UNIVERSITY OF EDUCATION, WINNEBA

DETERMINANTS OF GIRLS' PARTICIPATION IN SCIENCE, TECHNOLOGY, ENGINEERING AND MATHEMATICS (STEM) IN PUBLIC SENIOR HIGH SCHOOLS IN THE HOHOE MUNICIPALITY

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A dissertation in the Department of Educational Foundations, Faculty of Educational Studies, submitted to the School of Graduate Studies, in partial fulfilment of the requirements for the award of the degree of Post Graduate Diploma (Education) in the University of Education, Winneba

JULY, 2022

DECLARATION

Students' Declaration

I, Susan Enyonam Afedo, declare that this thesis, with the exception of quotations and references contained in published works which have all been identified and duly acknowledged, is entirely my own original work, and it has not been submitted, either in part or whole, for another degree elsewhere.

Signature:………………………………

Date: ……………………………………

Supervisor's Declaration

I, hereby declare that the preparation and presentation of this dissertation were supervised in accordance with guidelines laid down by the University of Education, Winneba.

Mr. Kweku Esia–Donkoh (Supervisor)

Signature: ………..……………………………

Date: …………………………………………

DEDICATION

I dedicate this work to my husband Mr Jerry John Tsorkor for his support and love during my studies and also my children Emmanuel Senam Tsorkor and Joshua Deladem Tsorkor. Finally to God Almightyfor his favour, love and mercy and protection throughtout this journey.

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Finally, my appreciation goes to all respondents who made it possible for me to obtain data for this study. I say may the Almighty God replenish your lost time and resources in multiple folds.

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ABSTRACT

Global statistics show that women are outnumbered by men in STEM activities, which has been the case for many centuries. More women than men drop out of science fields during studies or careers. Therefore, the purpose of the study is to examine the factors that influence students' choice of STEM programs in the Hohoe Municipality. The study is quantitative, and the descriptive survey design was employed. A random sampling technique was used to select STEM students for the study. Factor analysis was conducted to ascertain the factors influencing students' choice of STEM courses. Teachers' attitude towards girls in STEM programs is related to STEM-related courses. Home-related and role model-related factors are determinants of STEM courses choice in the Hohoe Municipality. The study recommends that the government of Ghana should organise STEM clinics in selected districts in Ghana to sensitise girls to various STEM-related careers that girls can pursue (e.g. teaching, medicine, laboratory work, or telecommunications engineering). STEM clinics have a strong potential for increasing girls' interest in science. This will help girls have a unique opportunity to interact with young female scientists and learn from the wide range of opportunities offered by studying STEM subjects.

CHAPTER ONE

INTRODUCTION

1.0 Background to the Study

Despite a promising job outlook in science, technology, engineering, and mathematics (STEM) fields, many students worldwide are reluctant to pursue those majors. The White House Council on Women and Girls, females account for just a quarter of STEM jobs in a still desperate field for experts, expected to grow by another 20% by 2022 (Murphy (2020). Access, achievement, and retention of female students in STEM continue to be major issues in Africa and Ghana during secondary and higher education. Recognising the importance of education in poverty reduction, the governments of Ghana and other African countries have prioritised the education of girls' children, especially in STEM programs (Mbano & Nolan, 2017). Many women and girls are still excluded from science education and employment, and Ghana is not an exception. Girls continue to underperform compared to boys in STEM subjects in secondary school (Quansah, Ankoma-Sey, & Dankyi, 2020).

Many factors affect girls' involvement in science, including a widespread misconception that science-related subjects are better suited to boys (Stoeger, Hopp, & Ziegler, 2017). This low female participation in STEM is also receiving attention, as Kwame Nkrumah University of Science and Technology (KNUST) is required to implement affirmative action in the 2016/2017 academic year due to concerns about low female enrollment in science and technology. It is estimated that less than 10% of female students currently study STEM (Quansah et al., 2020). Several studies have suggested reasons for girls' poor enrollment in STEM in various jurisdictions around the world, such as girls' interest and motivation in stem are shaped by their environment, social biases affecting women's career advancement and choices and inadequate role models (Agyapong, 2018; Kang et al., 2019).

As part of its educational reforms, Ghana's government has stated that they will introduce policies and programs to improve and upscale STEM study, starting at the primary level (Kang et al., 2019). The Ministry of Education and the Ministry of Environment, Science, Technology, and Innovation, who are in charge of this, are required to enrol more science students in the country's educational system to meet the initial goal of 60% science students in technical institutions (Yeboah-Bentil, 2017). To give impetus to the Ghana government's commitment, a minimum of 1% of GDP was dedicated to promoting research and development expenditure in STEM education (Abdul-Rahaman et al., 2020). It is also worth noting that school administrations will often force students with good grades to enrol in STEM-related courses to encourage girls to join the program. Although all of the government's and school administration's efforts are commendable, one must carefully examine the girls' ratio in STEM. The gender ratio in Ghana's population favours the boy's enrollment (Agyapong, 2018).

School-related factors such as teacher attitudes toward boys and girls, the decision to do STEM courses by coercion or by preference, the role of parents in their children's education and their level of education, and peer influence on children's STEM involvement are said to be the main causes of low participation of women in STEM (Fredricks, Hofkens, Wang, Mortenson, & Scott, 2018). Other factors include societal role models and their effect on girls in high schools or STEM programmes. Gender equality can be achieved only when all forms of discrimination against women and girls are abolished and equal conditions, care, and opportunities are given to girls and boys and women and men, according to the MDG3 (Fredricks et al., 2018). We are also far from achieving gender equality in education and gender equity in society globally (UNDP, 2018). The number of girls in STEM is alarmingly low, necessitating an investigation into the influencing factors that encourage girls in STEM (Teig, 2021).

1.1 Statement of the Problem

According to global statistics, women outnumber men in STEM activities, which has been the case for decades. More women than men drop out of science fields during their studies or careers, resulting in the so-called "leaky pipeline" (UNESCO, 2012). As a result, the premise is that childhood, conditioning, school management effect, and social gender norms all play a significant role in the science gender gap. Several studies have established several factors contributing to girls' underrepresentation in STEM programmes, such as Unproductive work environment, self-doubt and confidence, demanding schedules for STEM-related works, sexual harassment, lack of role models (Aeschlimann, Herzog, & Makarova, 2016; Bøe, Henriksen, Lyons, & Schreiner, 2011; Eccles & Wang, 2016).

Workshops have been arranged in Ghana to enable more girls to participate in STEM programmes. This is a commendable attempt to encourage girls to participate in the scheme. In all of its attendance expenditure, the representation of girls in STEM remains poor. In a similar vein, school administrators force girls to select STEM courses based on their test scores to increase female STEM courses participation. One flaw with the various stakeholders who help promote STEM in Ghana is that they use a one-size-fits-all strategy, assuming that the causes of low representation are common to all countries (Quansah et al., 2020).

There have been few studies in Ghana on factors influencing STEM courses' pursuit, especially those pursued on one's own volition or pressured by the school management. It is worth noting that, even if the causes of low female representation are the same or similar, the degree to which these factors affect the choice of STEM courses when school heads compel girls to do STEM-related courses based on their West African Basic Certificate Examination grades have not been explored in Ghana This research, therefore, examines factors accounting for voluntary or forced choice of STEM courses using a survey and quantitative methods. This study is unique because it identifies the various factors affecting girls' STEM courses choice in Senior High Schools, such as teacher-related factors, home-related factors, role models, peers, and personal goals and values. The current study sought to close the research gap by examining these factors that influence the STEM courses choice of girls in Senior High Schools in the Hohoe Municipality.

1.2 Purpose of the Study

The purpose of the study was to examine determinants of girls' participation in science, technology, engineering and mathematics (STEM) in public Senior High Schools in the Hohoe Municipality.

1.3 Objectives of the Study

The study sought to:

1. determine the teacher-related factors that influence the choices of STEM courses by girls in SHS in the Hohoe Municipality;
2. examine the home related-factors that encourage the choice of STEM in SHSs in the Hohoe Municipality;

3. investigate how role models in STEM professions encourage girls in SHSs in the Hohoe Municipality to choose STEM courses.

1.5 Research Questions

The following research questions were explored:

1. what are the teacher-related factors that influence girls' choices of STEM courses in SHS in the Hohoe Municipality?
2. What are the home-related related factors that encourage the choice of STEM in SHSs in the Hohoe Municipality?
3. How do role models in STEM professions encourage girls in SHSs in the Hohoe Municipality to choose STEM courses?

1.6 Significance of the Study

STEM education plays a crucial role in the government of Ghana's rapid growth because STEM-related careers are in high demand yearly. The study's findings will help the Ministry of Education formulate policies relating to STEM education in Ghana. Given that information and technology education is still in the inception stage in Ghana, proper policy frameworks in STEm targeting girls is paramount for Ghana's future development. The findings will also be beneficial to teachers at the various educational levels in Ghana. It will help them identify what they should do to encourage girls to pursue STEM-related courses. Parents of girls also have a very important role to play. Thus the current findings will help parents make the right decisions in helping their female wards in choosing the right programs of study.

Furthermore, it will contribute to the existing literature and serve as a reference for other relevant stakeholders in the education sector like educational NGOs, PTA, Ghana Education Service (GES), education directories in the regional and district levels to encourage more girls to enrol in STEM programmes.

1.7 Delimitation of the Study

The study includes female students from three senior high schools and a technical school in the Hohoe Municipality of Volta Region. The schools are Hohoe EP Senior High School, Likpe Senior High School, Alavanyo Senior High Technical School, Akpafu Senior High Technical School, Agate Senior High School and Afadjato Senior High Technical School. These schools are included in the study since they are public schools that offer STEM courses. One distinguishing feature of these schools is that they are a mix of endowed and less endowed schools and modern and relatively old public schools. The study also employed quantitative methods in investigating the determinants of girls' choice for STEM courses in the Hohoe Municipality.

1.8 Organisation of the Study

This study is divided into five chapters. Chapter One is the introduction that includes the research background, statement of the statement, purpose of the study, significance, and limitations. The second chapter is a literature review that focuses on the theoretical context and a review of applicable literature on the factors that affect girls' choice of STEM courses in high school and the theories and conceptual framework. It also provides a synthesis of the empirical literature analysis. Chapter Three discusses the research methodology, including the profile of the selected SHSs, data types and sources, study population and sample research instrument data processing, and data analysis. Chapter Four offers a presentation and review of outcomes of the factors affecting the STEM courses. It reports and explains the research results and summarises the findings of the review. Conclusions and guidelines are included in Chapter Five.

CHAPTER TWO

LITERATURE REVIEW AND HYPOTHESES

2.0 Introduction

This chapter reviews relevant theories relating to the subject under discussion. Thus theories that underpin the study were reviewed. In addition, relevant extant empirical literature was reviewed. The chapter ends with the conceptual framework that explains the relationship.

2.1 Theoretical Review

The study reviews important theories underpinning the research. These theories are the Implicit theory of intelligence, self-efficacy theory, and stereotyping.

2.1.1 Implicit theories of intelligence

According to Blackwell, Trzesniewski, and Dweck (2007), two implicit theories of intelligence describe how people view themselves as learners and how these beliefs shape their behaviours and motivations. The first is the entity theory of intelligence; learners holding this view will believe that intelligence and ability are fixed and stable gifts that one either has or has not. The second theory of intelligence is incremental; learners holding this view will perceive intelligence and ability as malleable and emergent, which can be developed through practice and dedication. Those learners with an entity view of intelligence, many of whom are female, tend to be vulnerable to declining performance and lose the desire to carry on in that field if they encounter difficulty in science education, whereas people with an incremental view of intelligence work hard, even when faced with difficulty (Blackwell et al., 2007).

Todor (2014) posits that a person's intelligence theory can be changed from entity to incremental through intervention and experience. Blackwell et al. (2007) achieved positive change in students' theory of intelligence by teaching them how the brain works, what kinds of physiological connections are being made during learning and how such repeated connections can increase intellectual ability. The students learnt that intellectual ability grows and develops over time; it is not fixed and static. From their study, Dinger and Dickhäuser (2013) were able to show how women are vulnerable and lose confidence when faced with obstacles and challenges in their learning, and ultimately when it comes to selecting and succeeding in STEM fields. They recommend not focusing on has scientific abilities or who does not, but instead on how best to foster and develop such abilities.

2.1.2 Self-efficacy Theory

Self-efficacy theory is worthy of discussion when understanding an individual's response in a learning situation. Self-efficacy is generally defined as a belief in one's own ability to complete a specific task and reach one's goals (Ormrod, 2006). Self-efficacy reflects how confident one is about performing specific tasks. A theory of self-efficacy predicts that individuals are more likely to engage in activities for which they have high self-efficacy and less likely to engage in those they do not (Van der Bijl & Shortridge-Baggett, 2001). Fencl and Scheel (2006) reported on studies that showed that self-efficacy is one of the most useful predictors of success and persistence. Self-efficacy was influenced by several personal experience factors, such as teacher and parent encouragement, successful grades, etc. (Fencl & Scheel, 2006). Other research indicates that the role played by successful female scientists, serving as role models for female students, should not be undervalued (Bamberger, 2014). Such role models work to counteract misinformation or stereotypes associated with STEM careers and provide opportunities for aspiring female STEM students to understand the day-to-day activities that are part of STEM-related careers (Kim et al., 2015). Understanding more about STEM-related careers has been shown to shape the development of self-efficacy and interest in STEM and long-term life goals (Wang & Degol, 2013).

2.1.3. Theory of Stereotyping

Gender stereotyping is known to exist in schools and workplaces. There are several ways in which the school reinforces sex typing. Sprinthall and OJa (1994) point out that schools often act to transmit the traditional values of the larger community in general. Gender role stereotypes are reinforced at home and at school, where it reflects society's view of what is considered gender appropriate. Downey and Feldman (1996) propose that school hallways present a very different world for males and females. Cabras and Mondo (2018), in agreement, note that various school and out of school factors have been found to combine to lower the academic performance and career aspirations of girls even when they remain in school.

Moreover, perceptions of individual women are filtered through stereotypes about their gender. For example, compared to men, women are stereotyped as less intelligent and less competent in mathematics and science (Lane, Goh, & Driver-Linn, 2012). Moreover, the cultural stereotype of the scientist as objective, rational, and single-minded is consistent with prescribed norms for men but counter to stereotypes and prescribed norms for women (Diekman & Steinberg, 2013).

2.2 Conceptual Review

This part of the literature review focused on extant literature relating to STEM, drawing on contemporary issues within the remit of factors influencing the choice of student girls in STEM programmes.

2.2.1 teacher-related factors that influence the choices of STEM courses by girls

School-related parameters such as teachers' attitudes towards boys and girls can be seen to be favourable or unfavourable, that is, either positive or negative (Sjøberg & Schreiner, 2014). Researchers have claimed repeatedly that there is the differential treatment of boys and girls in science lessons with teachers interacting more with boys than with girls, and that this has a crucial influence on students" attitudes, motivation and continuing participation and achievement in science subjects (Labudde, Herzog, Neuenschwander, Violi, & Gerber, 2014). In mixed-sex situations, male students have received more teacher attention than females in a classic study, showing that teachers tended to favour boys and were awarded higher marks if the piece of work was thought to have been written by a boy (Labudde et al., 2014).

Reiss (2018), in his study about gender effects on the interaction of boys and girls with their teachers in mixed-sex classes, found that the girl's participation in scientifically meaningful pupil-teacher utterances gradually declined throughout the study with the boys increasing their oral exchanges with the teacher and making a greater impression on the teacher by their assertiveness. In physics, particularly, the nature of the teacher-student relationship is more important for girls than boys (Sharp, 2014). It has been pointed out that although such relationships are important for all pupils, they are particularly useful in developing the positive self-concept of girls in physics (Whitelegg, Murphy, & Hart, 2017). Many studies have examined the teacher-student relationship. Schieber et al. (2014), in her meta-analysis of international research on gender differences in teacher-student interactions of the quantifiable data obtained from 81 studies from the UK, Canada, USA, Australia and Sweden, concluded that girls showed a willingness to participate in science lessons but did not receive their fair share of teachers' attention in class.

Boys tended to call out the answers to questions before selecting the teacher to answer. Though girls raised their hands, they received less attention and could not participate as much as the boys. Other studies focusing on science lessons have obtained similar findings (Schieber et al., 2014). It is very often reported that boys tend to dominate the classroom in physics and chemistry lessons in coeducational settings (Eliasson, Karlsson, & Sørensen, 2017). Female students tended to be quieter and less active in class (Fennema, Carpenter, Jacobs, Franke, & Levi, 2019). Thus, traditional sex-typing of the classroom environments gives science and mathematics a male image.

2.2.2 Home related-factors that encourage the choice of STEM in SHSs

Parent expectations socialise children's academic trajectories: The more parents encourage their children's after-school STEM activities, provide activity-related materials, and participate with them, the more children become interested in STEM (Simpkins, Fredricks, & Eccles, 2012). Parents' beliefs about their children's math ability and effort better predict children's confidence in math than children's actual math grades (Frome & Eccles, 2019). In middle and high school, mothers' (more than fathers') support predicts adolescent girls' motivation to persist in science and math (Leaper & Farkas, 2015). On the downside, on average, mothers apply gender stereotypes about math and science to their children more than fathers do (Frome & Eccles, 2019). In sum, parents are critical early socialisers of their children's academic interests. In a related study, it is observed that securing parents' support and "buy-in" is an excellent way to break down gender barriers and increase the number of girls in STEM.

Parents play a key part in their child's educational and later career choices. The socialisation of parents and gender stereotypes held by parents can drastically affect how they encourage or discourage their children from pursuing a certain career path. There is hard research showing that even small interventions with parents can significantly affect the academic courses their children enrol in (Oreopoulos, 2021). In a 2012 study published in Psychological Science, a journal of the Association for Psychological Science, researchers mailed parents of high school students two informational brochures, one at the beginning of the students' 10th year providing information about the importance of math and science courses, and a second brochure at the beginning of their 11th grade year, more focused on STEM careers and providing a link to a website dedicated to showcasing STEM careers (Simpkins et al., 2012). Their results demonstrated that the intervention had a noticeable effect on the courses that the students enrolled in: students whose parents received all the materials as part of the experimental group took more science and math classes in the last two years of high school than those who received no materials (Frome & Eccles, 2019).

While Gautam (2015) studies were concerned with gender issues in subject and career choices, other studies have explored other pertinent issues related to subject and career choices. Early work by Siann, Lightbody, Nicholson, Tait, and Walsh (2016) points out that family socioeconomic status influences career choices for the majority of the students. Parents encourage students to go for high status and well-paid professions. Furthermore, Siann et al. (2016) conclude that students' choices of subjects tend to be informed by their knowledge about possible careers when they make choices. This implies that students' support and guidance before making choices are important influences on students' choices and may keep students determined while working towards clear career goals. Moreover, if this is the case, students from high socio-economic status or where parents have higher education are more likely to have more knowledge of career and jobs at a time they make choices than those coming from a low socio-economic status where parents are not educated (Siann et al., 2016).

2.2.3 Role models in STEM professions and girls in STEM education

Career day presentations featuring women in STEM careers (if possible, find a graduate from the school who can highlight her experiences in school and her journey to her current high-tech career) can go a long way toward changing female students' beliefs about their ability to succeed in STEM courses and careers (Quansah et al., 2020). It is powerful for students to meet real-life female STEM professionals and speak with them face-to-face. Students love hearing about these women's school and career journeys and the obstacles and roadblocks they had to navigate along the way (Boucher, Fuesting, Diekman, & Murphy, 2017). In addition, mentoring plays a vital role in recruiting girls and keeping them excited and interested in STEM. It's meaningful for female students to see and hear passionate, successful professional women happily and profitably employed in a STEM field. By connecting girls with STEM professionals, the number who pursue and excel in STEM areas will increase significantly (Quansah et al., 2020).

Mentoring can open girls' eyes to the many high-tech and lucrative careers available to them and raise their awareness of the many opportunities out there, just waiting for them (Weber, 2011). In a related study, role models have been suggested to make a difference to girls"" interest in science as women role models may help engage them in science by de-stereotyping the objective and value-free image of science (Kelly, McGarr, Lehane, & Erduran, 2019). It has been argued that male teachers tend to predominate in the physical sciences, and girls could be less attracted to physical sciences due to the lack of female teachers acting as role models (García-Holgado, Verdugo-Castro, Sánchez-Gómez, & García-Peñalvo, 2020). However, Eggleston (2020) argued that science's teaching style is more important than the sex of the teacher. How more women acting as role models could encourage more girls to study the sciences has been explored by Jacob Clark Blickenstaff (2015). The latter argue that a critical mass of women scientists is a significant factor for girls in science and mathematics. One way of achieving this is through affirmative action, such as recruiting more role models at higher levels of science.

Interestingly, an initiative in the USA cautions against this; they contended that pupils retained a persistent stereotypical image of science despite efforts to change this by using role models (Buck, Clark, Leslie-Pelecky, Lu, & Cerda-Lizarraga, 2018). Furthermore, it has been argued that maternal interaction and socialisation have a particular influence on girls, indicating a gender similarity of girls with the mothers, whereas boys develop autonomy and separation from their mothers (Buck et al., 2018). Recent studies have pointed out that the gender of the teachers is not important; typically, young people prefer teachers who can forge a good relationship with them (Brownhill, Warwick, Warwick, & Brown Hajdukova, 2021). According to the United Nations Commission on the Status of Women Fifty-fifth session, Breda, Grenet, Monnet, and Van Effenterre (2021) report many causes of gender gaps in STEM activities. Science is associated with men and the liberal arts, with women in many societies. Such stereotypes derive from a multiplicity of sources. Socio-cultural norms, particularly in patriarchal societies, reinforce gender differences, resulting in girls opting for softer courses related to nurturing and caring (Breda et al., 2021).

Some of the traditional laws may reinforce these stereotypes. Such stereotypes can also affect girls' attitudes, participation, aspirations, and achievement in science subjects. Teaching materials can also spread negative perceptions about engendering the Sciences, such as using male figures in books to illustrate scientists (McNally, 2020). In addition, teachers' and parents' lack of proper mentorship and exposure to uninformed (or wrong) advice leads to negative attitudes to STEM careers. Such misconceptions must be addressed (McNally, 2020). The “stereotype threat” can influence individual performance and aspirations and result in national sex differences in science participation and achievement (Li & McLellan, 2021). Women's research and development output and internet usage are also affected, leading to detrimental consequences for career progression. The home and learning environment and workplace must be enabling (Li & McLellan, 2021).

Girls must be informed about careers, encouraged, inspired, mentored and motivated to feel that they can do as well as boys in science. The attitude factor can greatly determine one’s career options (Stevenson, 2020). The importance of role models at school (female teachers/professors), public office and industry cannot be overemphasised. This can be linked to the attachment of young women to experienced ones. The former can benefit greatly from being observers in such job shadowing training experiences. These attachments can lead to confidence development and exposure to existing networks resulting in career opportunities that would otherwise have been missed (Stevenson, 2020).

2.3 Conceptual Framework

According to Kothari (2004), a conceptual framework is a structure that presents the relationship between the main constructs in a given study. In the same vein, a conceptual framework explains how the researcher perceives the relationship between variables assumed to be important in a study (Mugenda, 2013). In this study, the proposed conceptual framework is as shown in figure 2.1.

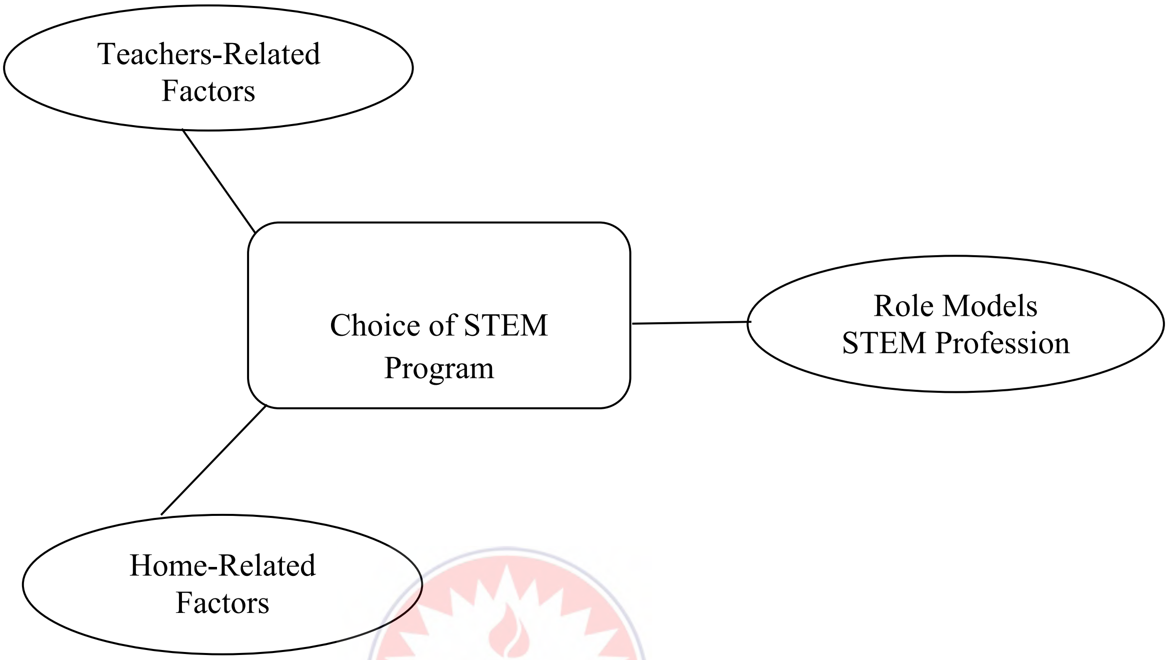

Figure 2.1 Conceptual Framework

Source: Author's Construct from Literature

Teachers-related factors influence girls are pursuing STEM courses, the influence of the parents on the student girl in pursuing STEM courses, the influence of the role models with careers in the STEM-related area. The conceptual framework also intimates a relationship between the choice of STEM courses and the factors that influence the choice of STEM. For example, teachers' attitudes towards students in STEM courses, such as guidance from teachers of STEM courses, the teaching and interest expressed by teachers in STEM courses, affect the choice of students to stay. Also, parents influence children's STEM course interests. Parents may encourage girls to do STEM activities and provide STEM materials at home, and they encourage girls to do it. At times fathers or mothers want girls to do STEM courses. Mothers think girls cannot do STEM courses due to stereotyping, while the parents' professions in STEM courses influence girls to do STEM courses. For instance, girls may choose the course because voluntarily they want to do it, or people think science is for boys, so girls should not do it, but they choose to challenge the status quo. In another vein, they know the carriers in the world that pay more and desire to earn big money, so they enrol in STEM courses. STEM courses do not allow practitioners to associate with other people very much because there is no time; hence girls who do not like social activities prefer it.

Role Models activities such as highlighting girls' and women's achievements in STEM may motivate girls to choose stem courses voluntarily if not even forced to. For instance, career day presentations featuring women in STEM, carriers and the high paying opportunities in STEM for women. As well as mentors guiding girls for the great careers available to those in STEM courses can influence the choice of the program. To add up, a mother may serve as a role model for girls in choosing STEM courses, or society's stereotyping effects may influence the choice of STEM.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This chapter of the study comprises the approaches, methods, and materials used in the execution of the study. The research paradigm, design, and approach are covered in this chapter. Additionally, the type and the source of data used in the study, the sample size and the measurement of variables of interest are discussed in this research section. The approach adopted in analysing data collected from the respondents is also presented in this chapter.

3.1 Research Approach

The study is quantitative and linked as the philosophy of science to the positivist model. The quantitative methodology, Gorard (2013), thought that the compilation and translation of data to numerical form could lead to mathematical calculations and conclusions (Langbroek & De Beuckelaer, 2007). Through questionnaires and inquiries or modifying past observational data with econometric methods, analytical and statistical, analytical, or computational data are also stressed. This technology requires a deliberate and detailed review and examination of determinants of girls' participation in science, technology, engineering and mathematics (STEM) in public Senior High Schools in the Hohoe Municipality.

3.2 Research Design

A descriptive study was used to explore and explain further by providing additional information about the study. The descriptive design describes in more detail by increasing our understanding of the study. The researcher adopted descriptive research to describe the prevailing situation at a particular time.

3.3 The Study Area

Hohoe Municipal is one of the Volta Region's 25 administrative districts in Ghana. It arose from the old Kpando District. The Legislative Instrument (L.I. 2072) of 2012 established it. The Municipality has a total land area of 1,172 km^2, accounting for 5.6% of the region's total land area (Ghana Statistical Service, 2013). It shares boundaries with the Republic of Togo on the east, constituting part of Ghana's international boundary; the Afadzato district and the Kpando Municipality on the southeast and southwest, respectively; the Hohoe Municipality on the north and the Biakoye districts on the northwest. Its capital, Hohoe, is about 78 kilometres from Ho, the regional capital, and 220 kilometres from Accra, the national capital. According to the 2010 Population and Housing Census, the population of Hohoe Municipality is 167,016 people, accounting for 7.9 percent of the total population of the Volta Region. It comprises 52.1 percent females and 47.9 percent men (Ghana Statistical Service, 2013).

In Hohoe, there are many private and public elementary schools. The following are educational institutions in Hohoe: The University of Health and Allied Sciences, St. Theresa's College of education, St. Francis College of Education, Hohoe Midwifery Training College. The senior high schools in the Municipality are Hohoe EP Senior High School, Likpe Senior High School, Alavanyo Senior High Technical School, Akpafu Senior High Technical School, Agate Senior High School Afadjato Senior High Technical School and The Seminary of St. Mary (Ghana Statistical Service, 2013).

3.5 Population of the Study

The study population is the number of individuals or objects with the same characteristics or features of interest for a study. To give a context for this research on factors influencing the choice of girls in STEM courses, the general population is students doing STEM subjects from the four SHSs in the Hohoe Municipality of the Volta Region. The schools that constitute the population are Hohoe EP Senior High School, Likpe Senior High School, Alavanyo Senior High Technical School, Akpafu Senior High Technical School, Agate Senior High School, Afadjato Senior High Technical School and The Seminary of St. Mary. These schools are a mix of old and new public schools in the district. All seven (7) schools offer one form of STEM courses or the other. The schools represent a blend of old and new SHSs. The students also have diverse backgrounds, considering the schools being considered.

3.6 Sample Size and Sampling Technique

Sampling is the process of choosing the samples for a study. And the sample refers to the subset of the population that a researcher wishes to study. In this study, purposive sampling reveals a purpose for which a sample was used to select the schools. As a non-probabilistic procedure, purposive sampling has the disadvantage of not generalising the findings to a wider population because of its non-representativeness. In purposive sampling, researchers handpick the cases to be included in the sample based on their judgement and the cases‟ typicality and thus build up a sample that suits their specific needs satisfactorily (Krejcie & Morgan, 2016). (Robson, Hartigan, & Murphy, 2013) posit that purposive sampling allows the researcher to choose a case in which s/he is interested. The schools from which the sample was drawn constitute a hundred percent of all students in SHS/SHSTS in the Municipality. The sample size for the study is 102, which is (340*30%) of the target population, based on the sample size table (Adam, 2020). The proportional representation of 30% of the target sample was chosen to select the various students from the four schools. A random sampling technique was used to select STEM students for the study. This is because these are the students doing STEM subjects in the schools. The sampling method was used since it gives equal chances to all girls offering STEM courses to be selected for the study. This eliminates bias in the sampling procedure. However, St. Mary Seminary was not sampled because is a boys school.

Table 1: Population and Sample Size

Name of High School	**Total Number of Girls**	**Number of Girls in STEM**	**Study Sample**
Hohoe EP Senior High School	245	63	19
Likpe Senior High School	258	87	25
Agate Senior High School	132	9	3
Alavanyo Senior High	208	69	21
Akpafu Senior High Technical School	240	66	20
Afadjato Senior High Technical School	260	46	14
TOTAL	**1343**	**340**	**102**

Source: Field Data (2021)

3.7 Data Collection Instrument and Procedure

This study on factors influencing the choice of girls in Senior Public Schools in STEM courses was conducted in October 2021, via self-administered hard copy questionnaires today students with the help of some teachers. To gather the data, the head of the Education, Management, Information System in the Hohoe Municipality was contacted to provide the data on several girls in the STEM programmes in the six (6) schools. To obtain information from the girls on reasons for doing STEM-related courses, permission was sort from each of the SHSs in which the survey was carried out, and the purpose of the study was indicated. The filling of the questionnaires by the girls was done in the students' classroom. Respondents were randomly chosen based on the proportion of their numbers. The student girls were requested to tick the appropriate responses to the questions posed. In all, a total of thirty-seven sub-factors in the constructs required students to circle the factors that they considered very important in choosing STEM courses. The researcher was with the students while they filled the hard copy questionnaires in class to avoid losing the questionnaire.

3.8 Research Instrument

The questionnaire was constructed based on related studies conducted and modified by the researcher and vetted by the supervisor. The various questions are explained to ensure answers are provided well. The questionnaire comprised two main parts: part one has age and gender for biodata data, while the main part (part two) has twenty-two sub-questions of three main constructs. The questions were all close-ended statements measured with a multiple five-point Likert-type that range from 1-strongly disagrees to 5-strongly agree.

3.8.1 Measurement of Variables

The four variables in this study are teachers-related factors, home-related factors that influence girls' STEM interest, peer influence girls' STEM interest, and role models in STEM professions. These four variables are measured with sub-constructs using factor analysis. Specific questions capturing each of the four variables were asked based on the questions adapted from the various extant literature. The measurement of the variables was carried out on all the sub-constructs. Those with high loadings of 0.5 and above are retained in the study, and those below are ignored. Meaning they do not influence the student's reason for choosing STEM. The answer options range from 1 to 5, where 1 connotes "strongly disagree" and 5 represents "strongly agree". The answers are aggregated by taking the mean of all respondents using principal component factor analysis.

Table 2 :Variable Notation, Definition, Measurement and Hypothesized Relationship

Variable	Definition of variable	Measurement
Teachers- Related Factors toward girls in STEM	The attitude of teachers towards girls in STEM courses	Rated on a scale of 1-5 using statements relating to teacher attitudes
Home -Related factors to offer STEM courses	The influence of parents is due to their level of education, support and carriers.	Rated on a scale of 1-5 using statements that relate to parents' influence
Role models in STEM professions	Women in STEM programs that have achieved, so march coming to interact and guide girls toward STEM	Rated on a scale of 1-5 using statements relating to role models

Source: Compiled from Literature

3.8.2 Validity of Instrument

To improve the feasibility of this study, a pilot was performed. The selection of respondents was based on correlations between their characteristics in the field of research and their programs of study. The aim was to ensure that participants answered all potential difficulties in replying to questions, which helped the researcher refine questions more explicitly.

3.8.3 Pilot-testing of Instrument

A pilot testing of the questionnaire was conducted on a small group of fifteen students in STEM programs to ensure that the content is valid Kumar (2019) to address the objectives stated in the study. This is to know how SMART (Simple- Measurable-Achievable-Realistic-Time bound) the questionnaire was above all to ensure its authenticity. Again, the pilot test was conducted to develop and check the feasibility of the questionnaire, after which amendments were made with the same simple procedure. The fifteen students who took part in the pilot study also partake in the actual study.

3.8.4 Reliability of Instrument

The unchanging consistency of any instrument is the degree of stability by which it quantifies its value. Langbroek and De Beuckelaer (2007) clarified that the transmission of the analysis is twice derailed to calculate the reliability, using the Cronbach Alpha coefficient method by the SPSS programme. The reliability of important research instruments has also been tested using the coefficient system Cronbach Alpha. This shows whether the instrument for data collection is accurate and reliable. The research instrument is reliable given that the Cronbach Alpha coefficient for the 22 sub-constructs is 0.76.

3.9 Data Collection Procedure

The questionnaires were administered to the students directly in their respective classrooms. This was after official permission was sort from the management of the seven schools sampled for the study. To facilitate smooth administration of the questionnaires, management appointed three teachers to assist the researcher in the questionnaire administration. The teachers were briefed about the questionnaire's content, and some items in the questionnaire were explained to them. With the help of the teachers in the various schools, the questionnaire administration was completed within seven days. Thus, averagely, one day was spent in each school.

3.10 Data Analysis Procedure

The data collected were thoroughly edited and assigned codes to non-numeric variables to ensure consistency and check omissions. The analysis summarises the data collected so that it is easily understood. This was done to ensure that the research objectives were answered sufficiently. A reliability and validity test was conducted to ensure the suitability of the data for the study. The analysis involves descriptive and inferential statistical methods. The descriptive methods include tables showing frequencies, percentages, means and standard deviations. Exploratory factor analysis was used to run further statistical analysis before the regression was carried out.

3.11 Ethical Consideration

Formal permission was obtained from the management of the schools to conduct the study on their students. The study's objective was explained to each participant, and they consented to participate. The school management was also assured that the research was solely for academic purposes.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.0 Introduction

This chapter covers the responses received, demographic information of respondents and other findings of the study, and regression analysis in ascertaining the effect of voluntary or forced choice of STEM programs by the female students in senior high schools in the Hohoe Municipality in the Volta Region. Furthermore, the study's findings were discussed under the thematic and sub-thematic areas in line with the study objectives.

4.1 Response Rate

The researcher administered 102 questionnaires; 100 was successfully retrieved. This response rate represents 98%. This response rate was sufficient in determining factors that determine girls' choice of STEM programs in the Senior High Schools in the Hohoe Municipality of the Volta Region. The response rate is confirmed by Mugenda and Mugenda (2003), who intimates that a statistically significant response rate should be at least 50%.

4.2 Demographic Information

The demographic information about the respondents is presented in Table 4.2.

Table 2: Age distribution of students

Age of students	Frequency	Percentage
15-16	41	41
17-18	39	39
18 and Above	20	20
Total	100	100

Source: Field Data 2022

Table 2 indicates the number of respondents' ages distributions. Out of the 102 questionnaires, one hundred were returned to the researcher, constituting 98% of the respondents were part of the study. From the table, 41 of the girls fall within the age bracket of 15 to 16 years. While 39% are within the age of 17 to 18 years and the rest are 18 years and above.

Table 3: Form distribution of respondents

Form of students	Frequency	Percentage
Form one	24	24
Form Two	28	28
Form Three	48	48
Total	**100**	**100**

Source: Field Data 2022

From Table 3, the largest respondents are from form three, composed of 48%. This is followed by form two, with a 28% level of respondents in the sampled students who responded to the study.

4.3 Factor Analysis

According to Stack (2009), factor analysis is a technique used to identify the relationships between groups of variables and their underlying structures, and it is an important tool in scale development. Consequently, this was considered appropriate for this research for two reasons. Foremost, this analysis explains variation among items and may prune down the number of items to a smaller number for further analysis while still representing the original construct. Secondly, DeVellis (2003) posits that factor analysis has been used to discover underlying item groupings that may not have been observed or anticipated at the initial stage. In addition, the factor pattern that emerges from a large-sample factor analysis will be more stable than that emerging from a smaller sample. As a result, this research used 100 participants, as Stack (2009) recommended.

In this section, the twenty-two (22) variables were involved in the factor analysis to identify the underlying factors responsible for female students' choice of STEM programs. For the appropriateness of factor analysis, reliability, the correlation matrix, the KMO and Bartlett 's test was all conducted as shown in the outputs below.

Table 4:Descriptive statistics of indicators

Variables	Indicator	Min	Max	Mean	Std. Dev.
Guidance from teachers of STEM courses	X_1	1	5	3.63	1.079
The teaching and interest expressed by teachers in STEM affects my choice of STEM	X_2	1	5	3.69	1.228
The teacher thinks you cannot do very well like boys	X_3	1	5	3.94	1.062
Teachers focus their attention more on boys than girls	X_4	1	5	3.87	1.323
Your relationship with the teacher affects your interest	X_5	1	5	4.09	.975
Too many male STEM teachers do not encourage you to do STEM courses	X_6	1	5	3.93	1.225
The teaching still is fair to me since I am given equal attention as the boys in the STEM courses	X_7	1	5	4.15	.892
My parents encourage me to do STEM activities	X_8	1	5	3.25	1.234
My parents provide STEM materials at home, and they encourage me to do it	X_9	1	5	2.54	1.275
My father wants me to do a STEM course	X_{10}	1	5	3.87	1.186
My mother thinks I cannot do a STEM course	X_{11}	1	5	3.90	.847
My parent's professions are from STEM courses	X_{12}	1	6	3.53	1.322
The ability of my parents to meet my financial needs make me take a STEM course	X_{13}	1	5	3.91	1.026
My parents provide study materials for me, so I like STEM	X_{14}	1	5	3.91	.986
My parents support me in choosing a STEM course	X_{15}	1	5	3.31	1.376
My parents have higher education (HND	X_{16}	1	6	4.05	1.298

and degree)					
Career day presentations featuring women in STEM	X_{17}	1	5	2.96	1.310
Carriers and the high paying opportunities in STEM for women	X_{18}	1	5	3.84	.940
Mentors told you of the great carriers available to those who did STEM courses	X_{19}	1	5	3.05	1.417
Does your mother serve as a role model for you in choosing STEM courses	X_{20}	1	5	3.98	1.063
Society affects your choice of STEM because many people think you cannot do it as a girl	X_{21}	1	5	3.68	1.127
Most textbooks use boys or men in practical, so you think you cannot do STEM course	X_{22}	1	5	3.46	1.298

Source: Field Data 2022

The descriptive statistics (Table 4) reveals the ratings of the indicators as to the respondent's level of agreement or disagreement concerning how the indicators determine the choice of STEM courses in Hohoe Municipality, with 5 being the highest value for those who strongly agree and 1 for those who strongly disagree. The mean ratings above show that most of the variables are quite highly rated as factors influencing students' choice of STEM courses. Fairness of the teaching, for example, proved to be the most highly rated of all factors with a mean, M = 4.15, standard deviation (S.D. = .89).

4.3.1 Reliability Test

Reliability of a given method used in the analysis is necessary when variables developed from summated scales are used to predict components in objective models. The summated scales are groupings of interrelated variables designed to measure underlying constructs, and the importance is to show whether the same set of items would reveal the same responses given that the same questions are presented and re-administered to the same respondents. According to Widodo, Dahlan, Harini, and Sulistyowati (2020), Variables derived from examination instruments are reliable only when they are stable and reliable upon repeated test administration. This study uses Cronbach's alpha as the index of reliability. It ranges between 0 and 1, with the variation accounted for by the true score of the underlying construct (Hatcher & Barends, 1996). The higher the score, the more reliable the generated scale is (Nunnaly, 1978).

Table 5: Cronbach's Alpha

Measure	**Value**
Cronbach 's Alpha	0.76
Number of items	22

Source: Field Data 2022

From table 5, the alpha value of 0.76 shows a very good level of consistency in the data generated for factor analysis. This is because a Cronbach 's alpha equal to or greater than 0.60, according to Stack (2009) was acceptable.

4.3.2 Tests of Appropriateness

The researcher next examines the Kaiser-Meyer-Olkin measure (KMO) and Bartlett 's sphericity tests to examine the appropriateness of variables for factor analysis. These tests are to establish whether the variables are correlated.

Table 6: KMO and Bartlett's test

Measure	**Value**
KMO Measure of Sampling Adequacy	0.544
Bartlett 's test Critical Value	1507.114
Bartlett 's Test degree of freedom	630
Bartlett 's Test significant value	0.000

Source: Field Data 2022

The Kaiser-Meyer-Olkin (KMO) measures are further correlation analyses. High values between (0.5 and 1) indicate factor analysis is appropriate. With the KMO value of 0.544, the test is adequate for factoring, and the analysis would provide a very good result. Bartlett ‘s test of sphericity is also highly significant, with a p-value of 0.000 at a relatively large chi-square value of 1507.114. This means there are correlations among the indicator variables as shown by the correlation matrix hence the factor analysis procedure is appropriate.

Table 7: Communalities

Variables	Initial	Extraction
X_1	1.000	.571
X_2	1.000	.737
X_3	1.000	.714
X_4	1.000	.651
X_5	1.000	.660
X_6	1.000	.632
X_7	1.000	.699
X_8	1.000	.812
X_9	1.000	.703
X_{10}	1.000	.759
X_{11}	1.000	.816
X_{12}	1.000	.688
X_{13}	1.000	.727
X_{14}	1.000	.816
X_{15}	1.000	.750
X_{16}	1.000	.733
X_{17}	1.000	.770
X_{18}	1.000	.589
X_{19}	1.000	.743
X_{20}	1.000	.750
X_{21}	1.000	.802
X_{22}	1.000	.753

Extraction Method: Principal Component Analysis.

Communality values shown in the table above indicate that significant proportions of the variables in the construct have been adequately explained by the three extracted components, with the least significant variable taking the value of 0.571. These are a very respectable loading for factor analysis. Averagely, at least 73.72% of the variations in each of the twenty-two variables accounted for by the three components extracted.

4.3.3 Extraction of Factors and Factor Interpretation

In factor analysis, the eigenvalue greater than one rule and the scree plot is used as the basis for factor extraction, which is applied in this research. The total variance explained output presents the number of factors suitable for extraction using the eigenvalue rule. According to DeVellis (2003), eigenvalues represent the amount of information captured by a construct. As a result, these values were used to determine the number of factors to be extracted. Accordingly, a guideline is factors with eigenvalues less than 1.0 should not be accepted for inclusion in the factors for analysis.

Table 7 is the total variance explained table, and it shows the number of factors suitable for extraction using the eigenvalue rule. From the extraction, only twelve out of the twenty-two determinants of STEM choice are considered in choosing a STEM program. This is because they have Eigenvalues greater than one. The total variance explained by these components accounts for about 72.19% of the total variations. The essential component accounts for about 11.614%. The other eleven components have 9.069%, 8.064%, and in that order.

Table 8: Total Variance Explained

Component	Eigenvalue	% Variation	Cumulative %
1	4.181	11.614	11.614
2	3.265	9.069	20.684
3	2.903	8.064	28.748
4	2.608	7.244	35.991
5	2.410	6.695	42.686
6	2.039	5.664	48.349
7	1.815	5.043	53.392
8	1.598	4.438	57.830
9	1.524	4.234	62.064
10	1.378	3.828	65.892
11	1.190	3.307	69.199
12	1.077	2.991	72.190

Source: Field Data 2022

4.3.4 Rotation Matrix

In factor analysis, rotation achieves clarity by seeking factors that result in each item substantially loading on (correlating with) only one factor (DeVellis, 2003). There are two types of rotation, out of which one can be chosen based on the type of correlation among variables during factor analysis. These are orthogonal and oblique. The Varimax orthogonal was chosen because the variables in this study correlate. The rotation of the factors presents an opportunity for a simpler factor structure, meaningfully interpreted, the rotated factor matrix. Below is the loaded variables, which are bolded.

Table 9:Rotated Factor Matrix

Factors	1	2	3
X_1	.615	.097	.248
X_2	-.429	.122	.120
X_3	-.596	-.249	.306
X_4	.302	-.049	.349
X_5	-.732	-.288	-.111
X_6	.473	.001	-.200
X_7	-.710	.299	-.348
X_8	-.041	-.049	.174
X_9	-.148	.654	.302
X_{10}	.493	-.156	-.354
X_{11}	.067	-.733	-.155
X_{12}	.156	.546	-.035
X_{13}	.001	.159	.387
X_{14}	-.343	.685	-.161
X_{15}	.141	-.584	.174
X_{16}	-.181	.147	.188
X_{17}	-.352	.358	.731
X_{18}	.213	-.016	.527
X_{19}	-.381	.042	-.002
X_{20}	.277	-.118	.630
X_{21}	-.144	-.290	.279
X_{22}	-.144	-.290	.279

Source: Field Data 2022

4.3.4.1 Teachers-related factors and girls in STEM

The is section of the analysis discusess teacher-related factors that influence the choice of STEM courses by girls in the Hohoe Municipality.

The first component, which is the teachers-related factors and girls in STEM, has significant loadings from four (4) indicators; Guidance from teachers of STEM courses (X1), the teacher thinks you cannot do very well like boys (X3), My relationship with the teacher affects my interest (X5), and the teaching skill is fair to me since I am given equal attention as the boys in the STEM courses (X7). The findings are in line with Sjøberg and Schreiner (2014), who opined that teachers' attitudes towards boys and girls could be seen to be favourable or unfavourable, that is, either positive or negative. The finding is at variance with the observation of de

Vet, Mokkink, Mosmuller, and Terwee (2017), who indicated that in mixed-sex situations, male students have been noted to receive more teacher attention than females in a classic study, showed that teachers tended to favour boys and awarded higher marks if the piece of work was thought to have been written by a boy.

4.3.4.2 Home-related factors and girls in STEM

The home related-factors that encourage the choice of STEM cources ampng girls in SHS in the Hohoe Municipality is presented in this paprt of the study.

The second component is the home-Related factors. This component recorded significant loadings from five (5) indicators: My parents provide STEM materials at home, and they encourage me to do it (X9), my mother thinks I cannot do a STEM course (X11), my parent's professions are from STEM courses (X12), my parents provide study materials for me, so I like STEM (X14) and my parents support me in choosing STEM course (X15). Thus, parent expectations socialise children's academic trajectories: The more parents encourage their children's after-school STEM activities, provide activity-related materials, and participate with them, the more children become interested in STEM (Simpkins et al., 2012). The result supports the position that parents encourage students to go for high status and well-paid professions. Also, students' choices of subjects tend to be informed by their knowledge about possible careers when they make choices (Bayne & Gallagher, 2020). This implies that students' support and guidance before making choices are important influences on students' choices and may keep students determined while working towards clear career goals.

4.3.4.3 Role models in STEM professions and girls in STEM education

In this sub-section, the role of the women role models in STEM profession and how tthese people encourage girls to opt for STEM programms is explored in this aspect of the analysis.

Concerning role models in STEM professions and girls' interest in the STEM, recorded significant loadings from three (3) indicators. The findings showed that indicators such as career day presentations featuring women in STEM (X17), carriers and the high paying opportunities in STEM for women (X18) and my mother serve as a role model for me in choosing STEM courses (X20). The current finding is at support the position of Byrne, Fattoum, and Diaz Garcia (2019), who argue that a critical mass of women scientists is a significant factor for girls in science and mathematics, and one way of achieving this is through affirmative action such as recruiting more role models at higher levels of science.

Quansah et al. (2020) posit that career day presentations featuring women in STEM careers (if possible, find a graduate from the school who can highlight her experiences in school and her journey to her current high-tech career) can go a long way toward changing female students' beliefs about their ability to succeed in STEM courses and careers. Eggleston (2020) also argued that science's teaching style is more important than the sex of the teacher. How more women acting as role models could encourage more girls to study the sciences has been explored by Jacob Clark Blickenstaff (2015).

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATION

5.0 Introduction

Chapter five of the study summarises findings in line with the study objective and conclusions drawn based on the findings. Additionally, policy recommendations on the way forward are given.

5.1 Summary of Findings

The study examines the factors that influence students' choice of STEM programs in the Hohoe Municipality. Specifically, the study determines the teacher-related factors that influence the choices of STEM courses by girls in SHS in the Hohoe Municipality; examine the home related-factors that encourage the choice of STEM in SHSs in the Hohoe Municipality and investigate how role models in STEM professions encourage girls in SHSs in the Hohoe Municipality to choose STEM courses. The study is quantitative, and a descriptive design was employed. The general population is students doing STEM subjects from the four SHSs in the Hohoe Municipality of the Volta Region. The study sample student respondents randomly from the girls in STEM programs in the seven SHS sampled for the study. The questionnaire was used to collect primary data. Factor analysis was performed to identify factors determining girls' choice for STEM courses in the Hohoe Municipality.

The majority of the girls fall within the age bracket of 15 to 16 years. While 39% are within the age of 17 to 18 years and the rest are 18 years and above. The largest respondents are from form three, composed of 48%. This is followed by form Two. Fairness of the teaching, for example, proved to be the most highly rated of all factors.

Teachers' attitudes towards girls in STEM programs influence their choice of STEM-related courses increasing. Teachers' attitudes towards girls offering STEM courses encourage girls to offer STEM programs. Thus, guidance from teachers of STEM courses, the teacher believe in boys to perform than girls, the relationship with the teacher affects students interest, and the teaching skills and equal attention is given to girls and boys in the STEM courses also encourage the girls to opt for STEM causes.
An increase in parental influence could increase the girl's choice for the STEM program. This indicates that parental influences and choice of STEM programs encourage more girls to offer STEM courses. Thus, parents provide STEM materials at home and encourage them to do it; parents' professions are from STEM courses, parents provide study materials for girls in STEM and parents' support in choosing STEM courses are the home-related factors determining girls' choice of STEM course in the Hohoe Municipality.

The findings showed that role models influence girls' choice of STEM programs. The findings showed that career day presentations featuring women in STEM, carriers and the high paying opportunities in STEM for women and mothers serving as role models for students in choosing STEM courses are role model-related factors influencing girls' choice of STEM courses.

5.2 Conclusions

The study concludes that teachers' attitudes towards girls in STEM programs influence their STEM-related courses. Guidance from teachers of STEM courses and how they relate to the female students helps the girls to opt for STEM causes. The study also concludes that parental influence could increase girls' choice for the STEM program. The encouragement of parents, provision of STEM-related books materials, and parents' involvement in STEM courses for the girl child. Finally, it is concluded that career day presentations featuring women in STEM, carriers and the high paying opportunities in STEM for women and mothers serving as role models for students in choosing STEM courses are role model related factors influencing girls' choice of STEM courses.

5.3 Recommendations

i. The government of Ghana should organise STEM clinics in selected districts in Ghana to sensitise girls to various STEM-related careers that girls can pursue (e.g. teaching, medicine, laboratory work, or telecommunications engineering). STEM clinics have a strong potential for increasing girls' interest in science. This will help girls have a unique opportunity to interact with young female scientists and learn from the wide range of opportunities offered by studying STEM subjects.

ii. Technical assistance should be provided to the Ministry of Education (MOE) and UNICEF to ensure the completion and passage of the draft Gender in Education Policy.

iii. Given the role of international organisations in science education in Ghana, Ghana Education Service, spearheaded by MOE, should work with Plan International Ghana to scale up the STEM clinics to more districts.

iv. Parents should encourage their girl child to take up STEM-related courses. This should be started at a very tender age where their interest will skew towards science-related activities through toys and games they play.

v. Teachers of STEM subjects should encourage and assist female students in taking an interest in STEM-related programs. This will motivate other girls who see the area as a preserve for male students.

5.4 Suggestions Further Research

The current study can be replicated in other parts of Ghana and at different levels of education. The study should consider other factors perceived to drive girls' choice of STEM courses.

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APPENDIX

QUESTIONNAIRE

Dear respondent,

Thank you for volunteering to participate in this research exercise. The questionnaire is a critical part of a study to explain what factors influence girls' choice of Science, Technology, Engineering and Mathematics (STEM) courses in the Hohoe Municipality of the Volta region. The information collected is treated strictly as confidential and would only be used for academic purposes and none other. Your cooperation in completing this questionnaire is very much appreciated.

Thank you.

PART I: DEMOGRAPHIC INFORMATION (PLEASE TICK)

1. Age [ ] 15-16 [ ] 17 -18 [ ] above 18

2. Form: [ ] One [ ] Two [ ] Three

PART II: DETERMINANTS OF YOUR CHOICE OF STEM COURSES

Please, kindly circle in the appropriate box against the statements defined below by rating in each case the factors you considered influencing your reasons for doing a **STEM** course. **The scale is from 1 to 5. 1-Strongly disagree, 2-disagree, 3-not considered, 4-agree, 5-strongly agree**

	Factors	Scale				
3. Teachers-Related Factors and Girls in STEM						
TRF1	Guidance from teachers of STEM courses	1	2	3	4	5
TRF2	The teaching and interest expressed by teachers in STEM affects my choice of STEM	1	2	3	4	5
TRF3	Teacher thinks you cannot do very well like boys	1	2	3	4	5
TRF4	Teachers focus their attention more on girls	1	2	3	4	5
TRF5	My relationship with the teacher affects my interest	1	2	3	4	5
TRF6	The too many male STEM teachers do not encourage me to do STEM courses	1	2	3	4	5
TRF7	The teaching still is fair to me since I am given equal attention as the boys in the STEM courses	1	2	3	4	5
4. Home-Related Influence on Girls STEM Interest						
HRF8	My parents encourage me to do STEM activities	1	2	3	4	5
HRF9	My parents provide STEM materials at home and they encourage me to do it	1	2	3	4	5
HRF10	My father wants me to do a STEM course	1	2	3	4	5
HRF11	My mother thinks I cannot do a STEM course	1	2	3	4	5
HRF12	My parent's professions are from STEM courses	1	2	3	4	5
HRF13	The ability of my parents to meet my financial needs make me take a STEM course	1	2	3	4	5
HRF14	My parents provide study materials for me so I like STEM	1	2	3	4	5
HRF15	My parents support me in choosing STEM course	1	2	3	4	5
HRF16	My parents have higher education (HND and degree)	1	2	3	4	5
5. Role Models in STEM Professions and Girls' Interest in STEM						
RM17	Career day presentations featuring women in STEM	1	2	3	4	5
RM18	Carriers and the high paying opportunities in STEM for women	1	2	3	4	5
RM19	Mentors told me of the great carriers available to those who did STEM courses	1	2	3	4	5
RM20	My mother serves as a role model for me in choosing STEM courses	1	2	3	4	5
RM21	Society affects my choice of STEM because many people think I can do it as a girl	1	2	3	4	5
RM22	Most textbooks use girls or women in practice so that I can do STEM course	1	2	3	4	5

Thank you

APPENDIX A

INTRODUCTORY LETTER

UNIVERSITY OF EDUCATION, WINNEBA
FACULTY OF EDUCATIONAL STUDIES
DEPARTMENT OF EDUCATIONAL FOUNDATIONS
P. O. Box 25, Winneba, Ghana   edufoundations@uew.edu.gh
030 298 0885

10th May, 2022.

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

LETTER OF INTRODUCTION

I write to introduce to you, AFEDO SUSAN ENYONAM, the bearer of this letter who is a student in the Department of Educational Foundations of the University of Education, Winneba. She is reading Post Graduate Diploma in Education with index number 200049373.

She is conducting a research on the topic: DETERMINANTS OF GIRLS' PARTICIPATION IN SCIENCE, TECHNOLOGY, ENGINEERING AND MATHEMATICS (STEM) IN PUBLIC SENIOR HIGH SCHOOLS IN THE HOHOE MUNICIPALITY. This is in partial fulfillment of the requirements for the award of the above mentioned degree.

She is required to administer questionnaire to help her gather data for the said research and she has chosen to do so in your outfit.

I will be grateful if she is given permission to carry out this exercise.

Thank you.

Yours faithfully,

DR. RICHARDSON ADDAI-MUNUNKUM
AG. HEAD OF DEPARTMENT

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