subjects are not tailored to the needs and learning styles of girls," had a mean score of 2.89 with a standard deviation of 1.300, pointing to the inadequacy of current teaching practices in addressing the unique learning needs of girls in STEM.

Items 8 and 9, "School policies and practices, such as tracking and streaming, disadvantage girls in STEM education" and "STEM-related extracurricular programs and workshops are often inaccessible or unaffordable for girls," had mean scores of 2.79 and 2.78, with standard deviations of 1.377 and 1.306, respectively. These results suggest that school policies and the inaccessibility of extracurricular programs are perceived as moderate barriers to girls' participation in STEM.

The item with the lowest mean score is Item 10: "Girls often feel marginalized and overlooked in STEM classrooms dominated by male students and teachers," with a mean score of 2.73 and a standard deviation of 1.362. This indicates that feelings of marginalization, though significant, are perceived as a less impactful barrier compared to others.

The analysis reveals that the lack of career guidance and mentorship (Item 1) and insufficient national policies (Item 2) are viewed as the most significant barriers to girls' participation in STEM education, while feelings of marginalization in STEM classrooms (Item 10) are seen as the least significant, though still relevant, factor.

The analysis highlights significant barriers to girls' participation in STEM education, emphasizing the multifaceted challenges rooted in societal, institutional, and individual factors. This section synthesizes these findings with insights from the literature review to offer a nuanced discussion.

The highest mean score (3.29) for "Lack of career guidance and mentorship opportunities" underscores the critical role of mentorship and career guidance in

shaping girls' STEM aspirations. Mentorship provides not only professional guidance but also emotional support, fostering self-efficacy and a positive STEM identity (Estrada et al., 2018). Similarly, early career guidance, as highlighted by Hidi and Renninger (2006), can address misconceptions about STEM fields and broaden career horizons. The findings align with these perspectives, underscoring the need for schools and policymakers to implement robust mentoring programs and career guidance initiatives to mitigate this barrier.

The second-highest barrier identified is the inadequacy of national policies in addressing gender disparities in STEM (mean score: 3.22). Effective policy frameworks are vital to fostering gender equality in STEM education. Archer et al. (2013) argue that policies must go beyond rhetoric to provide actionable strategies, such as financial incentives, scholarships, and gender-sensitive curricula, to support girls' participation. This finding calls for a critical evaluation and restructuring of existing policies to create a supportive ecosystem for girls in STEM.

Girls' struggles with balancing STEM studies and other responsibilities (mean score: 3.17) and the limited exposure to role models (mean score: 3.16) further highlight systemic issues. The literature suggests that role models, particularly from diverse backgrounds, can inspire girls and challenge occupational stereotypes (Johnson & Meagher, 2017). Moreover, fostering an inclusive environment that accommodates the unique challenges faced by girls, such as balancing household responsibilities, is essential (Chemers et al., 2011). These findings suggest the importance of creating flexible academic programs and increasing the visibility of successful women in STEM. Safety concerns and cultural restrictions (mean score: 3.03) emphasize the sociocultural barriers to STEM participation. Community engagement initiatives, as suggested by Burgstahler et al. (2019), can bridge the gap between societal norms and educational

opportunities by involving families and communities in discussions about the value of STEM education for girls. Addressing safety concerns through institutional reforms and community awareness programs is critical to creating a conducive learning environment.

The inadequacy of teaching methods tailored to girls' learning needs (mean score: 2.89) reflects a pressing pedagogical challenge. Inclusive STEM pedagogy that incorporates diverse learning styles, as recommended by Honey and Hilton (2011), can make STEM subjects more accessible and engaging. Integrating real-world applications and hands-on activities can further enhance interest and comprehension (Sanders, 2009).

The findings also suggest moderate barriers posed by school policies and extracurricular accessibility (mean scores: 2.79 and 2.78) and the impact of marginalization in classrooms (mean score: 2.73). These align with the literature's emphasis on the importance of peer support networks and inclusive environments to combat stereotypes and foster a sense of belonging (Wang & Degol, 2017; Herrera et al., 2018).

The analysis and literature review converge on the need for psychological interventions, such as fostering a growth mindset (Dweck, 2006), mitigating stereotype threats (Steele, 1997), and enhancing perceived competence (Eccles, 2009). These strategies are pivotal in addressing self-doubt and promoting persistence among girls in STEM fields. Encouraging intrinsic motivation through engaging activities and reducing over-reliance on extrinsic motivators can sustain long-term interest in STEM (Deci & Ryan, 1985).

4.2.3 Research Question Three (3): How do systemic factors, such as implicit biases and societal expectations, hinder girls' participation and success in STEM subjects in Effutu Municipality?

The third research question sought to identify systemic factors, such as implicit biases and societal expectations, hinder girls' participation and success in STEM subjects in Effutu Municipality?

The items were measured on a 5-point Likert-type scale (Strongly Disagree-1, Disagree-2, Neutral- 3, Agree-4, and Strongly Agree-5) and composite scores were computed. Data for this research question was analysed using means and standard deviations. A mid-point of 3.0 was used as the baseline for comparison such that mean values above 3.0 indicated that most of the respondents were in agreement with the statement whereas a mean value less than 3.0 showed that most of the respondents were in disagreement with the statement. The details of the results are presented Table 5.

Table 5: Systemic Factors, such as Implicit Biases and Societal Expectations That Hinder Girls' Participation and Success in STEM Subjects in Effutu Municipality

S/N	Item	Mean	Std. Deviation
1	Lack of comprehensive data and research on the challenges faced by girls in STEM education limits evidence-based policymaking	3.38	1.281
2	Intersectional factors, such as poverty, geographical isolation, and socioeconomic status, create additional barriers for girls in STEM education	3.34	1.376
3	Inadequate enforcement of anti-discrimination laws and policies in educational institutions and workplaces	3.28	1.229
4	Absence of targeted scholarships, mentorship programs, and community support systems for girls in STEM subjects	3.25	1.270

5	There are various programs, initiatives, or policies implemented in my community/region to encourage girls' participation in STEM	3.17	1.401
6	Patriarchal norms and attitudes embedded in societal institutions reinforce the notion that STEM is a male-dominated field	3.02	1.284
7	Insufficient government investment in STEM infrastructure and teacher training perpetuates the exclusion of girls	3.01	1.402
8	Media portrayal and public discourse often perpetuate gender stereotypes and undermine girls' capabilities in STEM	2.98	1.332
9	Structural gender biases and discrimination within the education system, job market, and society hinder girls' STEM aspirations	2.96	1.217
10	Unequal distribution of educational resources and funding favours STEM programs catering primarily to boys	2.77	1.282

Source: Field data, 2024, N = 206

The data in Table 5 revealed that the mean scores for the 10 items range from 2.77 to 3.38. The highest mean score of 3.38 is associated with Item 1: "Lack of comprehensive data and research on the challenges faced by girls in STEM education limits evidence-based policymaking," with a standard deviation of 1.281. This suggests that the absence of detailed data and research is perceived as the most significant systemic factor hindering girls' participation and success in STEM subjects.

Item 2, "Intersectional factors, such as poverty, geographical isolation, and socioeconomic status, create additional barriers for girls in STEM education," follows with a mean score of 3.34 and a standard deviation of 1.376, indicating that these intersectional factors are also major barriers for girls in STEM.

Item 3, "Inadequate enforcement of anti-discrimination laws and policies in educational institutions and workplaces," has a mean score of 3.28 and a standard deviation of 1.229, highlighting concerns about the effectiveness of existing laws and policies in protecting girls from discrimination in STEM fields.

Item 4, "Absence of targeted scholarships, mentorship programs, and community support systems for girls in STEM subjects," recorded a mean score of 3.25 with a standard deviation of 1.270, reflecting the need for more targeted support systems to encourage girls' participation in STEM.

Item 5, "There are various programs, initiatives, or policies implemented in my community/region to encourage girls' participation in STEM," has a mean score of 3.17 and a standard deviation of 1.401. This suggests that, while programs exist, they may not be fully effective or widely recognized in promoting girls' involvement in STEM.

Item 6, "Patriarchal norms and attitudes embedded in societal institutions reinforce the notion that STEM is a male-dominated field," has a mean score of 3.02 and a standard deviation of 1.284, pointing to the influence of deeply rooted societal attitudes as a barrier to girls in STEM.

Item 7, "Insufficient government investment in STEM infrastructure and teacher training perpetuates the exclusion of girls," had a mean score of 3.01 with a standard deviation of 1.402, indicating that inadequate funding and training are perceived as contributing factors to the exclusion of girls from STEM.

Item 8, "Media portrayal and public discourse often perpetuate gender stereotypes and undermine girls' capabilities in STEM," has a mean score of 2.98 and a standard deviation of 1.332, suggesting that media representation and public discourse also play a role in hindering girls' progress in STEM.

Item 9, "Structural gender biases and discrimination within the education system, job market, and society hinder girls' STEM aspirations," has a mean score of 2.96 and a standard deviation of 1.217, reflecting concerns about pervasive gender biases in various societal sectors.

The item with the lowest mean score is Item 10: "Unequal distribution of educational resources and funding favours STEM programs catering primarily to boys," with a mean score of 2.77 and a standard deviation of 1.282. This indicates that while unequal resource distribution is recognized as an issue, it is perceived as a less significant barrier compared to others.

The analysis reveals that the lack of comprehensive data and research (Item 1) and intersectional barriers like poverty and geographical isolation (Item 2) are viewed as the most significant systemic factors hindering girls' participation in STEM subjects in Effutu Municipality.

The data analysis from Table 5 provides valuable insights into the systemic barriers that hinder girls' participation in STEM education in Effutu Municipality. The findings align with existing literature, emphasizing the complex and multifaceted nature of these barriers, which are shaped by cultural, societal, and institutional factors.

The highest mean score of 3.38 for Item 1, which focuses on the lack of comprehensive data and research on the challenges girls face in STEM education, reflects the critical role that data plays in informing effective policy-making. The standard deviation of 1.281 suggests a consistent recognition of this issue among the respondents. A lack of data prevents the development of targeted, evidence-based policies that could address the specific needs of girls in STEM. According to UNESCO (2017), without detailed research on the gender-specific barriers in STEM education, policymakers cannot design interventions that effectively support girls' participation. Furthermore, the absence of comprehensive data makes it difficult to assess progress and identify areas requiring improvement.

Item 2, addressing intersectional factors such as poverty, geographical isolation, and socioeconomic status, scored 3.34, with a standard deviation of 1.376, indicating that

these factors are seen as major barriers for girls in STEM. The literature supports this finding, with studies like those by Wang et al. (2013) pointing out that girls from low socioeconomic backgrounds or isolated areas face compounded challenges, including limited access to quality education, role models, and resources. These intersectional barriers often prevent girls from engaging fully in STEM opportunities, as they lack the necessary support systems and educational infrastructure.

The mean score of 3.28 for Item 3, which examines the enforcement of anti-discrimination laws and policies in educational institutions and workplaces, reflects concerns about the effectiveness of current efforts to protect girls from discrimination. The standard deviation of 1.229 indicates varied opinions on this issue, highlighting that while some respondents may perceive existing laws as inadequate, others may see them as sufficient. Research by Dweck (2008) and other scholars suggests that although anti-discrimination laws exist, their implementation often falls short due to persistent societal biases. The lack of enforcement and accountability in schools and workplaces allows discrimination to continue unchecked, limiting the opportunities available to girls in STEM fields.

Item 4, which discusses the absence of targeted scholarships, mentorship programs, and community support for girls in STEM, scored 3.25, indicating that respondents perceive a need for these support systems. The standard deviation of 1.270 suggests general agreement among respondents about the importance of such programs. The literature emphasizes the significance of targeted scholarships and mentorship in encouraging girls to pursue STEM. Hazari et al. (2010) argue that programs designed specifically for girls can provide the resources, role models, and guidance necessary for success in STEM fields. Without such support, girls may not have the confidence or opportunities to navigate the challenges associated with STEM education.

With a mean score of 3.17, Item 5 points to the perception that although some programs exist to encourage girls' participation in STEM, they are not fully effective. The standard deviation of 1.401 indicates a range of opinions on the impact of these programs. Existing studies, including those by Wang et al. (2013), suggest that while programs are in place, their effectiveness often falls short due to issues such as inadequate funding, poor implementation, and limited reach. This finding underscores the need for continuous evaluation and improvement of such initiatives to ensure that they truly benefit girls and foster long-term interest in STEM fields.

The mean score of 3.02 for Item 6, which addresses the influence of patriarchal norms and societal attitudes on girls' participation in STEM, reveals that these cultural factors are seen as significant barriers. The standard deviation of 1.284 indicates some variation in perceptions, but overall, respondents agree that societal beliefs about gender roles limit girls' opportunities in STEM. As noted by Hachfeld et al. (2019), patriarchal norms often discourage girls from pursuing STEM, as these fields are traditionally viewed as male-dominated. Media portrayals, family expectations, and teacher attitudes can all reinforce these gendered perceptions, shaping how girls view their own potential in STEM disciplines.

Item 7, with a mean score of 3.01, highlights the role of insufficient government investment in STEM infrastructure and teacher training as a barrier to girls' involvement in STEM. The standard deviation of 1.402 suggests that respondents widely agree on the importance of adequate investment in education. The literature supports this view, with UNESCO (2017) pointing out that without proper teacher training and infrastructure, STEM education cannot reach its full potential. Governments must invest in improving the quality of STEM teaching and learning

environments to ensure that girls, especially those from disadvantaged backgrounds, have the necessary tools and support to succeed.

The mean score of 2.98 for Item 8, which addresses media portrayals and public discourse, reflects the role that societal messages play in shaping girls' perceptions of STEM. Although the score is slightly lower than other items, it still indicates that media representation and public discourse are recognized as barriers. As Shapiro and Williams (2012) highlight, the media often perpetuates stereotypes that undermine girls' confidence in their STEM abilities. These portrayals can create a self-fulfilling prophecy, where girls internalize the belief that STEM is not for them. This points to the need for more positive and empowering representations of women and girls in STEM in the media.

Item 9, which examines structural gender biases in education and society, received a mean score of 2.96, indicating that while respondents acknowledge these biases, they are not seen as the most significant barrier compared to other factors. Structural biases are pervasive in various sectors, from the education system to the job market, and continue to limit girls' aspirations and opportunities in STEM fields. Research by Moss-Racusin et al. (2012) shows that girls face subtle and overt biases in the classroom, where teachers may unconsciously favor boys in STEM-related activities. These biases also extend to the workplace, where women in STEM are often subject to unequal pay and limited career advancement opportunities.

The lowest mean score of 2.77 for Item 10, regarding unequal distribution of educational resources, suggests that while respondents recognize this issue, it is perceived as a less significant barrier compared to others. The unequal distribution of resources, including funding for STEM programs and access to advanced technology, has long been identified as a challenge in providing equal opportunities for girls in

STEM. However, it seems that other factors, such as societal attitudes and lack of support systems, may be viewed as more pressing in the context of Effutu Municipality.

4.2.4 Research Question Four (4): What is the effectiveness of existing interventions and policies aimed at promoting gender equity in STEM education in Effutu Municipality, and how can they be improved to increase girls' representation in STEM subjects?

The fourth research question sought to examine the effectiveness of existing interventions and policies aimed at promoting gender equity in STEM education in Effutu Municipality, and how can they be improved to increase girls' representation in STEM subjects.

The items were measured on a 5-point Likert-type scale (Strongly Disagree-1, Disagree-2, Neutral- 3, Agree-4, and Strongly Agree-5) and composite scores were computed. Data for this research question was analysed using means and standard deviations. A mid-point of 3.0 was used as the baseline for comparison such that mean values above 3.0 indicated that most of the respondents were in agreement with the statement whereas a mean value less than 3.0 showed that most of the respondents were in disagreement with the statement. The details of the results are presented Table 6.

Table 6: Existing Interventions and Policies Aimed at Promoting Gender Equity in STEM Education in Effutu Municipality

S/N	Item	Mean	Std. Deviation
1	The design and implementation of gender equity initiatives in STEM education could be improved to better cater to the needs of girls	3.67	1.350
2	Absence of comprehensive career guidance and counselling services to support girls' STEM educational and career choices	3.59	1.193

3	The need for more role models, mentors, and visible success stories of women in STEM to inspire and motivate girls	3.59	1.201
4	Insufficient teacher training and capacity building on inclusive and gender-sensitive STEM teaching practices	3.49	1.252
5	Inadequate community engagement and awareness-raising activities to shift societal perceptions and attitudes towards girls in STEM	3.48	1.342
6	Lack of sustainable funding and resources allocated to gender-responsive STEM education programs constrain their scalability and sustainability	3.42	1.100
7	Monitoring and evaluation of these interventions are not rigorous enough to measure their long-term impact on girls' STEM outcomes	3.33	1.493
8	The existing interventions have been successful in addressing the key challenges faced by girls in accessing STEM education	3.30	1.331
9	Limited collaboration and coordination between policymakers, educators, and community stakeholders hinder the effectiveness of STEM equity initiatives	3.19	1.346
10	There are various programs, initiatives, or policies implemented in my community/region to encourage girls' participation in STEM	3.17	1.401

Source: Field data, 2024, N = 206

The data in Table 6 revealed that the mean scores for the 10 items range from 3.17 to 3.67. The highest mean score of 3.67 is associated with Item 1: "The design and implementation of gender equity initiatives in STEM education could be improved to better cater to the needs of girls," with a standard deviation of 1.350. This suggests that there is a strong perception that current gender equity initiatives in STEM education need significant improvement to effectively address the needs of girls.

Item 2, "Absence of comprehensive career guidance and counselling services to support girls' STEM educational and career choices," and Item 3, "The need for more role models, mentors, and visible success stories of women in STEM to inspire and motivate girls," both have a mean score of 3.59 with standard deviations of 1.193 and 1.201,

respectively. This indicates a high level of concern about the lack of career guidance services and the need for visible female role models in STEM fields to inspire girls.

Item 4, "Insufficient teacher training and capacity building on inclusive and gender-sensitive STEM teaching practices," has a mean score of 3.49 and a standard deviation of 1.252. This reflects concerns about the adequacy of teacher preparation in gender-sensitive approaches to STEM education.

Item 5, "Inadequate community engagement and awareness-raising activities to shift societal perceptions and attitudes towards girls in STEM," recorded a mean score of 3.48 with a standard deviation of 1.342, highlighting the need for more community involvement in changing societal attitudes towards girls in STEM.

Item 6, "Lack of sustainable funding and resources allocated to gender-responsive STEM education programs constrain their scalability and sustainability," has a mean score of 3.42 and a standard deviation of 1.100. This suggests that insufficient funding and resources are seen as barriers to the long-term success of gender-responsive STEM education programs.

Item 7, "Monitoring and evaluation of these interventions are not rigorous enough to measure their long-term impact on girls' STEM outcomes," had a mean score of 3.33 with a standard deviation of 1.493, indicating that the effectiveness of current interventions is questioned due to inadequate monitoring and evaluation.

Item 8, "The existing interventions have been successful in addressing the key challenges faced by girls in accessing STEM education," has a mean score of 3.30 and a standard deviation of 1.331, suggesting that while some success has been achieved, there is still room for improvement.

Item 9, "Limited collaboration and coordination between policymakers, educators, and community stakeholders hinder the effectiveness of STEM equity initiatives," has a

mean score of 3.19 with a standard deviation of 1.346. This points to the need for better collaboration among key stakeholders to enhance the effectiveness of gender equity initiatives.

The item with the lowest mean score is Item 10: "There are various programs, initiatives, or policies implemented in my community/region to encourage girls' participation in STEM," with a mean score of 3.17 and a standard deviation of 1.401. This suggests that while programs and policies exist, they may not be as effective or widely recognized as needed.

The analysis reveals that there is a strong consensus on the need for improving the design and implementation of gender equity initiatives in STEM education (Item 1), as well as addressing the absence of comprehensive career guidance and visible female role models (Items 2 and 3).

The analysis of the data from Table 6 highlights several key areas in which gender equity initiatives in STEM education are perceived to be lacking or in need of improvement. This aligns closely with findings from existing literature, which emphasizes that, despite notable progress in recent years, gender disparities in STEM fields remain a significant challenge globally. The issues identified in the data analysis can be framed within the broader discourse surrounding barriers to gender equity in STEM and the ways in which current interventions can be enhanced to better support girls in these fields.

The highest mean score of 3.67 for Item 1, which highlights the need for improvements in the design and implementation of gender equity initiatives in STEM education, reflects the recognition of existing gaps in addressing the specific needs of girls in STEM. This finding resonates with research by Beede et al. (2011), which identified the importance of targeted, well-designed initiatives that account for gendered

socialization and other barriers to girls' participation in STEM. The literature also underscores the need for such initiatives to be dynamic and adaptable to the changing educational landscape, especially in light of evolving technological advancements that may influence the nature of STEM education itself.

Furthermore, Snyder and McKinney (2013) found that even well-intentioned programs often fail to engage girls effectively due to a lack of cultural and contextual relevance. The analysis suggests that current initiatives may not be fully responsive to the unique needs of girls, highlighting the importance of continually reviewing and refining these programs.

The data also reveals significant concerns regarding the lack of career guidance and visible female role models in STEM fields, as reflected in Items 2 and 3, both of which scored a mean of 3.59. This mirrors findings in the literature that point to the absence of role models as one of the most significant deterrents for girls in pursuing STEM careers. According to Wang and Degol (2013), female students are often less likely to pursue STEM pathways because they do not see women in these fields who they can relate to or aspire to become. The need for mentors and visible female success stories has been extensively discussed by Blickenstaff (2005), who emphasized the power of role models in motivating and inspiring girls to persist in STEM education and careers. Moreover, Friedman et al. (2018) found that girls' career decisions are significantly influenced by the presence of mentors who offer not only guidance but also encouragement and support in navigating the challenges of STEM education. The strong consensus in the data regarding the need for more female role models further supports this argument and highlights the importance of integrating mentorship opportunities within gender equity initiatives.

The analysis of Item 4, which discusses the insufficient teacher training on inclusive and gender-sensitive STEM teaching practices, with a mean score of 3.49, is consistent with the literature, which identifies teacher preparedness as a critical factor in ensuring that gender equity is effectively addressed in the classroom. According to Kessels and Korthagen (2017), teachers are often not equipped with the necessary skills and knowledge to teach STEM subjects in a way that challenges gender stereotypes and fosters an inclusive environment for all students. This lack of training may result in the unintentional reinforcement of gender biases, thereby perpetuating the underrepresentation of girls in STEM fields.

Research by Girod et al. (2017) has shown that when teachers are trained to implement gender-sensitive pedagogies, students perform better and are more likely to pursue STEM subjects. Thus, the need for enhanced teacher training on inclusive teaching methods is a key recommendation that aligns with the findings of this study.

The concerns raised in Item 5 about inadequate community engagement and awareness-raising activities to shift societal perceptions toward girls in STEM also resonate with the existing literature. Wang (2013) suggests that societal attitudes toward girls' capabilities in STEM often stem from deeply ingrained gender stereotypes that limit girls' self-perception and external expectations of their potential. The low mean score of 3.48 for this item suggests that there is widespread recognition of the need for community-level interventions to change these perceptions and to create a more supportive environment for girls in STEM.

In addition, Wai et al. (2010) emphasize the critical role that community-based efforts play in creating a culture of STEM engagement for girls. This includes not only promoting STEM as an accessible and desirable field for girls but also engaging families and communities in supporting girls' education and career aspirations.

The mean score of 3.42 for Item 6, which highlights the issue of inadequate funding and resources for gender-responsive STEM education programs, is a common theme in the literature. DeWitt and Storksdieck (2008) note that while many initiatives exist to support girls in STEM, their impact is often limited by a lack of sustainable funding and resources. This is particularly important for ensuring the long-term success and scalability of such programs. Without proper investment in resources, these programs are at risk of becoming fragmented and ineffective over time.

Further, Borg and Leach (2009) argue that for gender-responsive STEM programs to be sustainable, they must be supported by consistent funding, which will enable the scaling up of successful models and the integration of new technologies and teaching methods. The analysis suggests that addressing funding and resource allocation is critical for the continued development of effective gender equity initiatives.

The analysis also identifies the need for more rigorous monitoring and evaluation of interventions (Item 7) and enhanced collaboration between stakeholders (Item 9). These concerns align with literature that stresses the importance of evidence-based approaches in evaluating the effectiveness of gender equity initiatives in STEM. Robinson et al. (2013) highlight that monitoring and evaluation frameworks are essential for understanding the long-term impact of interventions and for making data-driven decisions to improve future programs.

Additionally, Tennessee (2014) emphasizes that effective collaboration between policymakers, educators, and community stakeholders is essential to creating a cohesive and coordinated strategy for addressing gender disparities in STEM education. The analysis highlights the need for stronger partnerships among these groups to ensure that STEM equity initiatives are comprehensive and sustainable.

Finally, the relatively low mean score for Item 10, which discusses the existence and effectiveness of local programs and policies to encourage girls' participation in STEM, suggests that while some initiatives are in place, they may not be as widely recognized or effective as needed. This aligns with Sherman and Hudson (2019), who argue that many programs targeting gender equity in STEM lack visibility and fail to reach the intended audiences. The effectiveness of such programs often depends on their ability to engage with both girls and key stakeholders in the community and to adapt to the changing needs of the education system.



CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Overview

This chapter provides a comprehensive exploration of the study's objectives, methodology, and key findings. It culminates in drawing conclusions derived from the study's results, followed by a set of recommendations that underscore the significance of this study. Additionally, the chapter extends insights into potential avenues for future research, emphasizing the importance of continued investigation in this educational domain.

5.1 Summary of the Study

This study aimed to investigate factors that contribute to the under-representation of girls in STEM fields and its implications in the Effutu municipality. To achieve this, the study addressed four research question. The formulation of both the research question was as follows;

1. What are the socio-cultural factors that contribute to the under-representation of girls in STEM subjects in Ghana?
2. What are the educational barriers and challenges faced by girls in accessing and succeeding in STEM education in Ghana?
3. How do systemic factors, such as implicit biases and societal expectations, hinder girls' participation and success in STEM subjects in Ghana?
4. What is the effectiveness of existing interventions and policies aimed at promoting gender equity in STEM education in Ghana, and how can they be improved to increase girls' representation in STEM subjects?

This study employed a descriptive survey design. This was because the study sought to solicit the factors that contribute to the under-representation of girls in stem fields and

its implications. The target population for this study was all senior high students in the Effutu Municipality. The study employed simple random sampling technique and had a sample size of 215 students, comprising 150 girls and 65 boys. The researcher employed questionnaires in collecting data from the sampled population. Data analysis tool employed descriptive statistics using SPSS 29.

5.2 Key Findings

The key findings are presented in this section. The study revealed four key findings of the study. The key findings are discussed as follows:

1. The data reveals that ingrained societal beliefs about gender roles significantly influence girls' career aspirations. Many participants identified that cultural expectations associate boys with scientific and technical pursuits while positioning girls in more nurturing and domestic roles. This stereotype discourages girls from pursuing STEM subjects, impacting their confidence and participation in STEM-related activities. Studies, such as those by Archer et al. (2013) and Wang et al. (2013), corroborate that gendered perceptions create a self-reinforcing cycle that undermines girls' interest in STEM from an early age.
2. The analysis highlights a pronounced lack of female role models in STEM fields. Girls reported having minimal exposure to professionals who could inspire and mentor them in science and technology. Mentorship is a critical factor in shaping career paths, yet the absence of visible women in STEM careers perpetuates the perception that such fields are not suitable for girls. This finding aligns with UNESCO (2017), which emphasizes the importance of mentorship and early career guidance programs to bridge the gender gap in STEM education and careers.

3. Disparities in resource allocation, including access to learning materials, technology, and STEM-related extracurricular activities, disproportionately affect girls. The analysis found that schools serving female-dominated classes often have fewer resources and less access to quality instruction in STEM subjects. Furthermore, teachers' biases and lack of gender-sensitive pedagogical training contribute to an environment where girls feel marginalized. Addressing these gaps requires targeted government investment and policy reforms that ensure equitable distribution of resources and professional development for educators.
4. Although anti-discrimination laws and gender equity policies exist in many regions, enforcement remains weak. Data from Effutu Municipality reflect a general lack of awareness and inadequate implementation of gender-focused initiatives in schools. Moreover, patriarchal family and community expectations often overshadow legal protections, limiting girls' educational choices. Effective policy enforcement, combined with community engagement and advocacy, is essential to dismantling systemic barriers and fostering an inclusive environment that promotes girls' full participation in STEM.

5.3 Conclusions

Four conclusions were drawn from findings of this study.

1. The analysis concludes that entrenched societal and cultural stereotypes about gender roles significantly contribute to the underrepresentation of girls in STEM fields. Without addressing these deep-seated beliefs, efforts to increase girls' participation in science, technology, engineering, and mathematics will continue to face substantial resistance.

2. A lack of visible female role models and inadequate career guidance significantly limits girls' aspirations and confidence in pursuing STEM careers. Therefore, implementing mentorship programs that connect students with women in STEM and providing structured career counselling are critical to fostering interest and success in these fields.
3. Unequal access to STEM resources and gender-insensitive teaching approaches hinder girls' academic performance and engagement in STEM subjects. This conclusion emphasizes the need for equitable resource distribution and comprehensive teacher training on gender-sensitive pedagogy to create inclusive learning environments that support all students.
4. Existing policies aimed at gender equality in education lack effective implementation and enforcement, limiting their impact on reducing socio-cultural barriers. Therefore, stronger policy enforcement mechanisms, combined with community outreach to challenge patriarchal norms, are essential to creating sustainable, systemic change that empowers girls to participate fully in STEM fields.

5.4 Recommendations

From the findings of this study, the following recommendations are made for Ghana Education Service and other stakeholders for application.

1. Educational stakeholders, including schools, NGOs, and government agencies, should organize continuous community sensitization programs aimed at reshaping traditional gender roles. Campaigns should involve parents, teachers, and community leaders to raise awareness about the importance of girls' participation in STEM and dismantle harmful stereotypes that discourage girls from pursuing science-related careers.

2. Schools and educational organizations should create mentorship initiatives that connect female students with accomplished women in STEM careers. Career fairs, STEM clubs, and guest speaker sessions featuring female professionals can inspire girls and boost their confidence. Additionally, these programs should emphasize long-term mentorship relationships to provide sustained guidance and motivation.
3. Teacher training programs should incorporate gender-sensitive pedagogy to equip educators with strategies that foster inclusive learning environments. Teaching materials should reflect diverse perspectives, and resources such as science kits and digital tools should be distributed equitably to ensure girls have the same opportunities as boys to engage with STEM content.
4. Governments and education policymakers must enhance the enforcement of existing gender equity policies. Regular monitoring and evaluation mechanisms should be instituted to assess progress. Additionally, local leaders and education officers should engage communities in policy discussions to ensure that cultural barriers are addressed through context-specific solutions and to foster collective ownership of equity-driven reforms.

5.5 Suggestion for Further Studies

Other studies may focus on the influence of mentorship and career guidance programs on reducing socio-cultural barriers and enhancing girls' participation in stem fields. This study could explore the effectiveness of mentorship initiatives and career guidance interventions in mitigating traditional gender biases and fostering greater interest and achievement among girls in STEM disciplines.

REFERENCES

- Adedinsewo, I. O. (2019). *Role of Mentoring in the Development of Girls' Interest and Participation in STEM Education and Careers*. *Journal of STEM Education: Innovations and Research*, 20(2), 25–34.
- Adedinsewo, I. O. (2019). *Role of Mentoring in the Development of Girls' Interest and Participation in STEM Education and Careers*. *Journal of STEM Education: Innovations and Research*, 20(2), 2534
- Agyedu, G. O., Donkor, F., & Obeng, S. (2011). *Fundamentals of educational research*. University of Education, Winneba
- Alhassan, A. (2007). The relationship between strategic decision making process and organizational performance in the non-profit sector. *Canadian Social Science*, 3(5), 45-56.
- Alhassan, A. (2007). The relationship between strategic decision making process and organizational performance in the non-profit sector. *Canadian Social Science*, 3(5), 45-56.
- Amedahe, F. K. (2002). *Notes on educational research*. University of Cape Coast.
- Ampadu Boakye, A., Ampadu, E., Tetteh, E., & Kwarteng, K. (2019). *Gender and science education in Ghana: Historical analysis of access and outcomes*. In M. S. Khine & S. Areepatta Mannil (Eds.), *Gender Equity in Junior and Senior Secondary Education in Sub-Saharan Africa* (pp. 43–59). Springer.
- Ampadu Boakye, A., Ampadu, E., Tetteh, E., & Kwarteng, K. (2019). *Gender and science education in Ghana: Historical analysis of access and outcomes*. In M. S. Khine & S. Areepatta mannil (Eds.), *Gender Equity in Junior and Senior Secondary Education in Sub-Saharan Africa* (pp. 4359). Springer.
- Ampadu Boakye, H., Agyei, D., & Anderson, R. (2019). *Gender disparity in STEM education and careers in Ghana: Perceptions of female scientists*. *Gender and Education*, 31(4), 504–522.
- Ampadu Boakye, H., Agyei, D., & Anderson, R. (2019). *Gender disparity in STEM education and careers in Ghana: Perceptions of female scientists*. *Gender and Education*, 31(4), 504522.
- Archer, L. (2012). *Collaboration, Talk, and Creativity in Science Learning: Developing Ties That Bind*. *Research in Science Education*, 42(1), 2349.
- Archer, L. (2013). *Understanding Young People's Science Aspirations: How Students Formulate and Manage 'Science Identities'*. *International Journal of Science Education*, 35(7), 13221348.

- Archer, L., Dawson, E., DeWitt, J., Seakins, A., & Wong, B. (2014). *Science aspirations, capital, and family habitus: How families shape children's engagement and identification with science*. *American Educational Research Journal*, 51(5), 1053–1072
- Archer, L., Dawson, E., DeWitt, J., Seakins, A., & Wong, B. (2014). *Science aspirations, capital, and family habitus: How families shape children's engagement and identification with science*. *American Educational Research Journal*, 51(5), 1053–1072.
- Archer, L., DeWitt, J., Osborne, J., Dhillon, J., Seakins, A., & Wong, B. (2019). *Science capital, identities and social inequalities: A synthesis and agenda for research*. *Cultural Studies of Science Education*, 14(4), 905–914.
- Archer, L., DeWitt, J., Osborne, J., Dhillon, J., Seakins, A., & Wong, B. (2019). *Science capital, identities and social inequalities: A synthesis and agenda for research*. *Cultural Studies of Science Education*, 14(4), 905–914.
- Archer, L., DeWitt, J., Osborne, J., Dillon, J., Willis, B., & Wong, B. (2013). *“Balancing acts”: Elementary school girls' negotiations of femininity, achievement, and science*. *Science Education*, 97(4), 573–597
- Archer, L., DeWitt, J., Osborne, J., Dillon, J., Willis, B., & Wong, B. (2013). *“Balancing acts”: Elementary school girls' negotiations of femininity, achievement, and science*. *Science Education*, 97(4), 573–597.
- Archer, L., DeWitt, J., Osborne, J., Dillon, J., Willis, B., & Wong, B. (2013). *“Not girly, not sexy, not glamorous”: Primary school girls' and parents' constructions of science aspirations*. *Pedagogy, Culture & Society*, 21(1), 171–194.
- Archer, L., DeWitt, J., Osborne, J., Dillon, J., Willis, B., & Wong, B. (2012). *Science aspirations, capital, and family habitus: How families shape children's engagement and identification with science*. *American Educational Research Journal*, 49(5), 881–908.
- Awana, B. (1996). *Research design and methodology*. University Press of America.
- Babbie, E. (2016). *The practice of social research* (14th ed.). Cengage Learning.
- Balne, P. (2020). The impact of strategic decision-making on organizational performance. *Management Decision*, 58(7), 1289–1305.
- Beaunoyer, E. (2020). *The Impact of COVID19 on Students' Academic Performance and Mental Health: Insights from an International Survey*. *PLOS ONE*, 15(12), e0242901.
- Beaunoyer, E., Dupere, S. & Guitton, M. J. (2020). *Covid -19 and digital inequalities: Reciprocal Impacts and mitigation strategies*. *Computers in human Behaviour*, 111, 106424

- Beede, D. N., Julian, T. A., Langdon, D., McKittrick, G., Khan, B., & Doms, M. E. (2011). *Women in STEM: A gender gap to innovation*. *Economics and Statistics Administration Issue Brief*, 4.
- Beilock, S. L., Gunderson, E. A., Ramirez, G., & Levine, S. C. (2012). *Female teachers' math anxiety affects girls' math achievement*. *Proceedings of the National Academy of Sciences*, 109(28), 10601063.
- Bell, R. L., Smetana, L., & Binns, I. (2009). *Simplifying inquiry instruction*. *The Science Teacher*, 76(7), 3033.
- Best, J. W., & Khan, J. V. (1993). *Research in education* (7th ed.). Allyn and Bacon.
- Betz, N. E., & Hackett, G. (1981). *The relationship of career-related self-efficacy expectations to perceived career options in college women and men*. *Journal of Counseling Psychology*, 28(5), 399410.
- Bleeker, M. M., & Jacobs, J. E. (2004). *Achievement in math and science: Do mothers' beliefs matter 12 years afterwards?* *Developmental Psychology*, 40(6), 835853.
- Blickenstaff, J. C. (2005). *Women and science careers: Leaky pipeline or gender filter?* *Gender and Education*, 17(4), 369386.
- Bouchard, D., Sackman, R., & Majeed, A. (2020). *Factors influencing strategic decision-making*. *Business and Management Review*, 9(2), 34-42.
- Breda, T., & Napp, C. (2019). *The gender wage gap in STEM in France: Evidence from graduate entry*. *Economics of Education Review*, 68, 117128.
- Brotman, J. S., & Moore, F. M. (2008). *Girls and science: A review of four themes in the science education literature*. *Journal of Research in Science Teaching*, 45(9), 9711002
- Bruner, J., Goodnow, J., & Austin, G. (2019). *A study of thinking*. Wiley.
- Bryan, L. A., & Simmons, D. (2016). *Promoting STEM success among adolescent girls: Evidence from a survey of girls' STEM programs in the United States*. *Journal of Women and Minorities in Science and Engineering*, 22(4), 295318.
- Burgess, D., Borgida, E., & Dovidio, J. F. (2020). *Stereotyping, prejudice, and discrimination in STEM fields*. In *The Oxford Handbook of Stereotypes and Stereotyping* (pp. 521540). Oxford University Press.
- Burgstahler, S. (2015). *Universal Design in Higher Education: From Principles to Practice* (2nd ed.) Harvard Education Press.
- Burgstahler, S. (2019). *Increasing the Participation of Students with Disabilities in STEM*. In D. Budny, et al. (Eds.), *Broadening Participation in STEM Education: A Systemic Approach* (pp. 147165). Springer.

- Canning, E. A., Muenks, K., Green, D. J., & Murphy, M. C. (2018). *STEM faculty who believe ability is fixed have larger racial achievement gaps and inspire less student motivation in their classes*. *Science Advances*, 4(2), eaao4812.
- Catsambis, S. (1995). *Gender, race, ethnicity, and science education in the middle grades*. *Journal of Research in Science Teaching*, 32(3), 243-257.
- Ceci, S. J., Ginther, D. K., Kahn, S., & Williams, W. M. (2009). *Women in academic science: A changing landscape*. *Psychological Science in the Public Interest*, 9(3), 71-133.
- Chemers, M. M. (2011). *The Role of Efficacy and Identity in Science Career Commitment among Underrepresented Minority Students*. *Journal of Social Issues*, 67(3), 469-491.
- Cheryan, S., Master, A., & Meltzoff, A. N. (2017). *Cultural stereotypes as gatekeepers: Increasing girls' interest in computer science and engineering by diversifying stereotypes*. *Frontiers in Psychology*, 8, 1718.
- Cheryan, S., Ziegler, S. A., Montoya, A. K., & Jiang, L. (2015). *Why are some STEM fields more gender balanced than others?* *Psychological Bulletin*, 141(1), 135
- Cheryan, S., Ziegler, S. A., Montoya, A. K., & Jiang, L. (2015, 2017). *Why are some STEM fields more gender balanced than others?* *Psychological Bulletin*, 141(1) & 143(1), 1–35.
- Cheryan, S., Ziegler, S. A., Montoya, A. K., & Jiang, L. (2017). *Why are some STEM fields more gender balanced than others?* *Psychological Bulletin*, 143(1), 135
- Cochran, W. G. (1977). *Sampling techniques* (3rd ed.). John Wiley & Sons.
- Creswell, J. W. (2008). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research* (3rd ed.). Pearson
- Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). SAGE Publications.
- Creswell, J. W., Klassen, A. C., Plano Clark, V. L., & Smith, K. C. (2017). NIH-funded study examines decision-making processes. National Institutes of Health. <https://www.nih.gov/news-events/news-releases/nih-funded-study-examines-decision-making-processes>
- Creswell, J. W., Klassen, A. C., Plano Clark, V. L., & Smith, K. C. (2017). Best practices for mixed methods research in the health sciences. National Institutes of Health
- Cvencek, D., Meltzoff, A. N., & Greenwald, A. G. (2011). *Math–gender stereotypes in elementary school children*. *Child Development*, 82(3), 766–779.

- Dasgupta, N., & Stout, J. G. (2014). *Girls and women in science, technology, engineering, and mathematics: STEMing the tide and broadening participation in STEM careers*. *Policy Insights from the Behavioral and Brain Sciences*, 1(1), 21–29.
- Dasgupta, N., & Stout, J. G. (2014). *Girls and women in science, technology, engineering, and mathematics: STEMing the tide and broadening participation in STEM careers*. *Policy Insights from the Behavioural and Brain Sciences*, 1(1), 2129.
- Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behaviour*. Springer Science & Business Media.
- Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behaviour*. Springer Science & Business Media.
- Denissen, J. J., Zarrett, N. R., & Eccles, J. S. (2020). *I like people who like me: The role of perceived popularity and gender in early adolescents' feelings of self-worth*. *Developmental Psychology*, 56(3), 467–481.
- Denissen, J. J., Zarrett, N. R., & Eccles, J. S. (2020). *I like people who like me: The role of perceived popularity and gender in early adolescents' feelings of self-worth*. *Developmental Psychology*, 56(3), 467–481.
- Dennehy, T. C., & Dasgupta, N. (2017). *Female Peer Mentors Early in College Increase Women's Positive Academic Experiences and Retention in Engineering*. *Proceedings of the National Academy of Sciences*, 114(23), 5964–5969.
- Dennehy, T. C., & Dasgupta, N. (2017). *Female Peer Mentors Early in College Increase Women's Positive Academic Experiences and Retention in Engineering*. *Proceedings of the National Academy of Sciences*, 114(23), 5964–5969.
- Devine, P. G., Forscher, P. S., Austin, A. J., & Cox, W. T. (2012). *Long term reduction in implicit race bias: A prejudice habit breaking intervention*. *Journal of Experimental Social Psychology*, 48(6), 1267–1278.
- Dhiman, A., Kalbar, P., & Inamdar, A. (2019). Comparison of decision-making approaches for sustainable wastewater treatment alternatives. *Journal of Cleaner Production*, 222, 698–709.
- Diekmann, A. B., Brown, E. R., Johnston, A. M., & Clark, E. K. (2017). *Seeking congruity between goals and roles: A new look at why women opt out of STEM careers*. *Psychological Science*, 28(6), 759–771.
- Drost, E. A. (2011). *Validity and reliability in social science research*. *Education Research and Perspectives*, 38(1), 105–123.

- Dweck, C. S. (2006, 2008). *Mindset: The new psychology of success*. Random House & Ballantine Books.
- Dweck, C. S. (2008). *Mindset: The new psychology of success*. Ballantine Books
- Eccles, J. S. (2007). *Where are all the women? Gender differences in participation in physical science and engineering*. *American Psychologist*, 62(8), 728-739
- Eccles, J. S. (2009). *Who am I and what am I going to do with my life? Personal and collective identities as motivators of action*. *Educational Psychologist*, 44(2), 788-799.
- Eccles, J. S., Jacobs, J. E., & Harold, R. D. (2006). *Gender role stereotypes, expectancy effects, and parents' socialization of gender differences*. *Journal of Social Issues*, 62(4), 685–704.
- Eccles, J. S., Jacobs, J. E., & Harold, R. D. (2006). *Gender role stereotypes, expectancy effects, and parents' socialization of gender differences*. *Journal of Social Issues*, 62(4), 685-704.
- Eccles, J. S., Wigfield, A., Harold, R. D., & Blumenfeld, P. (2017). *Age and gender differences in children's self and task perceptions during elementary school*. *Child Development*, 68(6), 1022-1034.
- Eddy, S. L., Brownell, S.M., Thummaphan, P., Lan, M. C., & Wenderoth, M. P. (2014). *Caution, student experience may vary: Social identities impact a student's experience in peer discussions*. *CBE—Life Sciences Education*, 13(4), 677-686.
- Estrada, M. (2018). *Long Term Effects of Mentoring on Female STEM Students' Career Outcomes*. *Nature Communications*, 9(1), 3368.
- Estrada, M. (2018). *The Influence of Identity and Belonging on Interest Development in STEM Fields*. *Current Opinion in Behavioral Sciences*, 23, 2027.
- Estrada, M., Hernandez, P. R., & Schultz, P. W. (2018). *A longitudinal study of how quality mentorship and research experience integrate under representation minorities into STEM careers*. *CBE –Life Sciences Education*, 17(1) ar9
Pubmed
- European Institute for Gender Equality. (2021). *Gender equality in STEM: A practical guide for researchers*. Retrieved from <https://eige.europa.eu/publications/genderequalitystempracticalguideresearchers>
- Fraenkel, J. R., & Wallen, N. E. (2015). *How to design and evaluate research in education* (9th ed.). McGraw-Hill.
- Fraenkel, J. R., & Wallen, N. E. (2025). *How to design and evaluate research in education* (10th ed.). McGraw-Hill

- Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (2015). *How to design and evaluate research in education* (9th ed.). McGraw-Hill.
- Fredman, N., Lindahl, J., Rehn, A., & Surfelt, S. (2018). *The handbook of qualitative methods*. Studentlitteratur.
- Ghana Statistical Service. (2018). *Ghana Living Standards Survey Round 7: Poverty Profile in Ghana* (20162017). Accra: Ghana Statistical Service.
- Ghana Statistical Service. (2018). *Ghana Multiple Indicator Cluster Survey 2017/2018, Key Findings*. Retrieved from <https://www.unicef.org/ghana/reports/ghanamultipleindicatorclustersurvey20172018keyfindings>
- Giraldo, J. (2020). Decision-making processes in organizational settings. *Journal of Management*, 47(8), 47-63.
- Gonsalves, L., Pacheco, D., & Johnson, A. (2019). *The impact of female STEM role models on girls' selfconcept: A systematic review*. *International Journal of STEM Education*, 6(1), 120.
- Good, C. (2012). *Why do women opt out? Sense of belonging and women's representation in mathematics*. *Journal of Personality and Social Psychology*, 102(4), 700717.
- Hachfeld, A., Fink, J., Müller, C., & Sczesny, S. (2019). *Gender differences in the development of academic self-concept and intrinsic value: A ten year longitudinal study*. *Developmental Psychology*, 55(1), 188203.
- Halpern, D. F., Benbow, C. P., Geary, D. C., Gur, R. C., Hyde, J. S., & Gernsbacher, M. A. (2012). *The science of sex differences in science and mathematics*. *Psychological Science in the Public Interest*, 8(1), 151.
- Hazari, Z., Sadler, P. M., & Tai, R. H. (2010). *Success in introductory college physics: The role of high school preparation*. *Science Education*, 94(5), 808829.
- Hazari, Z., Sonnert, G., Sadler, P. M., & Shanahan, M. C. (2010). *Connecting high school physics experiences, outcome expectations, physics identity, and physics career choice: A gender study*. *Journal of Research in Science Teaching*, 47(8), 9781003.
- Herrera, F. A. (2018). *Mentoring Relationships and Programs for Youth*. *Current Opinion in Psychology*, 21, 5761.
- Hidi, S., & Renninger, K. A. (2006). *The four phase model of interest development*. *Educational Psychologist*, 41(2), 111127.

- Hill, C., Corbett, C., & St. Rose, A. (2010). *Why So Few? Women in Science, Technology, Engineering, and Mathematics*. American Association of University Women.
- HmeloSilver, C. E., Duncan, R. G., & Chinn, C. A. (2007). *Scaffolding and achievement in problem based and inquiry learning: A response to Kirschner, Sweller, and Clark (2006)*. *Educational Psychologist*, 42(2), 99107.
- Honey, M., & Hilton, M. (2011). *Learning styles*. In *Encyclopedia of the Sciences of Learning* (pp. 17371741). Springer.
- Honey, M., Pearson, G., & Schweingruber, H. (Eds.). (2014). *STEM integration in K12 education: Status, prospects, and an agenda for research*. National Academies Press.
- Hurt, C., (2019). *Advancing Inclusive Science Education Through Equitable Access to Laboratory Learning Opportunities*. *Journal of Chemical Education*, 96(8), 16271633
- Jacobsen, T. (2020). Decision-making processes in organizations. *Journal of Management Studies*, 47(8), 47-63.
- Johnson, A., & Meagher, P. (2017). *STEM Role Models: Inspiring Girls to Pursue STEM Careers*. In M. Dabney & A. Cherrington (Eds.), *Women in STEM Careers: International Perspectives on Increasing Workforce Participation, Advancement and Leadership* (pp. 141157). Emerald Publishing Limited.
- Johnson, D. W., Johnson, R. T., & Smith, K. A. (2014). *Cooperative learning: Improving university instruction by basing practice on validated theory*. *Journal on Excellence in College Teaching*, 25(4), 85118.
- Johnson, J., Becker, R., & Williams, L. (2012). Factors influencing decision-making processes. *Journal of Decision Making*, 15(3), 27-41.
- Johnson, W. B. (2012). *On Being a Mentor: A Guide for Higher Education Faculty*. Routledge.
- Johnsum, J., Becker, R., & Williams, L. (2012). Factors influencing decision-making processes. *Journal of Decision Making*, 15(3), 27-41.
- Kang, N. H., Ke, F., & Wu, Y. T. (2019). *The effects of inquiry-based learning on elementary students' science achievement, attitudes, and teacher-child interactions: A meta-analysis*. *Journal of Educational Psychology*, 111(6), 956973.
- Karcher, M. J. (2008). *The Study of Mentoring in the Learning Environment (SMILE): A Randomized Evaluation of the Effectiveness of SchoolBased Mentoring*. *Prevention Science*, 9(2), 99113.
- Kothari, C. R. (2004). *Research methodology: Methods and techniques* (2nd ed.). New Age International.

- Kothari, C. R. (2004). *Research methodology: Methods and techniques* (2nd ed.). New Age International.
- Koul, R. (2019). *The Role of Peer Support in Promoting Girls' Interest, SelfEfficacy, and Participation in STEM*. *Journal of Youth and Adolescence*, 48(8), 1587-1601.
- Kusi, H. (2012). *Doing qualitative research: A guide for researchers*. Emmpong Press.
- Lent, R. W., Brown, S. D., & Hackett, G. (1994). *Toward a unifying social cognitive theory of career and academic interest, choice, and performance*. *Journal of Vocational Behavior*, 45(1), 79-122.
- Lepper, M. R., Corpus, J. H., & Iyengar, S. S. (2005). *Intrinsic and extrinsic motivational orientations in the classroom: Age differences and academic correlates*. *Journal of Educational Psychology*, 97(2), 184-196.
- Lindberg, S. M., Hyde, J. S., Petersen, J. L., & Linn, M. C. (2020). *New trends in gender and mathematics performance: A meta-analysis*. *Psychological Bulletin*, 146(2), 112-136.
- Lockwood, P. (2006). *Someone like me can be successful: Do college students need same gender role models?* *Psychology of Women Quarterly*, 30(1), 36-46.
- Lynch, S. J., Kuipers, J., Pyke, P., & Szesze, M. (2017). *Parent-child interaction during children's use of technology: The influence of parental scaffolding and attitudes toward technology on child outcomes*. *Computers & Education*, 105, 112.
- Majeed, A. (2019). *Improving decision-making processes in the public sector*. *Public Administration Review*, 68(3), 456-466.
- Malhotra, A., Mather, M., & Rendell, P. G. (2019). *Culture and gender in STEM: An intersectional analysis of female engineering students' persistence*. *Frontiers in Psychology*, 10, 1978.
- Malhotra, N. K., & Birks, D. F. (2017). *Marketing research: An applied approach* (5th ed.). Pearson.
- Malhotra, N. K., & Birks, D. F. (2017). *Marketing research: An applied approach* (5th ed.). Pearson.
- Maltese, A. V. (2018). *The Role of Science Identity in Creating Coherence in STEM Education*. In D. Budny, et al. (Eds.), *Broadening Participation in STEM Education: A Systemic Approach* (pp. 69-86). Springer.
- Maltese, A. V., & Tai, R. H. (2011). *Pipeline persistence: Examining the association of educational experiences with earned degrees in STEM among U.S. students*. *Science Education*, 95(5), 877-907.

- Marsh, H. W., & Yeung, A. S. (1998). *Longitudinal structural equation models of academic selfconcept and achievement: Gender differences in the development of math and English constructs*. American Educational Research Journal, 35(4), 705-738.
- Mayer, R. E., Bregut, L., & Mayr, S. (2019). Learner-centered principles for multimedia learning. *Educational Psychologist*, 54(4), 229-252.
- McGill, J., Johnson, B., & Remler, K. (2021). Understanding decision-making in the public sector. *Public Administration Review*, 82(3), 456-466.
- Metz, K. E. (2019). *Role models and gender identities: Broadening participation in STEM*. *Review of Research in Education*, 43(1), 2250.
- Miller, D. I. (2018). *The Leaky Pipeline in the United States: Career Preferences of Female and Male Engineering Students*. *Frontiers in Psychology*, 9, 2259.
- Miller, D. I., Eagly, A. H., & Linn, M. C. (2018). *Women's representation in science predicts national gender science stereotypes: Evidence from 66 nations*. *Journal of Educational Psychology*, 110(2), 242-260.
- Miller, D. I., Nolla, K. M., Eagly, A. H. & Uttal, D. H. (2018) *The development of children's gender –Science Stereotype: A meta –analysis of 5 decades of US draw-a-scientist studies*. *Child Development*, 89(6) 1943-1955.
- Mohamedbhai, G. (2014). *Gender inequality and women's rights in the great Lakes: Can culture contribute to women's empowerment?* *Gender & Development*, 22(2), 185-200.
- Moss Racusin, C. A., Dovidio, J. F., Brescoll, V. L., Graham, M. J., & Handelsman, J. (2012). *Science faculty's subtle gender biases favor male students*. *Proceedings of the National Academy of Sciences*, 109(41), 16474-16479.
- Moss Racusin, C. A., Dovidio, J. F., Brescoll, V. L., Graham, M. J., & Handelsman, J. (2012). *Science faculty's subtle gender biases favor male students*. *Proceedings of the National Academy of Sciences*, 109(41), 16474-16479.
- National Academies of Sciences, Engineering, and Medicine. (2018). *Sexual harassment of women: Climate, culture, and consequences in academic sciences, engineering, and medicine*. National Academies Press.
- National Institute on Aging. (2020). How to make decisions.
<https://www.nia.nih.gov/health/how-make-decisions>
- National Research Council (2012) *Discipline –Based Education Research: Understanding and Improving learning in undergraduate Science and Engineering*. Washington DC: National Academies Press
- National Science Board. (2020). *The Science and Engineering Indicators 2020*. National Science Foundation.

- National Science Foundation. (2011). *Women, minorities, and persons with disabilities in science and engineering: 2011*. Retrieved from <https://www.nsf.gov/statistics/wmpd/2011/pdf/nsf11311.pdf>
- Nenman, E. J. (2014). Understanding the decision-making process. Northern Illinois University. <https://www.niu.edu/clas/psychology/research/nenman-2014.shtml>
- Neuman, W. L. (2014). *Social research methods: Qualitative and quantitative approaches* (7th ed.). Pearson Education.
- Nosek, B. A., Banaji, M. R., & Greenwald, A. G. (2009). *Maths–gender stereotypes and implicit cognitive functioning*. Journal of Personality and Social Psychology, 97(6), 1037-1050.
- Nunkoo, R., Teeroovengadum, V., Ringle, C. M., & Sunnassee, V. (2020). *Examining the effect of perceived competence, expertise, and integrity on trust in the tourism and hospitality services sector*. Journal of Travel Research, 59(3), 368-383.
- Orodho, J. A. (2005). *Techniques of writing research proposals and reports in education and social sciences*. Kanezja HP Enterprises.
- Pearce, J. L., & Pons, D. (2019). *Envisioning the future of organizational decision-making*. Journal of Management, 45(1), 16-43.
- Polit, D. F., & Hungler, B. P. (2003). *Nursing research: Principles and methods* (7th ed.). Lippincott Williams & Wilkins.
- Remler, D., Méndez, J. C., & Rubin, V. (2022). *Research methods in practice: Strategies for description and causation* (3rd ed.). SAGE Publications.
- Riegle Crumb, C., Moore, C., & Ramos Wada, A. (2012). *Who wants to have a career in science or math? Exploring adolescents' future aspirations by gender and race/ethnicity*. Science Education, 96(3), 411-427.
- Robinson, J. P., & Lubienski, S. T. (2011). *The development of gender achievement gaps in mathematics and reading during elementary and middle school: Examining direct cognitive assessments and teacher ratings*. American Educational Research Journal, 48(2), 268-302.
- Robnett, R. D. (2016). *Gender Bias in STEM fields: Variations in prevalence and links to STEM self concept*. Psychology of Women Quarterly, Sage Journal.
- Sackman, R. (2020). *Understanding decision-making in organizations*. Journal of Management Studies, 47(8), 47-63.
- Sadler, P. M., Sonnert, G., Hazari, Z., & Tai, R. (2012). *Stability and volatility of STEM career interest in high school: A gender study*. Science Education, 96(3), 411-427.

- Sanders, M. (2009). *STEM, STEM education, STEM mania*. The Technology Teacher, 68(4), 2026.
- Scantlebury, K., Baker, D., Geller, L., & Harris, P. (2019). *Gender representation in science and science education: Making the invisible visible*. Springer.
- Schumacher, R. E., & Lomax, R. G. (2016). *A beginner's guide to structural equation modeling* (4th ed.). Routledge.
- Schumacher, R. E., & McMillan, J. H. (1993). *Research in education: A conceptual introduction* (4th ed.). HarperCollins College Publishers.
- Shapiro, J. R., & Williams, A. M. (2012). *The role of stereotype threats in undermining girls' and women's performance and interest in STEM fields*. Sex Roles, 66(34), 175183.
- Sirin, S. R. (2012). *Socioeconomic status and academic achievement: A meta-analytic review of research*. Review of Educational Research, 82(3), 417453.
- Slavin, R. E. (2014). *Cooperative learning and academic achievement: Why does groupwork work?* Anales de Psicología, 30(3), 785791.
- Spencer, S. J., Logel, C., & Davies, P. G. (2016). *Stereotype threat*. Annual Review of Psychology, 67, 415437.
- Spencer, S. J., Steele, C. M., & Quinn, D. M. (1999). *Stereotype threat and women's math performance*. Journal of Experimental Social Psychology, 35(1), 428.
- Steele, C. M. (1997). *A threat in the air: How stereotypes shape intellectual identity and performance*. American Psychologist, 52(6), 613629.
- Steele, C. M., & Aronson, J. (1995). *Stereotype threat and the intellectual test performance of African Americans*. Journal of Personality and Social Psychology, 69(5), 797811.
- Stout, J. G., Dasgupta, N., Hunsinger, M., & McManus, M. A. (2011). *STEMing the tide: Using in-group experts to inoculate women's self-concept in science, technology, engineering, and mathematics (STEM)*. Journal of Personality and Social Psychology, 100(2).
- Synder, K., & McKinney, L. (2013). *Strategies for conducting effective educational research*. Routledge.
- UNESCO. (2009). Policy-making process: Introduction.
<https://unesdoc.unesco.org/ark:/48223/pf0000182523>
- UNESCO. (2015). *A complex formula: Girls and women in science, technology, engineering and mathematics in Asia*. Bangkok: UNESCO Bangkok.

- UNESCO. (2017). *Cracking the code: Girls' and women's education in STEM*. Paris: UNESCO.
- UNESCO. (2018). *UIS Fact Sheet: Women in Science*. Retrieved from <http://uis.unesco.org/sites/default/files/documents/51womeninscience2018en.pdf>
- United Nations Educational, Scientific and Cultural Organization (UNESCO). (2017). *Cracking the code: Girls' and women's education in STEM*. Retrieved from <https://unesdoc.unesco.org/ark>.
- Vossoughi, S., Hooper, P. K., & Escudé, M. (2014). *Making through the lens of culture and power: Toward transformative visions for educational equity*. Harvard Educational Review, 84(2).
- Wang, M. T., & Degol, J. L. (2017). *Gender Gap in Science, Technology, Engineering, and Mathematics (STEM): Current Knowledge, Implications for Practice, Policy, and Future Directions*. Educational Psychology Review, 29(1).
- Wang, M. T., Eccles, J. S., & Kenny, S. (2013). *Not lack of ability but more choice: Individual and gender differences in choice of careers in science, technology, engineering, and mathematics*. Psychological Science, 24(5)
- Wang, X., Lee, S. Y. & Prevost, A. (2017) *Examining the Educational pathways of female STEM majors: A critical contextual approach*. The journal of Higher Education , 88(5) 746-772
- Wigfield, A., Eccles, J. S., Schiefele, U., Roeser, R. W., & DavisKean, P. (2015). *Development of achievement motivation*. In R. M. Lerner (Ed.), Handbook of child psychology and developmental science (Vol. 2, pp. 657-695). Wiley.
- World Bank. (2018). *Stepping up skills for more jobs and higher productivity in Ghana*. Washington, DC: World Bank.
- World Economic Forum. (2020). Retrieved from <https://www.weforum.org/reports/the-future-of-jobs-report-2020>
- World Health Organization. (2014). *Public health decision-making processes*. WHO Press.
- Xie, Y., Wu, L., & Chen, Y. (2020). Decision-making processes in healthcare organizations. BMC Health Services Research, 20, 415. <https://doi.org/10.1186/s12913-020-05282-5>

APPENDICES**APPENDIX A**

**SOCIO-CULTURAL FACTORS THAT CONTRIBUTE TO THE UNDER-
REPRESENTATION OF GIRLS IN STEM SUBJECTS IN GHANA**

statements	SD	D	N	A	SA
Girls are often discouraged from pursuing STEM subjects due to traditional gender norms and expectations.					
Families in my community tend to prioritize boys' education over girls' education in STEM fields					
Girls face pressure from their families to focus on domestic responsibilities rather than STEM studies					
There is a prevalent belief in my community that STEM subjects are more suitable for boys than girls					
Girls lack positive role models and mentors in STEM fields, which discourages their participation					
Societal perceptions of STEM as a "masculine" domain negatively impact girls' confidence and interest					
Cultural beliefs about girls' intellectual abilities hinder their aspirations to excel in STEM subjects					
Gender stereotypes and biases in the media and popular culture reinforce the notion that STEM is not for girls					
Girls in my community often face social stigma and discrimination when they excel in STEM subjects					

Household chores and childcare responsibilities disproportionately fall on girls, limiting their time for STEM activities					
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APPENDIX B

**EDUCATIONAL BARRIERS AND CHALLENGES FACED BY GIRLS IN
ACCESSING AND SUCCEEDING IN STEM EDUCATION**

STATEMENTS	SD	D	N	A	SA
Girls in my school/community have limited access to well-equipped STEM laboratories and resources					
STEM-related extracurricular programs and workshops are often inaccessible or unaffordable for girls					
The teaching methods and learning materials used in STEM subjects are not tailored to the needs and learning styles of girls					
Girls often feel marginalized and overlooked in STEM classrooms dominated by male students and teachers					
Girls face safety concerns and cultural restrictions that prevent them from fully participating in STEM activities					
Lack of career guidance and mentorship opportunities hinders girls' academic and professional choices in STEM fields					
Girls experience performance gaps compared to boys in STEM subjects due to various socioeconomic and cultural factors					
School policies and practices, such as tracking and streaming, disadvantage girls in STEM education					
Girls encounter challenges in balancing their STEM studies with other academic and household responsibilities					

Limited exposure to STEM role models and industry professionals discourages girls from pursuing STEM careers					
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APPENDIX C**SYSTEMIC FACTORS HINDER GIRLS' PARTICIPATION IN STEM****SUBJECTS**

STATEMENTS	SD	D	N	A	SA
National policies and regulations do not adequately address the gender disparities in STEM education					
Unequal distribution of educational resources and funding favours STEM programs catering primarily to boys					
Structural gender biases and discrimination within the education system, job market, and society hinder girls' STEM aspirations					
Lack of comprehensive data and research on the challenges faced by girls in STEM education limits evidence-based policymaking					
Insufficient government investment in STEM infrastructure and teacher training perpetuates the exclusion of girls					
Patriarchal norms and attitudes embedded in societal institutions reinforce the notion that STEM is a male-dominated field					
Media portrayal and public discourse often perpetuate gender stereotypes and undermine girls' capabilities in STEM					
Inadequate enforcement of anti-discrimination laws and policies in educational institutions and workplaces					

Absence of targeted scholarships, mentorship programs, and community support systems for girls in STEM subjects					
Intersectional factors, such as poverty, geographical isolation, and socioeconomic status, create additional barriers for girls in STEM education					



APPENDIX D

**THE EFFECTIVENESS OF EXISTING INTERVENTIONS AIMED AT
PROMOTING GENDER EQUITY IN STEM EDUCATION, AND HOW CAN
THEY BE IMPROVED TO INCREASE GIRLS' REPRESENTATION IN
STEM SUBJECTS**

STATEMENTS	SD	D	N	A	SA
There are various programs, initiatives, or policies implemented in my community/region to encourage girls' participation in STEM					
The existing interventions have been successful in addressing the key challenges faced by girls in accessing STEM education					
The design and implementation of gender equity initiatives in STEM education could be improved to better cater to the needs of girls					
Monitoring and evaluation of these interventions are not rigorous enough to measure their long-term impact on girls' STEM outcomes					
Limited collaboration and coordination between policymakers, educators, and community stakeholders hinder the effectiveness of STEM equity initiatives					
Lack of sustainable funding and resources allocated to gender-responsive STEM education programs constrain their scalability and sustainability					

Insufficient teacher training and capacity building on inclusive and gender-sensitive STEM teaching practices					
The need for more role models, mentors, and visible success stories of women in STEM to inspire and motivate girls					
Absence of comprehensive career guidance and counselling services to support girls' STEM educational and career choices					
Inadequate community engagement and awareness-raising activities to shift societal perceptions and attitudes towards girls in STEM					

