UNIVERSITY OF EDUCATION, WINNEBA

GENDER DIFFERENCES IN ATTITUDE AND PERFORMANCE IN ELECTIVE MATHEMATICS AT SENIOR HIGH SCHOOLS IN ACCRA METRO

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

DECEMBER, 2022

DECLARATION

Student's Declaration

I, Abraham Atsu, 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

Signature: ……

Date: …….

Supervisor's Declaration

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

Mr. John Bijou Agbemaka (Supervisor)

Signature: ……

Date: …….

DEDICATION

I dedicate this work to my wife Atsu-Noble, Abigail, my son Emerald Mawuenyega Atsu-Noble, my mom and my siblings for being there for me during my difficult moments and also encouraging me not to give up. Love you guys

ACKNOWLEGEMENT

I owe my greatest gratitude to God for the strength He has given me to go through this program successfully. I also want to appreciate my supervisor Mr. John Bijou Agbemaka in the department of Mathematics, University of Education, Winneba whose encouragement, guidelines, and patience have brought this work to light. Even though he was busy but he was able to go through this work for me.

I also was to appreciate the heads of Accra Academy SHS, Accra Girls' SHS, and Achimota SHS for their untiring effort and cooperation they gave me when I was collecting my data for this thesis.

I say God richly bless you all.

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ABBREVIATIONS

ATEMI	–	Attitude towards Elective Mathematics Inventory
ATMI	–	Attitude towards Mathematics Inventory
CPSS	–	Computerized Placement School System
EMATHS	–	Elective Mathematics
EMPT	–	Elective Mathematics Performance Test
GES	–	Ghana Education Service
JHS	–	Junior High School
MAS	–	Mathematics Attitude Scale
MTAQ	–	Mathematics Teachers Approach Questionnaire
OECD	–	The Organization for Economic Cooperation and Development
PISA	–	Program for International Student Assessment
SHS	–	Senior High School
STEM	–	Science Technology Engineering and Mathematics
STAE	–	Science Technology and Arithmetic Education
TIMSS	–	Trends in International Mathematics and Science Study
VOM	–	View On Mathematics
WAEC	–	West African Examination Council
WASSCE	–	West African Secondary School Certificate

ABSTRACT

The aim of this thesis was to ascertain the gender differences in attitude and performance in Elective Mathematics in the Senior High Schools in Accra Metro. Elective Mathematics, currently, is one of the important subject requirements for admission into attractive programs such as medicine, engineering, business, statistics, mathematics, actuarial science, economics, business administration, and architecture, among others in tertiary institutions in Ghana. To ascertain these differences, a performance test of Elective Mathematics knowledge and a questionnaire on attitude were administered to the targeted group. The performance test was made up of multiple-choice questions. The Likert type questionnaire for the students was in three (3) parts: Part A (Demographic of the respondents), Part B (questionnaire for students' attitude toward Elective Mathematics), and Part C (Questionnaire for exploring factors affecting students' attitude toward Elective Mathematics. A total of three hundred (300) elective mathematics students from three (3) SHS, one Boys' school, one Girls' School and a Mixed school in Accra metro were used for the study. Survey was the research design adopted for the study. Data were analyzed through the computation of frequencies, percentages, means, standard deviations, independent sample t-test as well as correlation. The current study found that students have a positive attitude toward the study of elective mathematics when it comes to gender differences in their attitude toward elective mathematics and their performance in elective mathematics. Also, the study found a significant difference in student attitudes based on gender, favoring female students. Again, the findings indicated a significant difference in the factors that students perceived to influence their academic achievement. In addition, the study discovered a weak positive relationship between students' attitudes toward elective mathematics and their academic performance in elective mathematics. It was therefore recommended that there should be a frequent elective mathematics seminars and workshop organized for students with the resource persons educating the students about the correlation between the topics they study in elective mathematics and the real-life situations. Also, topics taught by elective Mathematics teachers should be practical enough for the students to relate to.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

A prominent president, national leader of South Africa Nelson Mandela stressed the importance of education when he opines that "education may be a great engine of non-public development. It's only through education, a daughter of a peasant can become a doctor, that the son of a mine worker can become the top of the mine, that the kid of a hired hand can become the President of a good nation (Mandela 2000:559). Hoyle (1986) argues that schools are established to impart knowledge and skills to those that attend them. The high academic performance, as measured by the examination results, is one in all the foremost goals of a faculty. Behind all this is often the thought of enhancing good academic performance (Mankoe, 2002; Ankomah, Y. A., Koomson, J. A., Rosemary, A. B., & George, K. T., 2005). Enhancing good academic performance, it's imperative to be seen at the program choice of learners at the secondary school level.

The competence gained within the study of Elective Mathematics is widely employed in all spheres of human life. Mathematics plays a key role in shaping how individuals put up with the widely different spheres of personal, social, and civil life (Anthony & Walshaw, 2009). This justifies the compulsion of the study of subject by all students who bear basic and secondary education in most countries. Mathematics is therefore a core subject at these levels of education in Ghana. In the Senior High School, elective Mathematics becomes a choice which is supported the program of study. It's regrettable, therefore, that within the contemporary times many students who struggle with Mathematics perform abysmally low in their final examinations in most jurisdictions. In Ghana, students' performance in Mathematics (both core and

elective) at the Senior High School has not been encouraging recently. Candidates are reported to exhibit a poor understanding of Mathematical concepts and are unable to create the acceptable Mathematical models which might be tackled with the requisite skills" (Chief Examiner's Report, 2007). It's also been realized that a lot of students have developed a negative attitude toward the study of Mathematics as a results of mass failure of students in the subject. It is an irrefutable incontrovertible fact that the successfulness of learning the subject is dependent on many factors. Students' attitude and teacher factors all entrench on the training of Mathematics both core and elective. Particularly, the seriousness or otherwise attached to the teaching and learning of Elective Mathematics invariably affects students' performance in their final examinations. Elective Mathematics is a requirement by universities in Ghana to pick lyceum (secondary) learners for entry into science-based degree programs like medicine, Engineering and Computer Science, just to mention but a few.

Attitude as an idea is worried with an individual's way of thinking, acting, and behaving. It's a very serious implications for the learner, the teacher, the immediate group with which the individual learner relates, and also the entire establishment. Attitudes are formed as a result of some quite learning experiences students bear (Harbison & Hanushek,1992). And encompasses a part to play within the teaching and learning situation.

London School of Economics' (LSE) study reveals that subject's studied in lyceum may play an oversized part in a choice of the subject at university. There's a requirement to research more into gender differences in mathematics and science for two main reasons. Firstly, as noted across many developed nations, there's a shortage of science graduates to satisfy the wants of industry, which Handelsman et al. (2005)

addressed by broadening the pool of applicants entering the science pipeline to incorporate a greater representation of girls. Many national science boards have identified increasing the quantity of women and ladies studying STEM-related degrees as a vital intervention target. As an example, within the United States, the National Science Foundation produces a bi-annual report into the quantity of ladies and girls studying STEM-related subjects and degrees (National Science Foundation, 2017), as mandated by the US Science and Engineering Equal Opportunities Act. Secondly, gender equality and educational outcomes remain a problem of importance. No matter whether or not a student chooses to pursue a STEM-related field, educators stress the importance of basic mathematical skills and science literacy for full participation in today's society (OECD, 2016), which equality of educational outcomes could be a desirable social good.

The causal factors responsible for the underrepresentation of girls in STEM fields are complex and contentious Ceci & Williams, (2011). But two major factors that are suggested to form a contribution are (a) gender differences in mathematics and science achievement during compulsory schooling (Else-Quest, Hyde, & Linn, 2010), and (b) self-efficacy beliefs and attitudes towards mathematics and science (Nosek, Banaji, & Greenwald, 2002). These factors are important, as an oversized body of research has shown that they contribute to the decision-making processes that lead adolescent students to undertake or avoid further STEM-based studies and careers (Eccles, 2013; Jacobs, Lanza, Osgood, Eccles, & Wigfield, 2002; Simpkins, Davis-Kean, & Eccles, 2006). While some researchers have investigated gender differences in these factors at the endpoint of compulsory schooling (Guiso, Monte, Sapienza, & Zingales, 2008; Reilly, Neumann, Andrews, 2015), it's also important to think about differences at earlier time points in the child's development. Attitudes toward

mathematics and science are acquired by children early in their education during primary and middle school (Marginson, Tytler, Freeman, & Roberts, 2013; Simpkins et al., 2006), and are supported by early socialization experiences and enrichment activities provided by parents and caregivers (Simpkins, Davis-Kean, & Eccles, 2005). However, developmental literature has identified that the eighth grade represents a critical time for the development of self-efficacy beliefs in STEM subjects and also help in the formation of attitudes towards mathematics and science as a career (Eccles, 2013; Riegle-Crumb, Moore, & Ramos-Wada, 2011). Additionally, a sizeable body of research has documented widening gender differences in mathematics achievement and beliefs in adolescence after puberty, making eighth grade ideally suited to documenting developmental gender differences Goldman & Penner, (2014).

The gender gap within the possibility of enrolling in courses especially in advanced mathematics at the university level must be studied. Dooley, Payne, and Robb (2012) have shown that although not all students who enter a STEM program will graduate with a Science, Technology, Engineering and Mathematics (STEM) degree, attrition rates from STEM programs appears to be identical for both males and females. Moreover, most programs have rigorous multi-year course sequences students who don't enroll in STEM programs save to have little chance of graduating with a STEM degree. Per Kobrin, 2007; Long, Iatarola, and Conger, 2009 (as cited in McCormick & Lucas, 2011) studies revealed that female students are less likely to be prepared for college-level mathematics than their male counterparts.

According to Lee, Burkam, Chow-Hoy, Smerdon, and Geverdt, (1998) (as cited in Atuahene & Russel, (2016), found that Black and Hispanic students, low-income

students, female students, and students who received lower grades in earlier math courses failed to progress into more intensive math courses in high school as often as their counterparts who performed well academically (p. 14). The researchers argue that a constrained curriculum is more advantageous to students than having a high school curriculum that provides a large array of math courses. This wide math distribution unknowingly sets the scholars up for later slow math progression.

1.2 Statement of the Problem

Elective Mathematics, currently, is one in all the important subject requirements for admission into attractive programs like medicine, engineering, business, statistics, mathematics, actuarial science, economics, business administration, and architecture, among others in tertiary institutions in Ghana.. This example was found by Nkani (1993) that girls participate less than boys in Additional Mathematics (the harder option mathematics) in forms four and five of the old secondary school system in Ghana. This case isn't different within the USA, where Sherman and Fennema (1978) found in studies in mathematics enrolment that, fewer girls than boys enrolled in high school mathematics course.

Nyala (2010) also reported that 67.6% of students from Junior High School have the desire to study elective mathematics at the Senior High School level and of this percentage, 41.8% were females and 25.8% were males. Orora (1986) indicates that students in secondary schools who have very positive attitudes toward learning mathematics have interest to pursue further studies in mathematics.

One may have a desire to study further mathematics but one's attitude towards what he or she is studying matters. Attitudes formed by students when studying

mathematics tend to stay for a protracted time and these attitudes help them to learn mathematics better if it's positive or favourable (Evans, 1965).

Authorities have sought to spice up student performance in mathematics classrooms over the years (Abiam & Odok, 2006; Mahlomaholo & Sematle, 2005; Opolot-Okurut, 2005). Recently, female students' math performance appears to be improving, albeit at a slower rate. In their study on education and development: evidence of recent priorities, (Haddad, Carny, Rineld, and Ragar (2001) state that investing in female education reduces the huge academic gap between male and female performance in our schools.

Despite the actual fact that the Ministry of Education recognizes STEM performance, so as for Ghana to be a mathematics-friendly country, the view of mathematics as an unfeminine subject must be critically examined. Female students mustn't be excluded from the trail of learning mathematics within the country, particularly public schools. The thought of improving female students' performance in public schools has been slowly improving over the years, and many factors have contributed to the present.

According to the Colleges of Education Weekly Journal (2019), approximately four hundred and sixty (460) level 100 trainee teachers across Ghana's forty-six Colleges of Education would be withdrawn for poor performance within the primary year of the four-year Bachelor of Education program, of which mathematics generally could a component and of this number the females are more. Similar incidents occurred in our universities, particularly within the department of mathematics, where many first-year students failed mathematics courses of which the females are more than the males whereby they were unable to continue with the program. This could be to students' attitudes toward the study of mathematics normally. Furthermore, elective

mathematics is required to study advanced mathematics at these levels. For example, in 2014, the University of Cape Coast admitted nearly 300 first-year students to the Bachelor of Education in Mathematics program, but only about 200 students advanced to the next level according to (Christopher Y., Benjamin E. A., & Mary D. (2020). The majority of these who dropped out at the tip of the first year reapplied to other programs of which females were more. What was these students' attitude toward elective Mathematics, how did they perform in elective Mathematics, and were these students fully prepared to study mathematics at these higher levels?

Factors related to mathematics skill deficiency have received lots of attention. Lewis (1998) acknowledged that lots of students with low mathematics skills are admitted to universities. At the school level, such students' needs for developmental-level mathematics become critical.

Women tend to gravitate toward more traditionally "feminine" subjects like nursing and education while avoiding traditionally "masculine" subjects like mathematics and science. STEM (Science, Technology, Engineering, and Mathematics) subjects had rock bottom low proportion of female students. Computer science courses, for example, have only 18% female students, Engineering and Technology had 19% female students, and Mathematical Sciences have a modest 37% female students' population. Studying these subjects at undergraduate degree levels generally lead to higher paying jobs according to Chloe Lane (2021).

Chloe Lane (2021), on the other hand, discovered that the subjects with the best possible percentage of female students were generally subjects with lower earning potential. The foremost popular subjects for women to review were those related to medicine, like nursing and nutrition, with 79% female students. Education was the

second hottest among women, with 78% female students, followed by Veterinary Science (78%), and Languages (67%).

Table 1.1: Elective mathematics WASSCE result from 2007 – 2014

YEAR	PASS(A1- C6)		FAIL (D7- F9)		TOTAL
	No.	%	No.	%	
2007	13,685	36.5	23,817	63.5	37,502
2008	15,352	35.7	27,608	64.3	42,960
2009	17,862	35.7	32,189	64.3	50,051
2011	32,711	68.1	15,304	31.9	48,015
2012	44,619	75.1	14,781	24.9	59,400
2013	63,105	47.1	70,786	52.9	133,891
2014	15,484	20.5	60,135	79.5	75,619

Source: WAEC IT DEPARTMENT, 2014

Taking a detailed analysis of 2012 and 2013 WASSCE results, a total of 60,098 students registered for the 2012 May/June WASSCE Elective Mathematics examination, out of which 42,472 were males and 17,626 were females. But at the end 59,400 sat for the paper, out of this, 17,458 were females and 41,942 were males. 698 failed to write the examination. 44,619 students obtained credit and above grades (i.e., students who had C6 and above) which represents75.1% of the total score, out of which 31,292 which represents 52.7% were males and 13,327 representing 22.4% were females. 10653 students passed the examination (i.e. students obtained D7 and E8), this represents 17.8% and out of which 2,966 representing 5% were females and 7,687 representing 12.8% were males. 4,019 students failed (i.e. students who had F9) representing 6.7%, of which 1148 representing 4.8% were females and 2871 representing 1.9% were males.

135,404 students registered for the 2013 WASSCE Elective Mathematics examination out 94637 were males and 40,767 were females. But 133,891 out of the students who registered for the examination did sit for the paper of which 94,619 were males and 40423 females. 1,513 did not write the exams 63,105 students obtained grades A1 to C6 (i.e. credit and above grades) which represents 47.1%. Out of this, 44554 representing 33.3% were males and 18,551 which is 13.8% were females. 40712 student obtained grades between D7 and E8 (i.e. pass grades) this represents 30.3% and out of this, 12,478 which represents 9.3% were females and 28,234 representing 21.0% were males. 30,074 students failed the examination (i.e. students who had F9) representing 22.4% and out of which 9,394 were females which represents 7% and 20,680 representing 15.4% were males.

Results from the 2012 WASSCE was fairly good with majority of the students passing the examination with just a few students failing. Many students sat for the 2013 Elective Mathematics examination, none the less, the performance was poor as compared to the 2012 results. Students who failed in the 2013 elective mathematics were greater than those who passed. Performance on gender basis was almost similar as both males and females had similar passes and failures in the 2012 examination, but in the 2013 examination many female students failed with few passing while majority of their male counterpart passed with few failures. In general, the females did not perform well as compared to their male counterpart.

The question then is, what is the attitude of these students towards the study of elective Mathematics at the Senior High level? In light of this, this study sought to investigate the gender differences in attitude and performance in elective mathematics at Senior High Schools in the Accra Metropolis.

1.3 Purpose of the Study

The purpose of the study is to explore the factors that influence which gender group to have more positive attitude towards elective Mathematics in mixed and segregated Senior High Schools and how these factors help this gender group to perform better in elective Mathematics.

1.4 Objectives of the Study

The study was guided by the following objectives:

1. Investigate senior high school students' attitudes towards elective Mathematics
2. Investigate whether there is a difference in the attitude of students towards elective mathematics based on gender.
3. Determine whether there is a gender difference in the factors that influence students' attitudes in elective Mathematics.
4. Determine the effect of students' attitudes towards elective mathematics on their academic performance in Elective mathematics.

1.5 Research Questions

1. What are the senior high school students' attitudes toward elective Mathematics?
2. Is there any significant difference in the attitude of students towards elective mathematics based on gender?
3. Is there any gender difference in the factors that influence student performance in Elective Mathematics?
4. What is the effect of students' attitude towards elective mathematics on their performance in elective mathematics?

1.6 Significance of the Study

The study's goal is to investigate and describe the attitudes of both male and female students toward elective mathematics at the Senior High level, as well as which gender group performs better in elective mathematics. The findings would add to our understanding of the theories that underpin the paper. It will help both teachers and parents to change their minds about labeling achievement in elective mathematics as a domain reserved for men. It will also help teachers understand what to expect from the various gender groups when it comes to elective Mathematics, as well as how to strategize and develop new teaching methods to suit the various gender groups. The researcher believes that the study's findings will be used to improve female students' attitudes toward elective mathematics in Senior High Schools. It will also aid in changing girls' attitudes toward the subject, specifically in dispelling females' misconceptions about elective mathematics. Furthermore, the findings would aid classroom teachers of mathematics and further mathematics in encouraging many females to study high-level mathematics by creating a classroom environment that is open and supportive for all students, not just a few "brilliant" students.

1.7 Limitations

The size of the population in the research school limited the scope of this study. Another limitation is that attitudes can change daily, and a bad experience on the day of the survey could skew the students' responses. Another limitation is that this study is being conducted in only three Ghanaian schools: Achimota Senior High School (Mixed), Accra Academy Senior High School (Single Sex School, Boys), and Accra Girls Senior High School (Single Sex School, girls). Although the study's focus is on these schools, the researcher's ability to generalize the findings to a larger population of all Senior High Schools in Ghana is limited.

1.8 Delimitation

The study is carried out in the Senior High Schools in the Greater Accra Metropolis of Ghana and therefore the finding reflected the situation in Ghana. The study is delimited to only Elective mathematics students' senior high schools in the Accra metropolis.

1.9 Definition of Key Terms

Attitude is the opinions or feeling that you usually have about something, especially when this is shown in your behavior.

Gender per this study means either males or female

Performance: How well or bad something is done

Mathematics is the science of numbers and other shapes including algebra, geometry, and arithmetic.

Elective Mathematics is an elective course that is optional for General Arts and Business students but compulsory for General Science students in Ghana.

Mathematics Inventory is an adaptive assessment that measures achievement

Single-sex schools are schools where males or females attend school solely with members of their own sex

1.10 Organization of the Rest of the Study

This study was divided into five chapters. The first chapter discusses the research introduction, which includes the background to the study, the statement of the problem, the purpose of the study, the research objectives, the research questions and the significance of the study, delimitation, limitation, definition of terms, and the organization of the rest of the study. The second chapter discusses the previous

research literature review as well as the study's conceptual framework. The third chapter examines the research design, population, sampling procedure, data collection instruments, data collection procedure, data processing, and analysis. In Chapter Four, the results and data discussion. Chapter Five discussed the summary of findings, discussions, recommendations, and suggestions for further research into the problem based on the findings of this study.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter examines the literature relevant to the present study. A scientific identification and analysis of documents containing information relevant to the study is stated as a literature review. The chapter is split into two sections: a theoretical review and conceptual review, which incorporate sections on the nature of mathematics, gender differences in mathematics and elective mathematics, males and females' attitudes toward elective mathematics, and factors influencing males and females' performance in elective mathematics.

2.1 Conceptual Framework

Many studies have been conducted to research factors influencing students' mathematics learning, performance, and achievement. (Papanastasiou, 2002; Reynolds & Walberg, 1992). Mathematics anxiety (both core and elective) (Zakaria & Nordin, 2008); attitude toward mathematics (Hannula, 2002); mathematics self-efficacy (Williams & Williams, 2010); teachers (Beverley, 2002; Hill & Rowe, 1998); peers (Berndt & Ke (Gray, 1996; Kenney-Benson, Pomerantz, Ryan, & Patrick, 2006). The conceptual framework will take into account the following.

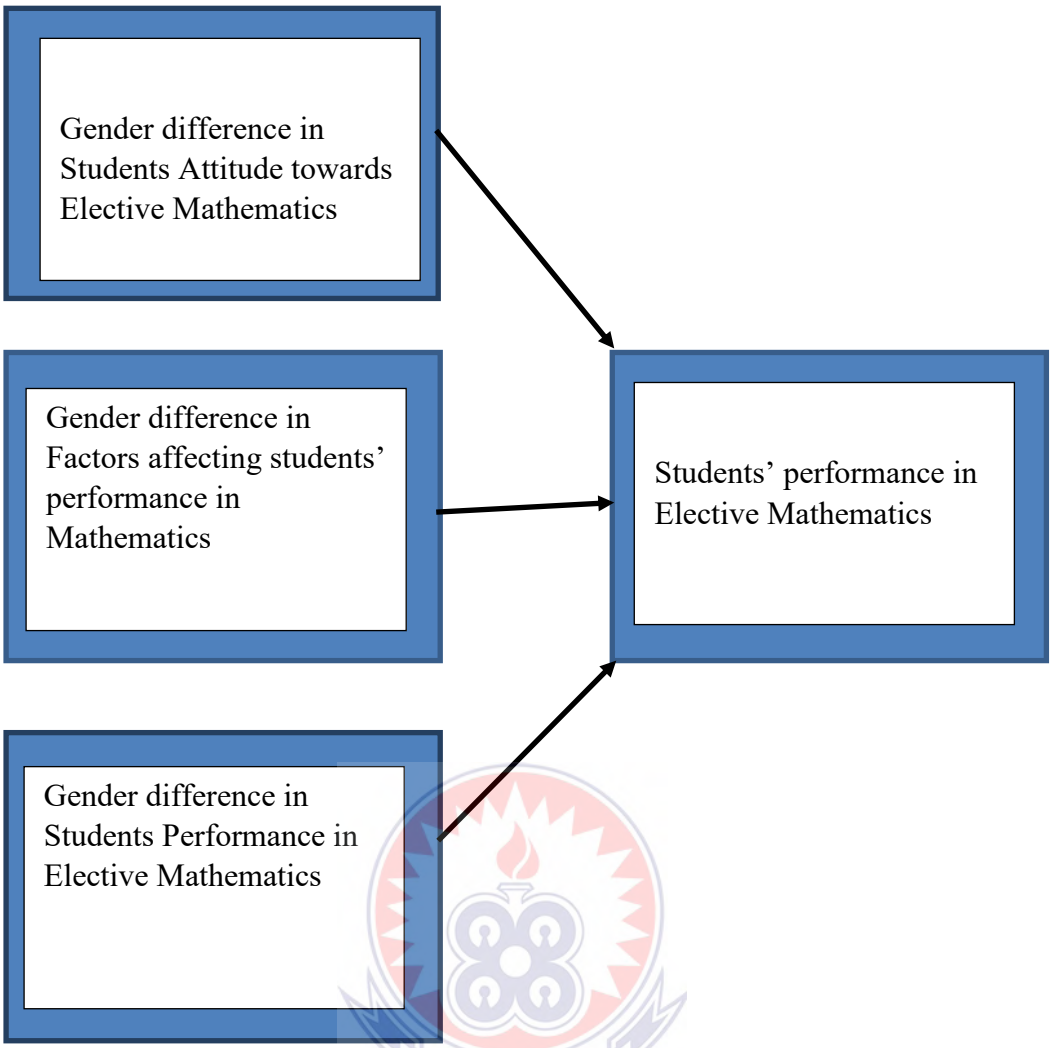

Figure 2.1: Conceptual framework

The study's conceptual framework indicated the role of gender in students' attitudes toward elective mathematics learning. That is the framework that depicts male and female attitudes toward elective mathematics study. Furthermore, the framework identified the factors that influence both male and female performance in Elective mathematics, indicating that if the factors are favorable, students intend to develop a positive attitude toward the study of elective mathematics as well as perform well in the subject. Finally, the study looked into whether or not there are gender differences in Elective Mathematics, as well as the impact of the factors on the dependent variable.

2.2 Nature of Mathematics

According to Yadav (2017) as cited by Dora (2021) referred to Mathematics as the queen of science. The expression 'Mathematics' originates from the Greek term 'mathema'. It means the learning and or the study of science. It remains an interdisciplinary language, a tool considered as a rudiment in formal educational system (Roy, 2011). Mathematics remains essential as far as knowledge acquisition in many other disciplines are concerned. Mathematics is the science of order, relation and structure. It evolves from fundamental practices of measuring, describing and counting the shapes and objects (John & Berggren, 2019). Mathematics is the language of all material science and pivot of all engineering programs. Mathematics is life, it is a critical filter of college selection and job placement.

"Mathematics could be a tool through which students and youth gain knowledge and skill about life; they found out how to pander to problems and apply their knowledge to real-world problems; they improve their reasoning and reasoning skills, and that they indurate their future." Gömleksiz (1997).

Many people believe that mathematics is the key to unlocking future career opportunities (Stafslien, 2001). Meanwhile, mathematics is employed to enhance one's understanding of life and to elucidate natural phenomena (Papanastasiou, 2002). As a result, mathematics is at the guts of today's reform efforts, which aim to ascertain a system for guiding students' learning and understanding of mathematics (Smith, 2000; Franke and Kazemi, 2001).

Mathematics, whether general (Core) or advanced (Elective), is quite just presenting formulas, concepts, symbols, then on for students to memorize; it’s an issue that’s intertwined with a system of ideas, principles, and processes. Mathematical

knowledge may be a valuable asset in our society (Baroody, 1987). It's a tool that may be employ in our daily lives to assist us overcome obstacles (Bishop, 2012). As a result, mathematics is thought to be one among the foremost important core subjects in a school curriculum. Attitude toward mathematics is critical within the teaching and learning of mathematics and it has an effect on students' achievement. The tactic of instruction and also the mode of assessment have an effect on students' attitudes toward mathematics and for that matter Elective Mathematics.

Typically, the way mathematics is presented within the classroom and perceived by students, even when teachers believe they're presenting it in an authentic and context-dependent manner, incorporates a negative impact on many students' interests in mathematics (Barton, 2000; Furinghetti & Pehkonen, 2002). Higgins (1997) discovered that school students within the United States who were trained in problem-solving techniques are supported by the recommendations from the National Council of Teachers of Mathematics (NCTM) to have more positive attitudes toward mathematics and were more persistent in seeking solutions than students in additional traditional classrooms. This means that the standard approach to teaching mathematics should be abandoned in favor of performance-based instruction (PA-driven instruction).

The traditional approach to mathematics instruction consists almost entirely of teachers instructing students to memorize presented facts or apply formulae, algorithms, or procedures without regard for why or when this is often appropriate. Recent research has consistently confirmed that isolated learning doesn't last (Hiebert, 2003). Mathematics is an integrated system of ideas, principles, and processes. Connections between concepts and principles should be established in

order that learning arithmetic is more of a challenge to the student's intelligence than just merely memorizing formulas. When students learn a procedure without understanding it, they're going to struggle to understand when to use it, remember a way to use it, apply it in new situations, and judge whether the results are reasonable.

Mathematics is defined by the Advanced English Dictionary as "the logical study of shape, arrangement, quantity, and plenty of other related concepts" (Kumar, 1988). Mathematics, which is often utilized in the sciences and other subjects, primarily uses numerical figures to elucidate the phenomenon under investigation. In keeping with Bochner (2007), mathematics is an important medium through which scientists express, formulate, and communicate scientific phenomena. It's broadly classified into three areas: algebra, arithmetic, and geometry. Mathematics may be a tight-knit system of ideas, principles, and processes.

2.3 Elective Mathematics

The Senior High School elective mathematics (EMATH) is a course that you choose to take as part of your program of study. Tests are employed to assess student's mathematical ability or preparation just like any course of study in preparation towards the final WASSCE examination. Unlike core Mathematics which is a mandatory course for all students in the Senior High Schools in Ghana to meet the requirements of a program of study, Elective Mathematics is not a mandatory for certain programs in the SHS but its compulsory for certain programs as it's a requirement to attain admission into the tertiary institutions to study certain programs.

E-Math preparation, maybe a measure of students' abilities. An oversized proportion of studies on the effect of mathematics on students' academic performance try to control for students' mathematical abilities by including a dummy variable for

whether students have taken calculus or a measure of mathematics aptitude (Ballard and Johnson, 2004).

2.4 Effects of Elective Mathematics on the Study of Other Subjects

Further Mathematics, also known as Elective Mathematics, has a bearing on other areas of study. It has been discovered that students who have a more positive attitude toward studying Elective Mathematics have an impact on other subjects. According to Yusif (2015), The Department of Economics has one of the highest rates of students' failures, repetition and withdrawals in the Kwame Nkrumah University of Science and Technology (KNUST), Kumasi. In the 2011/2012 and 2012/2013 academic years 35.8% and 30.6% of the 232 and 301 final year students respectively could not graduate. This concern has been attributed primarily to the low mathematical ability of the affected students. Consequently, university authorities in the 2013/2014 academic year made senior high school (SHS) elective mathematics a central requirement for students who intend pursuing economics as major. He therefore concluded that taking elective mathematics in the SHS has significant positive impact on performance in university economics in KNUST.

Some researchers in developed countries have investigated the impact of mathematics on university students' academic performance. Hoag and Benedict (2010) used data from Midwestern University to apply the ordered probate model to a sample size of 2,823 students from 2002 to 2006. They found that students who completed a mathematics class for majors/educators had a 12.6 percentage point higher average probability of receiving a grade A and a 12.2 percentage point higher average probability of receiving a grade B when compared to students in elementary and

intermediate algebra. They argue that high school mathematics maturity will help students perform better in their first economics course at university.

Furthermore, Lagerlöf and Seltzer (2008) investigated the impact of remedial mathematics, which was implemented by the Economics Department of Royal Holloway, University of London, on students who had not studied mathematics beyond the age of 16 or who had performed poorly in secondary school mathematics. Lagerlöf and Seltzer (2008) discovered that students' performance in mathematics courses before university has strong predictive power on their performance in a variety of economics courses. Reid (1993) demonstrated that having taken a mathematics class in their senior year of high school has a statistically significant and positive effect on the grade students earn in a college course.

Furthermore, higher knowledge in algebra, trigonometry, and geometry was associated with a higher likelihood of receiving good grades in economic classes. According to Hoag and Benedict (2010), the effect of ACT math sub-scores indicated that students with higher scores in elementary algebra, college algebra, or trigonometry and geometry had a higher probability of receiving A and B grades in their economics courses. Again, the higher the level of mathematical ability, such as trigonometry and geometry, the more likely the student will perform well in economics. Taking college-level business calculus or higher-level mathematics has an economically and statistically significant impact on economic performance.

2.5 Attitude

Attitude is defined by Ajzen (1988) and Franzoi (2000) as a positive or negative evaluation of an object. People, things, events, and issues are all examples of objects. For example, one of the most common characteristics of attitude is its evaluative

nature, which includes things like, dislike, love-hate, and pleasant - unpleasant (Franzoi, 2000 & Ajzen, 1988). Bolaji (1996) provided an overview of many aspects of mathematical attitudes, including a review of instrumentation; however, it is still unclear how the school environment influences the development of students' mathematical attitudes. That is the extent to which students believe the school influences their attitudes toward mathematics, i.e., whether they like or dislike mathematics in general, and elective Mathematics in particular.

Also, attitudes formed by students when studying mathematics tend to stay for a protracted time and these attitudes help them to find out mathematics better if it's positive or favorable (Evans, 1965). This might however always be not true since students may additionally form unfavorable attitudes as they learn mathematics within secondary schools. There are some well-equipped senior high schools with well-organized classrooms and enough teaching and learning resources yet students in such schools perform gloomily poorly in mathematics. Orora (1986) indicates that students in secondary schools who have very positive attitudes toward learning mathematics have an interest in pursuing further studies in mathematics. Orora (2010) again stresses that the foremost glaring weakness in students' mathematics attainment within the West African Senior School Certificate Examination is that the student's lack of data of elementary techniques and their ignorance of simple straightforward algorithms and processes. The Ghana Education Service (GES) together with the West Africa Examinations Council initiated in-service training courses for mathematics teachers in senior high schools in Ghana in a trial to boost their teaching techniques (Dzakadzie, 2015). Despite these efforts, students of some schools don't learn mathematics adequately to enable them perform better in their final mathematics examinations (Etsey, Amedahe & Edjah, 2004).

Attitude is a tendency to respond positively or negatively to a particular idea, object, person, or situation (Orora 1986). Studies on students' achievement in mathematics, particularly elective mathematics, have been linked to positive attitudes toward the subject as well as a conducive school environment (Carolinem & Kaczala, 1980). Tadesse (2006) confirms this, stating that teaching methodologies that increase students' interest have a direct positive effect on student performance. Students are crucial in what is taught as approved by the official curriculum because teachers are the intermediaries of teaching and learning.

Teachers use different teaching methods depending on the needs of their students, which may differ from the official curriculum to be implemented. This necessitates the consideration of appropriate learning targets based on learner characteristics (Rodgers, 2000). According to Rhodreck (1997), there can be no effective expressive teaching and learning without adequate instructional resources. To ensure that the national curriculum is fully implemented, education authorities must provide schools with adequate and relevant teaching and learning resources that allow teachers and students to participate actively in the curriculum implementation process.

2.6 Gender

Gender here refers to either one is a male or female. Early adolescence can be a critical time for females‟ development of academic interests and attitudes. Many girls think that being bright is in conflict with being popular. High academic success can easily be in direct conflict with the social aspects of adolescence concerning learning opportunities, student/teacher interactions, and mathematic performance (Lee, 1996).

Fennema and Franke (1992) have suggested that learning habits that involve working independently on high-level tasks may enable some children to do better in math and

science. Males and females have different learning styles and those females excel at a higher rate when learning mathematics through rules. They pointed out that young girls are socialized to be dependent, and they receive more protection and more assistance in doing tasks from their parents and teachers than boys receive. As a result of the reinforcement of dependence, when children enter school, females tend to be more dependent on others and males tend to be more self-reliant. Females as young as Grade 6 and 7 rates being popular and well-liked as more important than being perceived as competent or independent. Boys, on the other hand, are more likely to rank independence and competence as important. It is clear that both girls and boys have learned to equate maleness with opportunity and femininity with constraint (Sadker and Sadker, 1994).

With this awareness on the parts of both males and females as they progress to the SHS level, the teachers got to know each student on the basis of his or her gender and this will impact on his or her studies when it comes to elective mathematics

2.7 Self–confidence among Students in Mathematics

Gender differences in mathematics self-confidence and self-concept have gotten plenty of attention, with girls reporting low-self-confidence self-concept about their math abilities (Asante 2012; McGraw et al. 2006). Else-Quest et al. (2010) discovered a really small gender difference in tuts affective dispositions in a very meta-analysis of the Trends in International Mathematics and Science Study (TIMSS) and also the Program for International Student Assessment (PISA) data, representing 493,495 students aged 14 to 16 from 69 countries, with girls showing significantly less motivation and confidence in their mathematical abilities. In terms of self-concept, studies of single-sex schools have yielded conflicting results (Mael et al. 2005).

Marsh et al. (2013) discovered that self-concept was higher for boys in Anglo-Saxon countries and better for women in Arab countries where school type is predominantly single-sex when analyzing TIMSS-2007 motivational constructs. Students in single-sex schools have high self-concepts than those in mixed schools, in line with Lee and Bryk (1986). When other variables are controlled for, a reanalysis of Lee and Bryk's data found no differences at school type (single or mixed) (Marsh 1989). Other studies, however, have found that girls in a single-sex environment have higher self-concept (e.g., Riordan 1990) and self-confidence (e.g**., Mallam 1993; Rowe 1988).**

Students Attitudes Toward Mathematics in Separated and Mixed Schools, students' beliefs, values, attitudes, self-confidence, and motivation all have an effect on how they approach and process information. These elements can either help or hinder math learning (Bofah & Hannula, 2015a; Hannula, 2015). Understanding students' beliefs and also the influence of those factors can provide insight into their learning and motivation. Gender influences students' mathematics self-concept, mathematics self-confidence, and perceived usefulness of mathematics per research (e.g., Belcher et al. 2006). Many countries related to the United Kingdom (e.g., Commonwealth nations like Australia, Canada, New Zealand, Nigeria, Kenya, Ghana, South Africa, and others), the United States, and the Arab world (e.g., Saudi Arabia) have single-sex schools (Lee & Bryk 1986; Mael et al. 2005; Marsh et al. 2013; Smithers and Robinson 2006).

Males and females attend single-sex schools, where they’re the sole students of their sex. Such single-sex settings can include the whole school or simply one class, program, or stream within the school. Because of the scarcity of those sorts of schools in some areas, little research has been conducted into single-sex and mixed schools.

There is because such research has been limited to areas where those school types exist. Furthermore, much of the research on secondary single-sex and mixed schooling has focused on student studies 'in the social and psychological environments of the faculties instead of specific domains like mathematics (Belcher et al. 2006; Lee and Bryk 1986). As a result, because single-sex schools are a worldwide phenomenon, the varied educational systems and cultural contexts related to these countries limit generalizations from such studies (Bigler and Signorella 2011)

Improved behavior, higher achievement, increased student self-confidence and self-concept, fewer school dropouts, a far better social climate, and improved student and parent attitudes toward schooling are all notable outcomes in single-sex schools. However, unless variables like prior achievement, socioeconomic status (SES), parental support, school traditions, and homogeneity in class types are controlled for, actually impact of single-sex schools cannot be determined according to (Marsh, 1989). (Hayes et al. 2011; Nagengast et al. 2013).

Furthermore, immediate factors like expectations and situational pressures, additionally as social and cultural gender patterns, influence school and gender-related behavior (Deaux and Major 1987). Smithers and Robinson (2006) found no evidence that one school type was superior to a different one and in review of studies on single-sex schools conducted in Australia, the United States, Canada, New Zealand, Ireland, and the United Kingdom. They concluded that providers should offer the school type based on the circumstances, and parents should choose the best school type for their children. There is no clear advantage to one school type over another. The students' "Views on Mathematics (VOM)," as well as elective or further Mathematics, in single-sex and mixed schools in Ghana is very important. The study

will look at the psychometric properties (factor structure, reliabilities, method effect, and measurement invariance sex boy school) of the View on Mathematics constructs (e.g., mathematics self-concept, family encouragement, and teacher quality) across school types.

2.8 The attitude of Female Students towards Elective Mathematics

According to (Kaldo, 2015), in Estonia at the university level over than two-thirds of scholars believe that what they are learning in mathematics is interesting. Female students pursuing Mathematics in both mixed and segregated schools in Ghana found what they were learning to be interesting and are eager to advance their studies. The 2020 National Science and Mathematics Quiz, which was held in Ghana, demonstrated how exceptional female students were in comparison to their male counterparts in the queen of sciences (Mathematics). They demonstrated command of the subject. Other research indicates that females have a more positive attitude toward mathematics than their male counterparts. In their study, Kaldo and Hannula (2014) discovered an unexpected result: female students in Estonia had a more positive view of mathematics than male students. Female students found mathematics to be interesting, and they excelled at it (Kaldo & Hannula, 2014). It was also discovered that male students found mathematics to be more difficult than female students (Kaldo & Hannula, 2014). Males also perceived Mathematics as a difficult subject. (Kaldo and Hannula) extensively described Mathematics as very harder when it comes to the males' point of view. Females have a more Positive Attitude toward Mathematics in the General. According to research, females have a positive attitude toward mathematics. They prefer Mathematics and believe it is more important to study Mathematics than their male counterparts. Li (2007) collected data from 450 secondary students (grades 7-12) and discovered that female students in Canada have

significantly more positive attitudes toward mathematics than male students. That is, female students enjoy learning mathematics more than male students and believe it is more important to learn mathematics. Since females have a more positive attitude toward mathematics than males. (Steinthorsdttir and Sriraman 2007) show that in Iceland, gender differences in mathematics achievement favored girls or females more than males. Steinthorsdottir and Sriraman (2007) demonstrated that significant gender differences in mathematics achievement favoured girls in Iceland.

Furthermore, while Steinthorsdottir and Sriraman (2007) found that gender differences in achievement favored girls or females, Lindberg et al (2010) found that the gender difference in weighed studies was very small. Lindberg al. (2010) conducted a meta-analysis of 242 studies on gender differences in mathematics performance, representing testing data from 1,286,350 people published between 1990 and 2007. The key finding of their study was that the gender difference was very small when weighted across all studies.

In addition, Eshun (2004) and Nyala (2010) discovered that girls or females in segregated schools reported the highest Mathematics confidence when compared to their male counterparts in segregated schools and both sexes in mixed schools in a study of students' attitudes toward Mathematics in Ghana. Males in mixed schools reported lower confidence in Mathematics than males in segregated schools. Males in mixed schools reported the lowest level of Mathematics confidence overall.

In most cases, the attitude of lower grade school students is carried over to the higher level. Thus, when Brown and Ronau (2012) examined ninth-grade students' attitudes toward learning mathematics (e.g. confidence), science, and school climate perception, they discovered no significant difference in males' and females' attitudes

toward learning Mathematics or Science, even when grouped into segregated schools and mixed schools or classes. Githua and Mwangi (2003) discovered that boys in segregated schools had higher mathematics self-confidence and self-concept than girls in segregated and mixed schools in Kenya.

2.9 Students' Attitude towards Mathematics based on Gender

Kö et al. (2009) investigated grade school students' attitudes toward mathematics in terms of some variables. Gender doesn't appear to own a big impact on student's attitudes toward mathematics in grades 6, 7, or 8. This demonstrated that there was no discernible difference in male and feminine students' attitudes toward mathematics. Batool, Akhter, and Kalsoom (2020) investigated gender differences in attitudes toward mathematics at the secondary level in Pakistan. A total of 1186 students were chosen for this study employing a multistage sampling process. Gender differences in middle school students' attitudes toward mathematics in Pakistan were investigated employing a questionnaire designed by the researcher. There have been no significant differences in attitudes toward mathematics between men and girls, in line with the findings.

Imasuen and Omorogbe (2016) investigated the impact of gender on junior lyceum pupils' attitudes toward mathematics in Edo State's Ovia North East Government Area. The findings revealed a big difference in male and feminine students' attitudes toward mathematics. In step with Asante, "girls lacked confidence, had debilitating causal attribution patterns, regarded mathematics as a male domain, and were concerned about mathematics" when put next to boys. Sanchez, Zimmerman, and Ye (2004) discovered significant gender differences in eighth-grade students' attitudes toward mathematics during a study with North American students. Sanchez,

Zimmerman, and Ye (2004) discovered that gender differences in eighth-grade students' attitudes toward arithmetic were significant. Within the United States, boys were more curious about math than girls, but girls thought math was more important than boys. Furthermore, girls performed better on items regarding math challenges. Farooq et al. (2008) conducted a study on students' attitudes toward mathematics. They discovered that there's no significant difference in male and female students' confidence in mathematics at the secondary level at the 0.05 level of significance. Furthermore, the study discovered that gender has no differences pertaining to the usefulness of mathematics.

Elçi (2017) aimed to spot students' attitudes toward mathematics, investigates mathematics teachers' techniques and in-class activities on students' attitudes toward mathematics. The study was conducted with Turkish high school students. This study employed both quantitative and qualitative methodologies. Semi structured interviews, which measures Mathematics Attitude Scale (MAS) and Mathematics Teachers' Approaches Questionnaire (MTAQ) were the tools used to collect the data. The results revealed that students' attitudes toward mathematics differed by gender, field, and arithmetic score but not by grade, which of cause teachers' approaches and activities influenced students' attitudes toward mathematics in a very special way.

The attitude of students toward mathematics has been identified as a very important ways of learning, participation, and achievement in mathematics (Papanastasiou, 2002; Shashanni, 1995). In general, a positive attitude toward an issue is believed to influence a student's success in this subject. A positive or negative evaluation of a psychological object has been defined as an attitude toward mathematics (Ajzen & Fishbein, 1980). Hannula (2002) identified four distinct evaluative processes related

to attitudes toward mathematics: (a) emotions experienced while engaging in mathematical activities; (b) emotions evoked by the concept of mathematics; (c) evaluations of the results of doing mathematics; and (d) evaluations of the worth of mathematics to one's future goals. In an exceedingly similar vein, attitude toward mathematics has been considered multidimensional (Hart, 1989; Ma & Kishor, 1997), distinguished by variety of dichotomies: whether one likes or dislikes mathematics; whether one believes one is proficient or inefficient in mathematics; the proclivity to pursue or avoid mathematics; beliefs that mathematics is critical or non-significant, easy or difficult (Ashcraft, 2002; Ma & Kishor, 1997; Neale, 1969; McLeod, 1992). These pairings differ within the degree of emotionality or cognition related to them, and it's possible that a student will have a positive attitude toward some while having a negative attitude toward others. For several years, researchers have attempted to grasp the connection between mathematical attitude and mathematical achievement (Ma & Kishor, 1997; Nicolaidou & Philippou, 2003).

Ma and Kishor (1997) discovered a major but weak causal relationship between the 2 constructs in their meta-analytic study. In line with Ma and Kishor's (1997) findings, Singh, Granville, and Dika (2002) discovered that a positive attitude toward mathematics influenced math achievement in Grade 8 students from the Longitudinal Study of yank Youth database. Mato and de la Torre (2010), Nicolaidou and Philippou (2003), and Thomson, Hillman, and Wernert (2012) all reported similar findings. Chagwiza, Mutambara, Tatira, and Nyaumwe (2013), on the other hand, found no significant relationship between attitude toward mathematics and mathematics achievement in middle school students from three urban schools in Bindura, Zimbabwe. The complexities of the construct of attitude toward mathematics

because of the inconsistency of its definitions across studies, make it difficult to produce a conclusive picture of the character of the link.

It has been observed that students' mathematical attitudes and beliefs change gradually as they progress through school (McLeod, 1992). In line with researchers, most secondary school students enjoy mathematics and have more positive beliefs about its importance than their high school counterparts (National Center for Education Statistics, 2001; Dossey, Mullis, Linquist, & Chambers, 1988). Wilkins and Ma (2003) discovered, using data from the Longitudinal Study of yankee Youth (LSAY), that lyceum students' attitudes toward mathematics become increasingly negative as they progress from elementary to Gymnasium. Although studies with Western and East Asian samples revealed a positive relationship between the constructs, it's unclear whether these findings are applicable within the Ghanaian context. As a result, this study investigates the impact of elective mathematics on attitude and elective mathematics achievement or performance among senior high students in both segregated and mixed schools in Accra Metro.

2.10 Are both males and females given equal opportunities?

Males and females are given equal opportunities in every hemisphere of life in Ghana, from pre-school up to the university level of education. Consistent with the researcher, females are given even more opportunities than males at school program selection. As an example, within the CPSS (Computerized Placement School System), students who want to pursue STEM (Science, Technology, Engineering, and Mathematics) courses are all given equal opportunities, with females having a plus. Following this, Else-Quest et al (2010) specifically identified the domain of gender equity as being answerable for the gender gap in Mathematics, furthermore as

commenting that there's gender equity in class enrollment for the gender gap in Mathematics.

Else-Quest et al. (2010)'s findings identify the precise domains of gender equity that are chargeable for gender gaps in mathematics. Gender equity in class enrollment, women's share of research jobs, and women's parliamentary representation were identified. Gender studies typically conclude that mathematics may be a male domain or that no gender differences exist. Some studies, however, show that females have a more positive attitude toward mathematics than males. As a result, both boys and girls are given equal opportunities to participate in Mathematics education and further Mathematics in the least levels of education in Ghana and worldwide.

According to Maccoby and Jackklin (2004), the impact of gender on student achievement in examinations found that "boys clearly perform better than girls in mathematics examinations." Mitchemore (2007) "acknowledges the prevalence of male students over female students, noting that boys obtained higher scores than girls all examinations." Consistent with Ajai and Imoko (2015), there's no significant difference within the achievement of males more than females' student once they are taught algebra; thus, male and female students are equally skilled to compete and collaborate in mathematics. However, (Howes, 2002) reports to buttress the point above that females equally perform well as compared to their male counterparts in mathematics once sufficient care is given in scientific analysis during the female students' learning process.

Although gender inequality in science, technology, and mathematics education (STME) may be a global issue, it's claimed that closing the gender gap is one among the foremost important ways to realize development. To support gender equality in

mathematics, each counterpart must have equal challenges and opportunities. With information from TIMSS over the years, the Ghana MOE 2017/18 has taken steps to meet the demands of (STEM) across all levels of the education system. When Ghanaian students were compared to other countries that participated within the TIMSS 2003 examination, Ghanaians performed among all-time low, consistent with Anamuah-Mensah, Mereku, and Asabere-Ameyaw (2004). TIMSS 2007 only described little or no progress in mathematics achievement, demonstrating that females' have slower performance in mathematics. However, consistent with MOE 20017/2018 reports, there's a ready collaboration with Africa Institute Mathematical partnering with other countries to strengthen and promote Science, Technology, Engineering, and Mathematics in Ghana, with the goal of promoting female mathematics achievement. Nevertheless, the foremost important about a student's educational success, in keeping with Merttens (2005), is their parents.

According to Nsubuga (2008), the role of oldsters, particularly through the Parent-Teacher Association (PTA), was a major contributory factor to students' learning achievement. Other important factors identified in gender and arithmetic research include family influences, parental socioeconomic status, and cultural and traditional influences (Kaino & Salani, 2004). Nonetheless, despite the very fact that a lot of researchers seek to enlighten the parent as an element in students' performance, it appears that several parents are more passively engaged in their ward's mathematics achievement (Cannon & Ginsburg 2008), demonstrating how students' mathematics performance and participation in mathematics may be a true reflection of their parent's involvement in their studies. As a result, the slow rate of female students' achievement in mathematics may be attributed to folks and residential factors.

Female self-perceptions, on the opposite hand, are primarily formed through interactions with and interpretations of one's environment. This includes attitudes and knowledge about the environments, abilities, skills, and social acceptability (Bouche & Harter, 2005). Consistent with Fan (2001), parental involvement has a direct impact on students' academic achievement; thus, female students enjoy parental involvement. The environment in which children grow has a sway on their attitude toward mathematics. The house environment contains a range of things that influence students, but the foremost important one involves the **fogeys**.

2.11 Females' participation in elective mathematics as compared to their male counterparts

Females are underrepresented in elective mathematics studies, in line with mathematics education researchers. During a study conducted by Lamb (1997), 37% of women studied advanced mathematics compared to 63% of boys within the final year of Gymnasium (year12). As a result, Lamb concluded that girls studied the harder option mathematics much less frequently, and that they were way more likely to drop the topic entirely when it became elective. The pursuit of an answer to the current problem has prompted researchers to have specific concern about female students' aversion to mathematics in school.

There is substantial evidence that the female proportion of all students taking elective mathematics examinations within the final year of college decreases year after year. In fact, many of the ladies who pursue a career with large quantitative elements are highly successful, but their overall number is way under that of their male counterparts; a situation that is uncommon in non-quantitative fields like English and French. Nash (1979), as cited by Fabricant, Svitak, and Kenschaft (1990), states that

when the quantity of women enrolled in non-required advanced mathematics classes becomes very small, the remaining girls tend to drop out.

According to some studies, girls' education in mathematics, whether core or elective, is usually discouraged in secondary schools (Eboutou, Quaisie, Masanja & Mulemwa 1997; Opyene-Eluk&Opolut-Okurut,1995). These examples show that girls are underrepresented in elective mathematics studies at the lyceum level. To deal with the problem of girls' aversion to mathematics, particularly elective mathematics, many governments have implemented programs to encourage female participation in schools, including a redesign of college curricula within which all students are given equal participation opportunities. For instance, Ghana accepted the Common Wealth Secretariat educational ministers' recommendation in 1987, Nigeria in 1989, and Botswana in 1990, and arranged various workshops in science, mathematics, and technology to encourage girls to have an interest in and enter careers in science, mathematics, and technology.

In Ghana, the Science, Technology, and Mathematics Education (STME) clinic is held each year to address the issue of girls' low participation in mathematics-related courses. Despite these efforts and the importance of mathematics, girls' participation in elective mathematics in secondary school is low. Girls have a low rate of participation (Eboutou et al, 1997). Furthermore, male and female students' study in the same environment and under the same learning conditions in co-educational institutions. They interact so well that at the end of secondary school (SSS 3), they could see each other as equals in academic pursuits, especially these days when women's changing roles are taking on new dimensions.

In a related study, Blum-Anderson (1992) discovered that if girls did not understand the relationship between higher-level mathematics and their future educational and career opportunities, they were less likely to enroll in mathematics classes once its an elective. Girls are under-represented in the study of elective mathematics because more boys than girls adhere to the school-wide policy of studying both elective and core mathematics. As a result, the higher the level of the mathematics course, the greater the proportion of males enrolled. Fennema (1978) Other studies have discovered larger differences in male and female students' participation in higher level mathematics options required for university entry into the physical sciences, engineering, and technology Lamb (1997).

Concerning female role models, the absence of these role models in the study of elective mathematics reinforced girls' belief that elective mathematics was a domain reserved for men. Riordan's (1985) study focused more on the assumption that female teachers, as role models, promoted more positive attitudes in female students. The traditional view of mathematics as a male domain has contributed to the decline of females in high school mathematics, according to research (Armstrong & Price, 1982; Shaughnessy, 1983). (Ernest 1976; Fennema 1981, 1984; Sells 1980). Given this, any differences in participation in elective mathematics studies at the senior secondary school (SSS) level observed between boys and girls can be attributed to differences in the two sexes' characteristics, sociological, and job preferences.

2.12 Factors that influence Student's Performance in Elective Mathematics

2.12.1 Elective Mathematics Teachers Not Teaching for students to comprehend the Application Aspects of the Elective Mathematics topics

The elective Mathematics teachers usually do not teach the application aspect of the topics they teach leading to students' inability to relate their everyday life to the elective Mathematics they learnt.

Another thing that affects students' performance is that teachers do not teach topics that students can relate to in their everyday life. The more the students can practicalized whatever they are learning makes more meaning to them and that affects the day they learn and it improves their performance.

Majority of students are able to relate well with topics that are applicable and relate to their daily lives and since most students are not adventurous, they rather refer practical topics and this most of elective mathematics do not teach to make the lessons or the topics reals to the students and this affects their performance.

There is a video in the social media where a student was seen by his mathematics teacher and when he, the teacher asked him why are you selling "meat pie"? The student response to the teacher that sir you taught me πr^2 so I am now selling "pie". This lesson was probably not practicalized for this student to relate to his everyday life. Augustus and Ebenezer (2018) findings revealed that most students of Odoben Senior High school had poor attitudes toward the study of mathematics because of teachers' failure to break mathematical concepts into their simplest forms for easy understanding, absenteeism of students in mathematics lessons, behavioral characteristic acquired through socialization in the school environment and lack of both qualified mathematics teachers and teaching and learning resources for the

smooth implementation of the mathematics curriculum. The major effect was poor academic performance of students in mathematics.

2.12.2 Teachers' Mastery over the elective mathematics content

Before an effective teaching and learning commenced, one important factor of the matter is the teacher's mastery over the content matter he or she teaches.

Großschedl, Welter and Harms (2019) defined content knowledge as being knowledgeable in the topic at stake. For example, ability to demonstrate master over Mathematics together with its structure. It includes, the representation and formulation of a subject, so that it becomes understandable to others. Another example is demonstrating understanding in making the teaching and learning of a specific topic either easy or difficult. (Rollnick & Mavhunga, 2017)

There many teachers teaching elective mathematics at the SHS levels but do not have mastery over the subject content. Although they manage to complete programs at the university levels but they are not well vest in the content they teach at the SHS level. Ones the teacher is unable to explain topic well for the students to understand, it dampens their spirit and this normally affects their performance.

Prof. Christopher Okpoti of University of Education, Winneba once said during Complex Variable class that "most of you teachers do not have mastery over the mathematics content you teach". This statement was confirmed by Donkor (2020).

Donkor (2020) also states that for a teacher to teach very well, he or she needs to know the subject matter in a comprehensive way. A student once confounded in the researcher that a teacher was taking them in elective mathematics and he happened to go on holiday and another teacher came to replace him and the students' performance

decline drastically. When the former teacher investigated, he got to know that the current elective mathematics teacher does not have that mastery over the content of what he was teaching so the student lost interest in the elective mathematics.

Prominent evidence of the relationship between teachers' Mathematics Content Knowledge and teaching ability is the extraordinary performance put up in the East Asian countries' international tests. The evidence is obviously clear in tests such as Programme for International Student Assessment (PISA) and Trends in International Mathematics and Science Study (TIMMS) (Mullis, Martin, Foy & Arora, 2012; Organization for Economic Co-operation and Development [OECD], 2014). Emerging data from the test shows that a very high proportion of students from the East Asian countries meet international benchmarks as compared to the Western countries counting Australia, Britain, the US, and Modern Zealand (Norton, 2019).

Dora (2021) stated that African countries particularly Ghana did not meet the international benchmarks. You can only give what you have, a teacher with inadequate Elective Mathematics knowledge will have a negative effect on his students and this can affect their performance.

2.12.3 Interest in Elective Mathematics as a Factor

To create new curriculum materials that would be used to improve students' beliefs about the importance of mathematics and, by extension, further mathematics, we needed to place the mathematics in contexts that would appeal to students with a wide range of interests. It was unlikely that a single set would appeal to all students. Students differed in many ways, including their readiness to learn, learning styles, experiences, and interests (Tomlinson, 2000). Two types of interest have been identified as critical in their literature: personal interest, which is activated internally,

and situational interest, which is activated externally and is important in capturing students' attention (Schraw, Flowerday, & Lehman, 2001). Offering students meaningful choices was one of the strategies described by Schraw et al. (2001) to increase situational interest.

The positive relationship between choice and interest is widely acknowledged (Flowerday & Schraw, 2000), and it can also be derived from self-determination theory (Deci, , Pelletier, & Ryan, 1991). Offering options did not guarantee a connection with students' interests. The options from which students could choose Vallerand had to be meaningful to them to be relevant to their personal goals, not too numerous or complex, yet not too simple, and congruent with the values of the student's social background (Katz & Assor, 2007). Several students indicate who is not challenging at times, and according to Bean and Eaton (2000, p. 57), such students will revert to avoidance behavior such as not attending class, not studying, or performing poorly academically. During the interviews, students mentioned these and other reasons as the effect of the problem on their studies, which eventually led to the students withdrawing from their studies (Bean & Eaton, 2000).

2.12.4 Incentives for elective mathematics students

Incentives such as a special handshake for students who do well in Elective Mathematics could promote Elective Mathematics development among girls and boys. A student once said "I remember when I was called in front of the whole school for being first in our end of year elective Mathematics examination. The feeling was great, it's a moment I can never forget. I resolved to work hard to maintain the position." Another respondent said "he could simply not take it when a girl was named as the best elective Mathematics student in his class. He promised to be the

next person whose name will be mentioned. He worked hard towards it and he achieved it. It is clear from the above that the use of incentives motivates students to study elective Mathematics. They believed that support in the form of scholarships, educational materials, and extra tuition if the need arose could do a lot in supporting the students than mere handshake.

According to Amanullah (2013) learner or students become punctual and regular when incentives and scholarships were awarded. These incentives motivate learner to put in their very best in studying elective mathematics. A student who is aware that becoming first in his or her elective mathematics examinations, he or she will be awarded a scholarship to study in the University, will put in the best to study the subject in order to achieve this.

Punctuality and regularity improve one's ability to study more. The more a student is regular, he or she gets the opportunity to study new things every day and that improves the student's ability to perform better in Elective Mathematics

2.12.5 Environmental Influence on Students' Academic Performance

Researchers are interested for an extended time within the classroom environment's influence on students‟ motivation and learning. The overall consensus has been that environment "characterized by mutual respect, high standards, and a caring attitude are more conducive to student persistence to other environments" (p. 103). Awanta (2000) said that influence within the classroom doesn't always flow from the teacher. He affirms that students do influence one another and may even influence the behavior of their teachers. He indicates that according to research dispensed by Newcomb (as cited in Awanta, 2000), many students conform illustrate to coevals' norms, a number of which are in contradiction to those held by educators and

teachers. Students do influence the behavior of their teacher. He says, “behavior in the classroom is bi-directional, that is, the behavior of the participants is influenced not only by what the teacher does but also what students do” (p. 107). Copeland further states that where there’s an enabling environment, where students have a positive perception of themselves and their peers and where they need satisfaction for his or her individual needs, “they continue academic tasks and work cooperatively with their teachers to fulfill the strain of classroom life” (p. 113). The way teachers handle their classes is an important factor that influences the way classes develop norms that they establish for social and academic work. This, he sees, as an important function of teachers. Providing leadership may be a critical executive function performed by teachers. Educators are a great deal concerned with the workings and influence of the peer group and associated characteristics of students‟ culture within the school. They end with an appeal to teachers to require under consideration the actual fact that peer relationships have a robust influence on what occurs within the school and also the classroom. The performance of students is invariably influenced by the attitude put up by teachers and their peers. They admitted that students are affected positively or negatively betting on whether or not they are favorable or unfavorable perceived by their teachers and peers. They conclude that a prime rate of success is achieved if classrooms are well-managed and students are given enough engaged time. This lies on the power of the teacher to manage the classroom as a good learning environment when transitions are orderly and brief. A conducive academic environment, they say, motivates students to realize high level of accomplishment. On the opposite hand, if the environment isn’t challenging enough, anyone within the community will have an occasional level of feat and motivation. They talked about socially harmful environmental influences that run counter to high school and societal norms. In such a

case, he advises heads of schools and educational officers to work with parents to think about all the environmental factors that affect children within the community and find appropriate solutions for them.

Agu and Hamad (2000) also are of the view that parental expectations among others have a good influence on the academic performance of boys and girls. They also state that quite a number of studies have proved that teachers' expectations of students' academic performance have a robust influence on the actual performance of the students.

2.12.6 School and Classroom Environments

Abotowuro (2015) states that the way teachers handle their classes are important factors that influence the way classes develop norms which they establish for social and academic work. This, he sees, as important function of teachers. Providing leadership is a critical executive function performed by teachers. He continues to say that Educators are very much concerned with the workings and influence of the peer group and associated characteristics of students‟ culture within the school. They end with an appeal to teachers to take into account the fact that peer relationships have a strong influence on what occurs in the school and the classroom. The performance of students is invariably affected by the attitude put up by teachers and their peers. They admitted that students are affected positively or negatively depending on whether they are favorable or unfavorable perceived by their teachers and peers. They conclude that high rate of success is achieved if classrooms are well-managed and students are given enough engaged time. This depends on the ability of the teacher to manage the classroom as an effective learning environment when transitions are orderly and brief.

A conducive academic environment, they say, motivates students to attain high level of achievement. On the other hand, if the environment is not challenging enough, any individual within the community will have a low level of achievement and motivation. They talked about socially harmful environmental influences that run counter to school and societal norms. In such a case, he advices heads of schools and educational officers to work with parents to consider all the environmental factors that affect children in the community and find appropriate solutions to them.

The environments affect student's outcome in terms of performance. A well-managed elective Mathematics classroom coupled with good, relaxed and conducive atmosphere for teaching and learning of elective mathematics will go a very long way to improve performance of students.

2.12.7 Elective Mathematics Anxiety

Mathematics anxiety has been defined as feelings of fear or tension associated with mathematical problem solving or any mathematics-related activity (Ashcraft, 2002; Ma & Xu, 2004b). Mathematics anxiety was defined by Dreger and Aiken (1957, p. 344) as "the presence of a syndrome of emotional reactions to arithmetic and mathematics." Bandalos, Yates, and Thorndike-Christ (1995) defined mathematics anxiety as a combination of test anxiety, thoughts of failure, low self-confidence, and a negative outlook on learning mathematics and, for that matter, elective Mathematics. Mathematics anxiety was defined in this study as students' negative emotional reactions to mathematical concepts and testing situations (F. C. Richardson & Woolfolk, 1980).

Mathematics anxiety has been identified at all levels of schooling, from primary to tertiary (Ma & Kishor, 1997), and has been found to influence students' mathematics

achievement. Over several decades, a small negative association has been observed between mathematics anxiety and achievement (Eccles & Jacobs, 1986; Woodard, 2004). Zakaria and Nordin (2008) discovered that pre-tertiary students who were anxious about mathematics performed significantly worse than less anxious students. Quilter and Harper (1988) discovered that highly mathematically anxious adults performed worse in mathematics than those with low mathematics anxiety.

Individuals' career options are also influenced by mathematics anxiety, both in terms of their mathematical attainment and their proclivity to pursue mathematically dependent options. The level of achievement in mathematics at the secondary and university levels influences a student's career options (Lent, Lopez, & Bieschke, 1993). Students who are anxious about mathematics are more likely to avoid mathematics-related activities, courses, or majors (Ashcraft, 2002; Ashcraft & Kirk, 2001; Zettle & Houghton, 1998), limiting their career options. Llabre and Suarez (1985) discovered that men have less specific math anxiety than women. Males with math anxiety frequently have generalized test anxiety rather than specific math anxiety.

Mathematics anxiety (both core or elective) refers to the persistent tension, apprehension and fear related to conditions numbers. Mathematics anxious individuals experience unpleasant apprehensions which affects their performance in Mathematics (Ramirez et. al, 2018). The consequences of the anxiety of an Elective Mathematics teacher goes beyond the individual teacher. This is because the mathematics anxious teachers cannot trust their ability to successfully carry out their teaching and learning processes to the admiration of all. That is, teaching with confidence and self-efficacy (Ramirez et.al, 2018). The teachers' Mathematics anxiety

has an influence on their students' Mathematics learning and performance. Numerous quantitative studies, (Maloney, Ramirez, Gunderson, Levine, & Beilock, 2015; Hadley, & Dorward, 2011; Beilock, Gunderson, Ramirez & Levine, 2010) as well as qualitative studies (Bryant, 2009; Furner & Berman, 2003; Sloan, Daane, & Giesen, 2002; Vinson, 2001; Ring, Pape, & Tittle, 2000) have reported the negative relationship that exist between the teacher's Mathematics anxiety and improvement in learners Mathematics attainment. There exists a relationship between how teachers feel about Mathematics and learning outcomes of their students. Therefore, how an elective Mathematics teacher feels about the subject have a ripple effect on the learner. There is a tendency of this teacher passing his or her elective mathematics anxiety to the students

2.12.8 General Test Anxiety

Even though math anxiety has been shown to limit women's career choices, research must be conducted to understand the factors associated with math anxiety to all problems. Problem studies have found correlations between math anxiety and other factors. Betz (1978) discovered a link between math anxiety and test anxiety. She contended that one component of math anxiety is anxiety about evaluation (testing). Bandalos, Yates, and Thorndike-Christ (1995) and Benson (1989) found a positive relationship between math anxiety and test anxiety, which supported this. Confirmatory factor analysis research has revealed that, while math and test anxiety are related, they are distinct measures (Kazelskis et.al. 2000).

2.12.9 Effect of Elective Mathematics Teachers' Professional Training on Students' Achievement

Abotowuro (2015) states that some Researchers are of the view that when teachers of mathematics (Core or Elective) are well-trained the students they teach will also achieve more in mathematics. When a teacher receives a good training, he or she is very likely to impact more on students.

In Ghana, teachers are supposed to be trained in the various teacher training colleges and the universities of education (UEW that is University of Education, Winneba, University of Cape Coast UCC etc). The afford mentioned universities, the training is done in specific subjects of specializations of the teacher trainees. However, there are some teachers who have been recruited into the teaching field without the prerequisite training in education this untrained teachers may have a negative influence on " achievement in elective mathematics"

There are certain teachers who did Mathematics as minor but major in other fields are being used as Elective Mathematics teachers. These teachers do not have that requisite knowledge in the subject area that is why their interest is in other subject area. So, the use of these teachers in teaching elective mathematics will affects student's performance. There is therefore the need once the teacher does not major in that particular subject area, he or she shouldn't be given that opportunity.

Teachers professional training adversely affect the achievement of students and elective mathematics is no exception. Adeyeye and Arifolo (1999) in their study of impacts of teachers" professional qualification and academic qualification on students in Chemistry in Eketi State found that a statistically significance difference exists between the academic achievement of students taught by professional and non-

professional teachers in Chemistry in secondary school level. Those taught by professional teachers showed a better overall academic achievement in Chemistry in Ekiti State.

2.12.10 Mathematics Preparation and Mathematics Ability

Early math anxiety research looked at the relationship between math anxiety and math preparation or math ability. Betz (1978) and Llabre and Suarez (1985) discovered that the more math preparation students received, the less likely they were to report high levels of math anxiety. Several other studies have found an inverse relationship between math anxiety and the number of math courses taken (Bandalos, Yates, and Thorndike-Christ 1995; Benson 1989; Burton 1979; Resnick Viehe, and Segal 1982). Furthermore, higher math achievement as measured by the ACT math subset has been linked to lower reported levels of math anxiety (Betz 1978).

Recent research has revealed that the relationship between math skills and math anxiety in males and females is more complex than previously thought. Stage and Kloosterman (1995) discovered that previous mathematics skills but not mathematics beliefs were significant predictors of course grades in males but not in females. Throughout high school, males and females take similar mathematics classes (Levi 2000). Thus, if there are differences in math anxiety between men and women, they cannot be attributed solely to math preparation. Furthermore, determining the direction of the relationship between math preparedness and math anxiety is difficult because math anxiety would reduce the number of math classes taken and a lack of math preparation would increase the amount of math anxiety.

2.12.11 Perceived Mathematics Ability or Mathematics Self-Efficacy

Previous research on the relationship between math self-concept or self-efficacy and math anxiety has been conducted (Bandalos Yates and Thorndike-Christ 1995; Benson Bandalos and Hutchinson 1994; O'Brian Kopala and Martinez-Pons 1995; Pajares and Kranzler 1995; Stuart 2000). Bandura defines self-efficacy as an individual's belief in his or her ability to complete a task (Bandura 1977). Even when the general mental ability was controlled for, Pajares and Kranzler (1995) discovered that students' self-efficacy affected their level of math anxiety. Women have lower math self-efficacy than men, according to numerous studies (Campbell and Beaudry 1998; Eccles 1987; Gutbezahl 1995; Lenney 1977; Malpass O'Neil and Hocevar 1999; Skaalvik and Rankin 1994).

Marsh (1989) specifically claims that "high school girls have lower mathematical self-concepts and achievement levels than boys, but sex differences in mathematics self-concepts appear to be larger and begin earlier than achievement differences" (p. 193). Interestingly, Campbell and Beaudry (1998) discovered a link between math self-concept and math achievement in boys but not in girls. Girls' math self-concept was unstable. They discovered that high-achieving girls had lower levels of confidence in their mathematical abilities and received more dysfunctional parental assistance" (Campbell and Beaudry 1998: 150).

Several explanations are proposed for the gender gap in mathematics. Some scholars talk over with biological factors (Baron-Cohen and Wheelwright 2004, Baron Cohen et al 2001). However, as shown by international assessments (OECD 2016, Mullis et al, 2016) the gender gap in math differs substantially across countries and a few contributions (Guiso et al., 2008, De San Roman and De La Rica, 2012; OECD 2015)

provide evidence that the gender gap in math within the PISA survey is negatively with to country-level indexes of gender equality. The literature also emphasizes the importance of fogeys (parents') and teachers‟ beliefs about boys' and girls' capacities (Fryer and Levitt, 2010; Cornwell and Mustard, 2013; Robinson et al., 2014; Jacobs and Bleeker 2004; Bhanot and Jovanovic 2009). Girls display less math self-efficacy (self-confidence in solving math-related problems) and math self-concept (beliefs in their abilities), and more anxiety and stress in doing math-related activities (OECD 2015, Heckman and Kautz 2012, 2014; Lubienski et al 2013, Twenge and Campbell 2001).

2.12.12 Teachers' Attitude and Teaching Method

Attitude as an idea is worried about an individual's way of thinking, acting, and behaving. It's very serious implication for the learner, the teacher, the learner's immediate group with which the individual learner relates and therefore the entire establishment. Attitudes are formed as a result of some quiet earning experiences that students undergo. This is often mimicry, which also incorporates a part to play within the teaching and learning situation. In this respect, the learner draws from his teacher's disposition to create his own attitude, which can likely affect his learning outcomes. (Yara 2009). Yara (2009), maintains that teachers with positive attitude toward mathematics were incline to stimulate favorable that attitude in their pupils or students. This immediately put the teacher on the spotlight together whose attitude, expressed in their behavior, featured a telling effect on students. Teachers' attitudes and beliefs play an awfully significant role in shaping classroom practices (Bolhuis & Voeten, 2004).

Teachers' attitudes toward mathematics may affect student's math anxiety (Fiore 1999; Jackson and Leffingwell 1999). High levels of mathematics anxiety are found within the pre-service teacher population (Sloan Daane and Giesen 2002; Hembree 1990). This mathematics anxiety can then be passed on to students (Wood 1988). Burton (1979) notices that primary school teachers often are victims of math anxiety thanks to the dearth of preparation mathematics during their professional training. According to Burton, teachers can cause math anxiety by (1) having negative attitudes toward math, (2) lacking presentation skills, (3) presenting information incorrectly, and (4) by failing to relate math to the important world. Teachers also can foster math anxiety by using destructive criticism, embarrassing students, and failing to produce additional assistance (Zaslavsky 1994). Gender inequities within the classroom might also create math anxiety for female students. Studies have also shown that Math teachers interact with boys quite than girls during math classes (Leinhardt Seewald and Engel 1979). Fennema et al. (1990) and Hyde et al. (1990) found that teachers' perceived traits associated with success in mathematics as more descriptive of male students than female students. Li (1999), demonstrate that teachers care-for overrate males' math ability, stereotype math as male, and have higher expectations for males.

Keller (2001) found that the more teachers stereotyped mathematics as a male domain, the more similar stereotypes students held, thereby influencing female math self-efficacy. According to research (Quinn and Spencer 2001; Oswald and Harvey 2000), there is a link between stereotype threat within the classroom and women's ability to unravel math problems. "Stereotype threat could be a situational threat that refer to stigmatized individual's concern with either conforming to, confirming or being evaluated in terms of a negative group stereotype" (Oswald and Harvey 2000: 339). Merton's (1968) theory of self-fulfilling prophecy could also be at work in this

situation, in which female students internalize teachers' negative stereotypes about female math ability, and these beliefs become reality. Similarly, girls are more likely than boys to say teachers because the most vital factor discouraging them from taking math classes (Sherman 1982).

Furthermore, there's evidence that high-school guidance counselors direct female students removed from math and college prep science classes (Marini and Brinton 1984). Despite the actual that this study was conducted in 1984, it's unfortunate that teacher stereotypes about women and mathematics don't appear to be a thing of the past. For example, after carefully reviewing literature, Fennema (2000) found that only moderate change has occurred in terms of equity in mathematics education. Numerous other studies support her findings that inequity and stereotypes are still prevalent in math classrooms (Governali 1999; Gutbezahl 1995; Jewett 1996; Li 1999).

While many studies have explored issues associated with math anxiety (e.g., Bandalos and Yates and Thorndike-Christ 1995; Benson 1989; Betz 1978; Zeidner 1991), few have simultaneously examined the broad range of things that are hypothesized to affect math anxiety to ascertain their relative importance. Likewise, most studies of math anxiety either assume that math anxiety is primarily a female phenomenon or that the problems associated with math anxiety are the identical for men and women (Betz 1978; Benson 1989).

This is consistent with Campbell and Beaudry's (1998) recommendation that "to study the equity problem more thoroughly, we recommend separate analyses for boys and girls that include larger groupings of socio-psychological variables" (150). Campbell and Evans' research provides additional justification for examining separate

models of math anxiety for males and females (1997). Females in single-sex classrooms had lower levels of math anxiety than females or males in coed classrooms, according to the study. Furthermore, they discovered that math anxiety decreased for females in single-sex classrooms and increased for males in coed classrooms, but increased for females in coed classrooms. This adds to the evidence that the same factor may affect men and women differently.

2.12.13 Elective Mathematics teachers' attitude towards the teaching of Elective Mathematics

The negative impact of elective Mathematics phobic teachers makes on their students by transferring their anxieties to them impedes the studying and learning of elective Mathematics. This as a matter of facts do not improves student's performance in elective Mathematics. The teacher serves as a role model, facilitator and a catalyst to the teaching and learning process. The students especially the girl child is likely to conclude if the facilitator demonstrates anxiety or phobia in their elective Mathematics delivery, then elective Mathematics is really not friendly. The students are likely to conclude that even the teacher does not like it because of its supposedly complex nature

2.12.14 Teachers Belief

The significance of teachers' beliefs and conceptions as an element within the process of teaching and learning is well established within the mathematics education literature. This defines a person's subjective knowledge and feelings about a particular object or person. Beliefs are seen as distinct from knowledge; the latter requires objectivity and validation about reality. Several studies have found a link between teachers' beliefs in their ability to teach and student performance (Ashton

and Webb, Chester and Beaudin 1996). When one considers that teachers' beliefs influence their perceptions and judgments, which in turn determine their behavior in the classroom, this relation makes sense. Teachers' beliefs, manifested as predispositions and expectations of themselves and their students play an important role in mediating experiences and teaching behavior (Pajares 1992). Teachers' beliefs about mathematics and arithmetic teaching shape their instructional practice and, as a result, influence their students' attitudes, interests, and achievements (Thompson, 1992). Gibson and Dempo (1984) investigated the connection between teacher beliefs, academic focus, and feedback behaviors. They found that teachers who have high efficacy beliefs engage in practices that lead to high achievement gains. Teachers with high efficacy deliver large-group and/or whole class instruction, can keep other students engaged while instructing small groups, assist low-achieving students during failure situations, and praise instead of criticize students. In summary, the overarching goal of high-efficacy teachers is to enhance mastery instead of performance (Prawat and Anderson, 1994).

Fernandes (1995) concluded by summarizing the finding of recent related studies: Teachers' formative mathematics experiences emerge as key players within the teaching process because what they do in the classroom reflects their thoughts and beliefs. Most pre-service programs do not appear to consider the candidate teachers' beliefs and attitudes toward mathematics. Studying teachers' thoughts, attitudes, and beliefs provides information that teacher-educator can use to improve teacher education programs. As a result, questions about teachers' attitudes toward mathematics, such as how these attitudes evolve and how they can be changed, are critical for program planners for mathematics teachers. The scarcity of studies that investigate the relationships between teacher characteristics and efficacy beliefs

suggests that more research is needed to improve understanding of changes in perspective self-efficacy beliefs and to illuminate individual characteristics of preparatory programs. Understanding the role of these programs in enhancing or diminishing student beliefs lays the groundwork for rethinking teacher education programs.

2.12.15 Societal Influence on Students' Performance

By the time a student enters form one, he or she will have had interactions with his or her parents, who have a large influence on his or her perception of learning in school in general and specific learning of mathematics. According to Orton (2007), the noticeable difference in learning between boys and girls is due to "societal attitudes and expectations." The author asserted that societal and environmental influences affect the mathematical development of students at various levels in both boys and girls. While playing children's games, boys and girls are socialized differently. Boys participate in more strenuous activities, whereas girls play more passive roles. This scenario is repeated in school and class while students are learning.

If no deliberate steps are taken to counter this mindset, students may develop negative attitudes toward any learning activity, resulting in variation in what is learned in a subject. Steele is quoted by Halpern (2000) as having discovered that when talented students took an advanced mathematics test with the negative stereotype that males outperform females, male students did outperform female students. When these students took the same test with the positive stereotype that male and female students will score equally, there was no overall gender difference in test scores. This is referred to as a "stereotype threat." Steele (1999) discovered that fear of being associated with a negative stereotype impaired intellectual functioning and disrupted

test performance in gifted individuals regardless of preparation, ability, self-confidence, or motivation.

The differences in attainment between the sexes have been attributed to differences in parental expectations, desires, and pressure they exert on their sons and daughters at home (Orton, 1994). According to Costello (1991), society views mathematics as a male subject. This is especially true when parents react differently to their daughters and sons. When their daughters do something mathematical, they are told, "you've tried," implying that nothing is expected of the female child. However, their sons are told, "you can do far, far better" (Costello, 1991). That is, male children are expected to perform significantly better in mathematics. Such comments made by parents, whether consciously or unconsciously, are registered in a child's sub-conscience and may influence how he or she perceives mathematics. As a result, the formation of attitudes among students may have been unconsciously registered by parents in particular and society in general.

Ying and Ching (1991) conducted a study comparing 894 students from 26 Hong Kong schools. They researched to determine correlations between mathematics achievement and parental and student expectations. They discovered a strong correlation between parental expectations and students' mathematics achievement after conducting multiple regression analyses. The study's contention was whether societal and parental expectations influence secondary school students' performance.

2.13 Gender and Academic Achievement of Students in Elective Mathematics

Boys' math achievement and attitudes are thought to be superior to girls. Contrary to popular belief, several studies have found that arithmetic achievement does not differ significantly between boys and girls (Scafidi & Bui, 2010). Lindberg, Hyde, Petersen,

and Linn (2010) discovered that boys and girls perform similarly in a meta-analysis of data collected from 12860350 students in 242 different studies. There were no significant differences in performance between male and female students, according to the researchers. Kaur (2017) examined five different aspects of people's attitudes toward mathematics in her study. She looked at gender differences in self-confidence, usefulness, and motivation in her research, but she found no differences between male and female students. Kaur discovered that male and female ninth graders in this study's sample had identical attitudes toward mathematics.

Kiptum, Rono Too, Bii & Too 2013); Kiptum, Rono Too, I conducted a study in Kenya's Keiyo south area to investigate the impact of students' gender on mathematics performance in elementary schools. The study used a descriptive survey design to investigate primary school students' attitudes toward mathematics. Data was gathered using questionnaires, interview schedules, and a previous class assessment. According to the findings, the majority of the students (both boys and girls) had a positive attitude toward mathematics learning. When boys' and girls' attitudes were compared, it was discovered that boys were more likely to have positive views than girls. Farooq et al. (2008) discovered no statistically significant difference between male and female students' total mean math scores.

2.14 Impact of students' attitudes on their academic performance

In a study conducted in Ghana, Mensah and Kuranchie (2013) discovered a considerable positive relationship between students' attitudes and performance. Similarly, Nicolaidou and Philippou (2003) discovered a link between attitude and mathematical achievement. Joseph (2013) discovered that the majority of students (55 percent) had a generally unfavorable attitude toward mathematics, with a positive and

significant link between attitude and performance (r = 0.33) in his research of community school students in Kagera, Tanzania. Ngussa and Mbuti (2017) conducted research with secondary school students in Arusha, Tanzania. When teachers humor as a teaching strategy, they discovered a moderate relationship between student attitude and performance. They came to a conclusion that improving students' positive attitudes can help them perform better in math. Students' overall achievement is influenced by their attitude toward mathematics, according to a study conducted by Hame, Bahari, and Abdullah (2008). Students with a negative attitude performed worse on tests. Bhowmik (2016) explore the relationship between high school students' attitudes toward mathematics and their achievement within the subject in Jangal Mahal, West Bengal (India). The findings revealed a significant gender difference in mathematical attitude, but not in mathematical achievement. Furthermore, there is a strong correlation between mathematical achievement and attitude toward the subject. Studies on the relationship between student attitude and academic achievement have found a direct correlation. (Bramlett & Herron, 2009; Mohd, Mahmood, &Ismail, 2011)

2.15 Summary

This chapter covers comprehensive literature on the factors that influences students' performance in Elective Mathematics. Elective Mathematics Teachers Not Teaching for students to comprehend the Application Aspects of the Elective Mathematics topics, teachers' Mastery over the elective mathematics content, 3 Interest in Elective Mathematics as a Factor etc. are some of the factors that influences students' performance in Elective Mathematics.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Overview

This chapter describes the methodology used to investigate gender differences in attitudes toward Elective Mathematics in senior high schools in Accra. The following sections are included in the chapter: research design, population and sample, data collection instrument, pilot study, sampling procedure, data analysis methods, and ethical considerations.

3.1 Research Design

According to James & Sally (2014), a research design is a plan that describes the conditions and procedures for collecting and analyzing data. The current study used a cross-sectional descriptive survey design. A descriptive survey was used because it provides a quantitative or numerical description of a population's attitudes, or opinions by studying a sample of that population (Creswell, 2003). It is also appropriate for this study because the data was gathered over a short period. Its cost effective, no interviewer bias, and it also help the researcher to collect information from the sample without influencing the population of the study. It provides consistent and uniform measurements, and respondents are not influenced by the researcher's presence or attitudes Sarantakos, (2013). Surveys can also provide descriptive, inferential, and explanatory data that can be used to determine correlations and links between the items and themes in the survey (Byrne, 2007). Cross-sectional descriptive survey design is a quantitative approach that is also known as the scientific method or conducting scientific research. It is also known as postpositivist research, empirical science, and positivist research. This is known as post-positivism because it represents thinking after positivism, challenging the

traditional notion of absolute truth in knowledge (Gibson et al., 2014) and acknowledging that when studying human behavior and actions, we cannot be certain of our knowledge claims.

Cross-sectional descriptive survey is a research strategy in which several different groups of subjects can be assessed at the same time according to James & Sally (2014). This study is directed towards exploring gender differences in attitude and performance in elective mathematics at the Senior High Schools in Accra Metropolis. A questionnaire and elective mathematics performance test were used as instruments for data collection.

3.2 Study Context

Greater Accra has both educational and political landmark demarcations. Accra is the Greater Accra region's economic and administrative hub and serves as the anchor of the larger Greater Accra Metropolitan Area (GAMA). The political administration of the region is through the local governance system. Under this administration, the region is divided five namely Accra Metropolitan Area, Tema Municipal Area, Ga East District, Ga West District, Dangme East District and Dangme West District.

Under the Educational landmark demarcations, the administration of the Region is through the Regional Director to the Municipal or District Director of Education.

Accra Metropolis or Metropolitan District is one of the ten districts in the Accra Metropolitan area. This research was carried out in Senior High Schools in the Accra Metropolitan District. Accra was chosen because it has majority of senior high schools and all types of senior high schools including Boys' Only Schools, Girls' Only Schools and Mixed schools.

3.3 Population

Population according to Kaul and Kaul (1992), Fraenkel and Warren (2006), refers to the entire set of individuals (subjects or events) with collective observable features which the study is interested in. The targeted population is all elective mathematics students in the public Senior High Schools in Accra Metro District. In Accra Metropolis, there are different types of schools based on gender. It is on the basis of this, that the population is grouped into three categories viz Segregated Schools (Boys' Only SHS and Girls' Only SHS) and Mixed SHS. There are ten Mixed Schools, two Girls' Only SHS and a Boys' Only SHS.

Out of these, a public SHS through cluster sampling is randomly selected. Achimota SHS (MIXED), Accra Academy SHS (BOYS' ONLY) and Accra Girls' SHS (GIRLS' ONLY) become the accessible population for this study. The Senior High Schools in Accra Metropolis have students who come from all over the country with diverse cultural background so the population will be similar elsewhere in the country.

3.4 Sample and Sampling Technique

A sample, according to Ortell, Switonski, Delaney (2019) is a portion or subset of a larger group. It represents a portion of a population with important characteristics such as gender, age and status, which are proportionately distributed in both groups. The importance of samples lies in the accuracy with which they represent or mirror on the target population. Leedy and Ormrod (2010) emphasized on the careful selection of the sample. This is to enable the researcher to identify the features and or characteristics of the entire population which is in the same proportion. It also identifies the relationships the research seeks to examine among the total population.

Sampling is the process of selecting a sample. According to Ortell et.al. (2019), sampling is efficient and precise in that those resources that might go into collecting an unnecessary number of individuals or groups can be spent on other activities of the research. It helps to focus the survey on precisely the characteristics of interest samples, which were expected to be representative of the population. Samples are, therefore, chosen by means of sound methodological principles.

To achieve the purpose of this study of investigating gender differences in student's attitude towards elective mathematics performance, a multistage sampling technique was employed in selecting 300 elective mathematics students for the study. Multistage sampling according to Kothari (2004) is a further development of the principle of cluster sampling.

In cluster sampling, the total population is divided into a number of relatively small subdivisions which are themselves cluster of still smaller units and then some of these clusters are randomly selected for inclusion in the overall sample according to Kothari (2004).

The targeted population is divided into three clusters namely Boys' Only Senior High Schools, Girls' Only Senior High Schools and a Mixed Senior High Schools. Out of these clusters, one Senior High School is randomly selected. Since these are themselves clusters and, in each cluster, the schools are very small and for that matter the schools are assigned numbers on a slip of paper and a school is drawn from each cluster.

In each of the three Senior High Schools selected, a sample of 100 elective mathematics students were conveniently selected from programs such as General

Science, Business (Elective Mathematics Option) and General Arts (Elective Mathematics Option) constituting sample size of 300 students. These are conveniently selected because they are the accessible group in each school and also are willing to help in answering the questionnaire in each of the programmes. Based on that, a quota system is used to select 40 elective mathematics students from General Science, 30 elective mathematics students from Business and 30 from General Arts in Accra Academy. In Accra Girls, 50 Elective Mathematics students were selected from General Science, 30 from General Arts and 20 from Business. In Achimota SHS, 45 Business students, 35 General Arts students and 20 General Science elective Mathematics students were selected. These numbers were selected so that the population could be evenly represented.

The SHS 3 students were considered in the selected schools because they have gone through the elective mathematics curriculum or syllabus for three years and were more exposed to the content than their counterparts in SHS 1 or 2.

Multistage sampling technique was employed because (i) a large number of units can be sampled for a given cost under multistage sampling because of sequential clustering whereas this is not possible in most the simple design. (ii) it is easier to administer than most single stage designs mainly because of the fact that the sampling frame under multistage sampling is developed in partial units according to Kothari (2004).

3.5 Research Instruments

Two instruments were used to measure gender differences in students' performance in Elective Mathematics. The instruments for collecting quantitative data are the Elective Mathematics Performance Test for the students and a questionnaire.

3.5.1. Elective Mathematics Performance Test (EMPT)

To cover basic Elective Mathematics areas, Elective Mathematics performance test item was developed based on the standards of the West African Secondary School Certificate Examination and the Ghana Education Service Elective Mathematics syllabus. The multiple-choice item format was employed because students turn to hesitate in answering an open response type of questions if they got to know that it's not for examination purpose. But they find it relatively comforting in answering a multiple – choice type of questions since there are options to choose from. The researcher chose the Elective Mathematics test items based on the table specifications below.

Content	Knowledge	Comprehension	Thinking	Appreciation	Total
Mathematics questions.	1	2	3	4	10

The above is used to determine how students in the Greater Accra Metropolis Tackle Elective Mathematics tasks. It aimed at determining the gender differences in students' performance in Elective Mathematics. It was constructed with some items adapted from WAEC's past questions from 2011 – 2020.

The purpose is to emphasize three (3) main abilities of the students:

i. Critical thinking abilities
ii. Problem-solving abilities
iii. Computational abilities

3.5.2 Questionnaire for the Students

The questionnaire for the students was in three (3) parts: Part A (Demographic of the respondents), Part B (questionnaire for students' attitude toward Elective Mathematics), and Part C (Questionnaire for factors affecting students' attitude toward Elective Mathematics).

3.5.2.1 *Part A: Demographics of the respondents*

This was used to collect data on gender, age, and program of study.

3.5.2.2*. Students' Attitude towards Elective Mathematics*

Tapia (1996) popular attitudes scale with established psychometric properties were used by the researcher to assess students' attitudes toward learning Elective Mathematics. The Attitudes Toward Mathematics Inventory (ATMI) (Tapia & Marsh, 2004) is a 40-item questionnaire that assesses four factors: enjoyment, general motivation, self-confidence, and value. Tapia and Marsh (2004) created the Attitudes toward Mathematics Inventory (ATMI) in English. The inventory contains 49 items and was designed to cover six domains of attitudes toward Elective Mathematics. These are self-assurance, anxiety, worth, pleasure, motivation, and parental/teacher expectations. The items were designed in a Likert-scale format, and students responded to the statements on a five-point scale ranging from strongly agree (5) to agree (4) to neutral (3) disagree (2) to strongly disagree (1). Twelve of the 49 questions have negative wording. These domains were chosen because the researcher identified them to be important factors based on the questionnaire adapted. The ATMI final version includes 40 items divided into four subscales: self-confidence (15 items), value (10 items), enjoyment (10 items), and motivation (5 items).

3.5.2.3*. Factors Affecting Student's Achievement in Elective Mathematics*

The Questionnaire for Identifying Factors Affecting Students' Elective Mathematics Achievement was adapted from (Mokhtar & Misiran, 2012). The Questionnaire developed by (Mokhtar & Misiran, 2012) was used to investigate the factors influencing students' mathematics performance. The inventory included 35 items divided into four (4) sub-scales: attitude (18), teacher role (6), peers (7), and interest (4). The items were designed in a Likert-scale format, and students responded to the statements on a five-point scale ranging from strongly agree (5) agree (4) neutral (3) disagree (2) strongly disagree (1).

3.6 Validity and Reliability of the Instruments (Questionnaire)

The instrument's validity and reliability are critical in research. This is because it has the potential to influence the overall findings of the study. It has been proposed that for an item to be considered reliable, the Cronbach's alpha value should be 0.7 or higher (Kline, 2000, Anastasi, 1982; Tavsancil, 2002). Validity and reliability of the questionnaire regarding students' attitudes toward mathematics have been established for high school (Tapia & Marsh, 2004) and college students (Tapia & Marsh, 2002). Furthermore, the subscale reliabilities of self-confidence, value, enjoyment, and motivation are 0.95, 0.89, 0.89, and 0.88, respectively (Tapia & Marsh, 2004). These values exceeded the reliability cutoff point of 0.70. (Hair, Anderson, Tathom, & Black, 2010). Also, the reliability index of the subscales affecting students' performance in Mathematics: Attitude (0.913), Role of the teacher (0.900), Peers (0.891), and Interest (0.752) are all greater than 0.7 and thus considered reliable for the current study.

3.7 Data Collection Procedure

The researcher obtained a letter from the Department of Mathematics Education, University of Education, Winneba to be given to the district education director and the head teachers of the selected schools to obtain permission to conduct this research in their respective schools. The questionnaire was administered entirely by the researcher. There are two types of self-administered questionnaires: those completed in the presence of the researcher and those completed when the researcher is not present (e.g., at home or work) hen, Manion, & Morrison, 2007).

This was accomplished by using a self-administered questionnaire to collect data for the study without the presence of the researcher. This allowed respondents to complete the questionnaire in private, devote as much time as they wanted to it, be in familiar environments, avoid potential treatment or pressure to participate caused by the researcher's presence, and it was less expensive and more anonymous than having the researcher present.

The presence of the researcher is beneficial in that any questions or concerns can be addressed immediately with the questionnaire designer. Furthermore, it usually ensures a high response rate (e.g., undertaken with teachers at a staff meeting or with students in one or more classes). It also ensures that all questions are completed and filled in correctly (the researcher can check these before receiving the questionnaire).

On the other hand, having the researcher present may be intimidating and induce a sense of compulsion, causing respondents to feel uneasy about completing the questionnaire and may refuse to complete it or even begin it. Respondents may also want more time to think about and complete the questionnaire, perhaps at home, and this is denied to them.

Having the researcher present also puts pressure on the researcher to attend at an agreed-upon time and location, which may be time-consuming and require the researcher to travel extensively, extending the time frame for data collection. For this study, the benefit of self-administration without the presence of the researcher outweighed the benefit of self-administration with the presence of the researcher. For the collection of the questionnaires from the respondent, the research personally collected the questionnaires one by one to make sure that all questions were responded to and none is left out by any respondent.

Before administering the questionnaire, the respondents were conscientized and educated that the instrument is in two folds, the questionnaire and the Elective Mathematics Performance Test (EMPT). They were also made aware that these are for research purposes only.

After the questionnaires were retrieved, the researcher also, later on, administered the Elective Mathematics Performance Test. The students were given ample time to respond to the test items individually devoid of any interference by the researcher. This helped them not to be under pressure. The Elective Mathematics Test was collected and marked. This was used to ascertain their performance.

3.8 Data Processing and Analysis

The data were entered into the Statistical Package for the Social Sciences (SPSS) version 21. The researcher conducted preliminary data screening before conducting data analyses. This included checking for missing values, outlier assumptions, and normality. The researcher entered the data to ensure the accuracy of the information. Before conducting any analysis, the data was cleaned. Cleaning the data allowed the

researcher to eliminate errors caused by coding, recording, missing information, influential cases, or outliers.

The first research question was examined using descriptive statistics such as means and standard deviations to determine senior high school students' attitudes toward Elective Mathematics.

The second research question was examined using an independent t-test to determine whether there was a significant difference in students' attitudes toward elective mathematics based on gender.

The third research question was examined using an independent sample t-test to see if there is a gender difference in the factors that influence student achievement in Elective Mathematics.

The fourth research question was examined using Pearson correlation to determine the relationship between students' attitudes and their performance in Elective Mathematics.

3.9 Ethical Clearance

When conducting research, ethical considerations must be taken into account. Through the district director, the researcher obtained ethics approvals from the University of Education, Winneba Ethical Approved Board and the Ministry of Education in Ghana. The purpose and objectives of this study were stated clearly to demonstrate what the study was about. The researcher described the participants and how the research could cause participants little or no harm. For example, sensitive information provided by the teacher was handled with care, and the anonymity and

confidentiality of the teachers' information were ensured. This encouraged participants to give their all in providing critical information for the study.

3. 10 Chapter Summary

The research questions and the research purpose influenced the methodology used in this chapter. The study's goal is to look into the gender differences in students' attitudes and performance in Elective Mathematics. As a result, the study employed the Post positivism paradigm, which is a quantitative research method. This was accomplished with the help of a survey. The researcher gave the survey respondents a questionnaire to fill out. The survey data was analyzed using the independent sample t-test, correlation, and linear regression. Before data collection, the ethics of conducting research were also followed. The following chapter collected and analyzed data to answer the research questions

CHAPTER FOUR

RESULTS AND DISCUSSION

4.0 Overview

The chapter discusses the results of the survey data. The study sought to explore gender differences in attitude and performance in elective mathematics at senior high schools in Accra metropolis, Ghana. This study sought to: investigate senior high students' attitudes towards elective Mathematics, Investigate whether there is a difference in the attitude of students towards elective mathematics based on gender to determine whether there is a gender difference in factors that influence students' attitude towards elective Mathematics, and determine whether there is the difference in students' performance in Elective Mathematics based on gender and determine the effect of students' attitude towards elective mathematics on their academic achievement in Elective mathematics. The main instrument used in this study is a questionnaire which consists of five parts. The data were analyzed using descriptive statistics such as percentages, frequencies, means, standard deviations, and inferential statistics such as independent sample t-test. The demographic characteristics of the respondents are shown in Table 1. The rest of the pages in this chapter show how the data have been organized and discussed under various headings

4.1 Demographic of the Respondents

This was analyzed by the use of frequencies and simple percentages as shown in Table 1.

Table 1:

Demographics of the Respondents

Gender	Frequency	Percentages
Male	150	50.000
Female	150	50.000
Total	**300**	**100.00**
Type of school		
Boys	100	33.333
Girls	100	33.333
Mixed	100	33.333
Total	**300**	**100.00**

Table 1 shows the demographics of the respondents. From Table 1, it could be seen that the number of males (150) participants and that of female (150) participants are equal resulting in an equal percentage of 50% for both groups. All the percentage of participants in boys' schools (33.333%), girls' schools (33.333%), and mixed schools (33.333%) are equal. This show that there is an equal representation of male and female participants concerning data collection.

4.2 Senior High Student's Attitude towards Elective Mathematics

Research Question One: What are the senior high school students' attitudes toward elective Mathematics?

This was analyzed by using mean and standard deviations to determine students' attitudes towards elective mathematics. The result is shown on Table 2

Table 2:

Students' Attitude towards Elective Mathematics

	Mean	Std. Deviation
Self Confidence	3.579	0.764
Enjoyment	3.194	0.421
Value	4.139	0.616
Motivation	3.815	0.439

Table 2 depicts students' attitudes toward the study of Elective Mathematics in senior high schools. According to the findings, students have a high or positive attitude toward the study of elective mathematics. This is evidenced by the students' high mean scores on the attitude scale (mean = 3.578), (standard deviation = 0.446). The student's perception of the value of elective mathematics appears to be high (mean = 4.139, standard deviation = 0.616) on the ATMI subscales, while the other subscales have above-average scores of 3.0. This demonstrates that senior high schools are supportive of ATMI. Furthermore, students have confidence when studying elective mathematics, they enjoy studying elective mathematics, and they see elective mathematics as beneficial in their current life, in their daily lives, and other subjects. Students are also encouraged to pursue elective mathematics courses in senior high schools. This finding is consistent with Tezer's (2010) study, which assessed the

attitudes of primary school second and third-grade students toward mathematics courses and found that students had positive attitudes toward mathematics courses. Kiptum et al. (2013) investigated the impact of gender on mathematics achievement in primary schools in Kenya's Keiyo South District. The findings revealed that the majority of students (both boys and girls) had a positive attitude toward mathematics learning.

Again, when students see the utility of studying Elective Mathematics in their daily lives, in the study of other subjects, and the study of advanced courses involving Elective Mathematics, they develop a positive attitude toward the subject. For example, if students discover that topics such as logarithms, equations, and mechanics are used to solve problems in Physics, they will be motivated to learn more about the subject. Furthermore, students or children usually prefer to engage in subjects that they are interested in or that they enjoy studying.

Children, for example, enjoy playing computer games because they find them enjoyable. As a result, if students enjoy doing or learning elective mathematics, they will develop a favorable attitude toward it. Finally, students who are motivated to learn usually develop a positive attitude toward the subject. That is, if they are unmotivated to study elective mathematics, they will develop a negative attitude toward it, and vice versa.

4.3 The difference in Attitude toward the Study of Elective Mathematics based on Gender

Research Question Two. Is there any significant difference in the attitude of students towards elective mathematics based on gender?

This was analyzed by using an independent sample t-test to compare the attitude of male and female students towards elective mathematics. The result is shown in Table 3.

Table 3:

Means and standard deviations of scores of student's attitudes towards Elective Mathematics on ATMI sub-scales for Male and Females Students

	Gender	**Mean**	**Std. Deviation**	**t-value**	**P-value**
Self Confidence	Male	3.612	.686		
	Female	3.547	.835	0.737	0.462
Enjoyment	Male	3.111	.386		
	Female	3.278	.439	-3.515	0.000
Value	Male	3.912	.697		
	Female	4.367	.414	-6.871	0.000
Motivation	Male	3.750	.331	-2.597	0.000
	Female	3.880	.518		
			Effect size = 0.5		

Table 4 compares students' attitudes toward elective Mathematics studies based on gender. The findings revealed a significant difference in students' overall ATMI (P = 0.000). Female students (mean = 3.683, SD = 0.417) have a more positive attitude toward elective mathematics than male students (mean = 3.474, SD = 0.451). This is surprising because numerous studies have shown that male students have a more positive attitude toward mathematics study in general than their female counterparts. Furthermore, based on the subscales, the results revealed a significant difference in

male and female students' attitudes toward elective mathematics study (enjoyment, value, and motivation).

Female students outperformed their male counterparts on the subscale's enjoyment (mean = 3.278, standard deviation = 0.439), value (mean = 4.367, standard deviation = 0.414), and motivation (mean = 3.880, standard deviation = 0.518). It is clear that the value of cohen equals to (0.5), which indicates a moderate effect where (Afana D., Izzo J.C., 2000) indicates that the size of effect is considered moderate if the value of cohen is equal to (0.5). This suggests that females are more motivated, enjoy doing mathematics, and recognize the value of elective mathematics than males. However, there is no statistically significant difference in male and female students' self-confidence when studying Elective Mathematics. This demonstrates that male and female students appear to have the same level of confidence in the study of Elective Mathematics. The following findings support this: Kö et al. (2009) discovered that gender has no significant effect on students' attitudes toward mathematics in grades 6, 7, and 8. However, when all grades are considered for gender, female students' attitudes are more positive than males in grades 6 and 7, except in grade 8.

This finding is consistent with the findings of studies conducted on Grade 6 students by Ylmaz (2006), elementary school students by Akr & et al. (2007), high school students by Kaplan & Kaplan (2006), and university students by elik ve Bindak (2005). In other words, gender has no bearing on attitudes toward mathematics. The researchers concluded that, while gender does not affect students' attitudes toward mathematics, female students appear to have a more positive attitude toward mathematics than their male counterparts. Nüket Elçi (2017) investigated attitudes and their impact on mathematics teaching approaches. His research has revealed

gender differences in people's attitudes. Sanchez et al. (2004) discovered significant gender differences in eighth-grade students' attitudes toward mathematics in a study with North American students.

Furthermore, Kiptum et al. (2013) found that boys were more inclined to have a positive attitude towards mathematics than girls in a study on the effect of gender on mathematics performance in primary schools in Keiyo South District, Kenya, which contradicts the current finding. In her study, Kaur (2017) investigated five dimensions of mathematical attitude. She also investigated gender differences in self-confidence, usefulness, and motivation in her research, but she discovered no differences based on student gender in this study. Kaur discovered that male and female ninth-grade students had similar attitudes toward mathematics. According to the current study, female students have higher confidence in mathematics than their male counterparts.

However, Asante (2012) found that "girls lacked confidence, had debilitating causal attribution patterns, perceived mathematics as a male domain, and were anxious about mathematics" when compared to boys. Furthermore, Sanchez, Zimmerman, and Ye (2004) discovered significant gender differences in eighth-grade students' attitudes toward mathematics in a study with North American students. American boys were more interested in mathematics than girls, but girls perceived mathematics to be more important than boys, which contradicts current research. Farooq et al. (2008) studied students' attitudes toward mathematics. He discovered that there is no significant difference in male and female students' confidence in mathematics at the secondary level, which is accepted at the 0.05 level of significance. However, the study found no significance in the usefulness of mathematics.

4.4 Gender difference in factors that influences student performance in Elective Mathematics

Research Question Three. Is there any gender difference in factors that influences student performance in Elective Mathematics?

This was analyzed by using an independent sample t-test to compare the view of male and female students on factors that influence students' performance in Elective mathematics. The results are shown in Table 4

Table 4:

Gender difference in Factors that influences Student Performance in Elective Mathematics

	Gender	Mean	Std. Deviation	t-value	P-value
Students' Attitude	Male	3.622	0.168	-5.558	0.000
	Female	3.806	0.370		
Role of Teacher	Male	3.291	0.215	-10.441	0.000
	Female	3.751	0.495		
Peers	Male	3.529	0.226	-8.780	0.000
	Female	3.960	0.557		
Interest	Male	2.533	0.350	-16.224	0.000
	Female	3.372	0.527		

Table 4 displays the gender differences in factors influencing student performance in Elective mathematics. The findings revealed a significant difference in male and female students' perceptions of the factors influencing students' performance in Elective Mathematics: attitude (0.000), the role of the teacher (0.000), peers (0.000), and interest (0.000). The data appears to indicate that female students have a higher

perception than male students of the factors; of attitude, the role of the teacher, peers, and interests that affect students' mathematics performance. The high mean scores of both males and females, on the other hand, indicated that these factors (attitude, teacher role, peers, and interest) have the potential to influence students' performance in elective mathematics.

The following findings support this: According to Yilmaz et al. (2010), good teaching and course enjoyment are factors that contribute to students' liking of mathematics. They include school, peer students, the home environment, and society (Yang, 2013). According to Mokhtar and Misiran (2012), the following factors influence students' mathematical performance: peers, interest, teacher role, and students' attitude toward mathematics.

4.5 Effect of students' attitude towards elective mathematics on their performance in elective mathematics

This was analyzed by using correlation to find out if there is a relationship between students' attitudes toward Mathematics and Students' performance in Elective Mathematics. The results are shown in Table 5.

Table 5:

Correlation between the attitude of students toward Elective Mathematics and their Elective Mathematics Performance

		Performance scores
Attitude towards Elective Mathematics	Pearson Correlation	0.056
	Sig. (2-tailed)	0.334
	N	300

The correlation between students' attitudes toward elective mathematics and their performance in elective mathematics is shown in Table 5. The findings revealed a low positive correlation (0.056) between students' attitudes toward elective mathematics and their performance in elective mathematics, but the correlation is not statistically significant. Regression analysis cannot be performed to assess the effect of students' attitudes on their performance in elective mathematics because the results contradict one of the assumptions of linear regression. This demonstrates that students' attitudes toward elective mathematics do not affect their academic performance in elective mathematics.

The following findings support this: This contradicts the findings of Mazana et al (2018), who discovered that while students initially exhibit a positive attitude toward mathematics, their attitude becomes less positive as they progress through higher levels of education. A significant positive weak correlation was found between students' attitudes and performance. In our data, students' performance was significantly predicted by their enjoyment and attitude toward mathematics.

In a study conducted in Ghana, Mensah and Kuranchie (2013) discovered a significant positive correlation between students' attitudes and performance. Similarly, Nicolaidou and Philippou (2003) discovered a significant relationship between attitude and mathematical achievement. Joseph (2013) discovered that the majority of students (55%) had a generally negative attitude toward mathematics in his study of community secondary school students in Kagera, Tanzania, with a positive and significant correlation between attitude and performance ($r = 0.33$).

Ngussa and Mbuti (2017) conducted a study with secondary school students in Arusha, Tanzania. When teachers use humor as a teaching strategy, they found a

moderate relationship between student attitude and performance. They concluded that improving students' positive attitudes can improve their math performance. Bhowmik (2016) investigated the relationship between students' attitudes toward mathematics and their achievement in high school in Jangal Mahal, West Bengal (India). The findings revealed a significant gender difference in mathematics attitude, but no significant difference in mathematics achievement. There is also a significant positive correlation between attitude toward mathematics and mathematical achievement.

Other research on the relationship between students' attitudes and academic achievement has found a positive relationship (Mohd, Mahmood & Ismail, 2011; Bramlett & Herron, 2009).

4.6 Summary of Key Findings

The current study found that students have a positive attitude toward the study of elective mathematics when it comes to gender differences in their attitude toward elective mathematics and their performance in elective mathematics.

Also, the study found a significant difference in student attitudes based on gender, favoring female students. In addition, the findings indicated a significant difference in the factors that students perceived to influence their academic achievement. Furthermore, the study discovered a weak positive relationship between students' attitudes toward elective mathematics and their academic performance in elective mathematics.

CHAPTER FIVE

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

5.0 Overview

The purpose of the study is to provide information on Gender differences in Attitude and performance in elective mathematics among Senior High Schools in Accra metropolis, Ghana. The study was carried out in three schools namely Accra Academy Senior High School (boys' Only), Accra Girls' Senior High School (Girls' Only) and Achimota Senior High School (Mixed). The study was guided by four (4) research question which include: 1. What are the senior high school students' attitude towards elective Mathematics? 2. Is there any significance difference in attitude of students towards elective mathematics based on gender? 3. Is there any gender difference in factors that influences student performance in Elective Mathematics? 4. What is the effect of students' attitude towards elective mathematics on their performance in elective mathematics? Survey was the research design adopted for the study. The questionnaire was the main instrument used to collect the requisite data to answer the research questions. Multi-stage sampling was used to select 300 senior high school students with 100 students from girls' school, 100 from boys' school and 100 from mixed school from Accra metropolis. It's a sampling that takes a sample in stages using smaller and smaller sampling units at each stage. Data were analyzed through the computation of frequencies, percentages, means, standard deviations, independent sample t-test as well as correlation. Multistage sampling was used because it helps the researcher to implement cluster or the random sampling after the group have been determined. It also enables the researcher to distribute the population into groups without restrictions.

5.1 Summary of Key Findings

Senior high school students are enthusiastic about studying elective mathematics. Furthermore, they scored highly on all ATMI subscales, indicating that SHS students enjoy studying elective mathematics, have self-confidence, see elective mathematics as a useful subject, and are highly motivated to study elective mathematics. The findings also revealed a strong positive relationship between students' overall attitude toward elective mathematics and the ATMI subscale.

Furthermore, the findings revealed a statistically significant difference in male and female attitudes toward mathematics study in favor of females. That is, females are more enthusiastic about studying elective mathematics than their male counterparts. They also have higher ATMI subscale scores than male students.

Furthermore, the study found a significant gender difference when it comes to the factors that influence students' academic achievement. In the achievement test, male students outperformed their female counterparts. Finally, the findings revealed a weak positive relationship between students' attitudes toward elective mathematics and their academic performance in elective mathematics.

5.2 Conclusion

According to empirical evidence from the literature, there is a significant difference in students' attitudes toward mathematics in favor of either male or female students. However, the study's findings show that female students appear to have a more positive attitude toward the study of elective mathematics than male students. The study also discovered that male students outperform female students in elective mathematics. Finally, the current study discovered a minor positive correlation between students' attitudes toward elective mathematics and their achievement in

elective mathematics. As a result, it can be concluded that female students are developing a positive attitude toward the study of mathematics.

5.3 Recommendations

1. It is suggested that teachers try to explain to students the benefits of each topic they teach.
2. Teachers should choose examples that deal with the application of Elective Mathematics in the students' lives.
3. Teachers should vary their teaching strategies to meet the individual needs of each learner.
4. Group work or think pair share should be used frequently to allow students to benefit from the experiences of their peers.
5. School authorities should devise more innovative methods of teaching the elective mathematics subject across all programs. This will ensure that, for example, Business and General Arts students, would have positive perception about the subject like their General Science and Technical students who also study related subjects like Physics.
6. School authorities and GES should regularly organize workshop, seminars, in-service trainings for Elective Mathematics teachers on simple, but effective ways of teaching of the elective mathematics subject

5.4 Suggestions for Further Research

The purpose of this study is to examine gender differences in attitudes and performance in elective mathematics among Senior High Schools in Accra, Ghana. It is therefore suggested that:

1. The study is replicated in Ghanaian primary schools to determine what persists there.
2. While this study only used a survey, a similar study using a qualitative or mixed method could be conducted to gain a more in-depth understanding of the topic.
3. Additional factors influencing students' performance in Elective mathematics can be investigated through research.

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APPENDICES

APPENDIX A

STUDENT ATTITUDE QUESTIONNAIRE

This study aims to assess gender differences in students' attitudes towards performance in Elective Mathematics.

Questionnaire for Students

Thank you for taking the time to complete this questionnaire. Please answer each question to the best of your knowledge. Your thoughtfulness and responses will be greatly appreciated.

Your responses will be kept completely confidential.

Part A: Demographics of the Students

Name of School: ……

School Type: Girls School [ ], Boys school [ ] , Mixed [ ]

Gender (If mixed School, indicate your gender)

Academic Program (indicate the program you are reading)

Business [ ] General Science [ ] Agric. Science [ ] Gen. Arts [ ]

Form: One [ ] Two [ ] Three [ ]

Part B: Students' Attitude towards Elective Mathematics

Directions: This inventory consists of statements about your attitude toward Elective Mathematics. There are no correct or incorrect responses. Read each item carefully. Please think about how you feel about each item. Tick the part that most closely corresponds to how each statement best describes your feelings. Please answer every question.

		Strongly Agree	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**
1.	Elective Mathematics is a very worthwhile and necessary subject.					
2.	I want to develop my Elective mathematical skills.					
3.	I get a great deal of satisfaction out of solving Elective mathematics problems.					
4.	Elective Mathematics helps develop the mind and teaches a person to think.					
5.	Elective Mathematics is important in everyday life.					
6.	Elective Mathematics is one of the most important subjects for people to study.					
7.	High school Elective math courses would be very helpful no matter what I decide to study.					
8.	I can think of many ways that I use Elective math outside of school.					
9.	Elective Mathematics is one of my most dreaded subjects.					
10.	My mind goes blank and I am unable to think clearly when working with Elective					

	mathematics.					
11.	Studying Elective mathematics makes me feel nervous.					
12.	Elective Mathematics makes me feel uncomfortable.					
13.	I am always under a terrible strain in an Elective math class.					
14.	When I hear the word Elective mathematics, I have a feeling of dislike.					
15.	It makes me nervous to even think about having to do an Elective mathematics problem.					
16.	Elective Mathematics does not scare me at all.					
17.	I have a lot of self-confidence when it comes to Elective mathematics.					
18.	I can solve Elective mathematics problems without too much difficulty.					
19.	I expect to do fairly well in any Elective math class I take.					
20.	I am always confused in my Elective mathematics class.					
21.	I feel a sense of insecurity when attempting Elective mathematics.					
22.	I learn Elective mathematics					

	easily.					
23.	I am confident that I could learn advanced mathematics.					
24.	I have usually enjoyed studying Elective mathematics in school.					
25.	Elective Mathematics is dull.					
26.	I like to solve new problems in Elective mathematics.					
27.	I would prefer to do an assignment in Elective math than write an essay.					
28.	I would like to avoid using Elective mathematics in college.					
29.	I like Elective mathematics.					
30.	I am happier in an Elective math class than in any other class.					
31.	Elective Mathematics is a very interesting subject.					
32.	I am willing to take more than the required amount of Elective mathematics.					
33.	I plan to take as much mathematics as I can during my education.					
34.	The challenge of Elective math appeals to me.					
35.	I think studying advanced					

	mathematics is useful.					
36.	I believe studying Elective math helps me with problem-solving in other areas.					
37.	I am comfortable expressing my ideas on how to look for solutions to difficult problems in math.					
38.	I am comfortable answering questions in Elective math class.					
39.	A strong Elective math background could help me in my professional life.					
40.	I believe I am good at solving Elective math problems.					

Part C: Factors Affecting Student's Performance in Elective Mathematics

Please answer all of the questions. For each item, select only one option that best describes you. If you are uncertain of or neutral about your response, you may always select "Neutral."

No.	Items	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
1	I feel confident to answer questions in Elective Mathematics.					
2	I prefer Elective mathematics to other subjects.					
3	Normally, I like to solve Elective mathematics problems.					
4	I always help other partners to resolve the problems of Elective Mathematics.					
5	I enjoy reading and referring to books in Elective Mathematics.					
6	Elective Mathematics can help to strengthen my mind.					
7	Friends and I form discussion groups to work together to learn Elective Mathematics.					
8	I always passed the Elective Mathematics test					
9	Elective Mathematics can help me in learning other subjects.					
10	I love Elective mathematics.					
11	Lecturers' success to attract and					

	giving attention to students while teaching.					
12	I often discuss with friends the problems of Elective Mathematics.					
13	I am easily influenced by the invitation of my peers in learning Elective mathematics.					
14	I always do Elective mathematics exercises when I have free time.					
15	Although the study of Elective mathematics requires hard work, I feel good.					
16	I always memorize Elective mathematics formulas.					
17	My friends always engaged me with Elective mathematics problem-solving.					
18	Elective Mathematics allows me to think logically and reasonably.					
19	Tutors encourage students to meet and ask questions if there are problems in Elective Mathematics.					
20	Tutors always make thorough preparation in teaching.					
21	Tutors can answer all questions submitted by students of Elective Mathematics.					
22	Tutors are always ready to discuss with students about topics that are					

	poorly understood.					
23	Tutors are always an encouragement to students to learn Elective mathematics seriously.					
24	Sometimes lecturers are not confident in teaching.					
25	The success of their peers in Elective mathematics gives a boost to me to be more work.					
26	Elective Mathematics is useful in all fields of work.					
27	With a master of Elective Mathematics, my job opportunities in the future better.					
28	I need a knowledge of Elective mathematics to solve problems in my daily work.					
29	Elective Mathematics is useful in today's future life.					
30	Elective Math skills enable a person to go into work in professional and technical fields					
31	My friends always help me solve Elective mathematics problems.					
32	I am feeling angry when answering questions in Elective Mathematics.					
33	In elective Mathematics too many numbers and words caused me to become confused.					

34	I always imitate my friend's answers in Elective mathematics.					
35	Elective Mathematics test question is more difficult when compared with other subjects' test questions.					

APPENDIX B

UNIVERSITY OF EDUCATION, WINNEBA.

MPHIL MATHEMATICS EDUCATION

PERFORMANCE TEST (OBJECTIVES TEST)

THIS TEST IS NOT FOR EXAMINATION PURPOSES BUT PURELY FOR RESEARCH WORK

SECTION A: BIODATA (ABOUT YOURSELF)

1. **Name of school** ……..

2. **Type of school**

   BOYS [ ] GIRLS [ ] MIXED [ ]

3. **Your Gender (if a mixed school, indicate your gender)**

   MALE **[ ]** FEMALE **[ ]**

4. **Academic Program (indicate the program you are reading)**

   Business [ ] General Science [ ] Agric. Science [ ] Gen Arts [ ]

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

DURATION: 30MINS

CIRCLE THE LETTER THAT CORRESPONDS TO THE CORRECT ANSWER

1. Factorize the expression $(x+ y - 1)^2 – (x – y + 1)^2$

   A. $2x\,(2y - 1)$ C. $4y\,(x – 1)$

   B. $2y\,(2x – 1)$ D. $4x\,(y – 1)$

2. If $\frac{8-3\sqrt{6}}{2\sqrt{3}+3\sqrt{2}} = p\sqrt{3} + q\sqrt{2}$, evaluate (p + q)

   A. $-\frac{10}{3}$ C. $-\frac{4}{3}$

   B. $\frac{4}{3}$ D. $\frac{10}{3}$

3. Find the set of values of x for which $3 < 2x – 1$ and $\frac{2}{3}x < 3$

A. $\left\{x: x < \frac{9}{2}\right\} \cap \{x: x > 2\}$ C. $\{x: x > 2\}$

B. $\left\{\boldsymbol{x: 2 < x < \frac{9}{2}}\right\}$ D. $\left\{x: x < \frac{9}{2}\right\}$

4. If $(x - 2)$ is a factor of the polynomial $f(x) = x^3 + x^2 - px + 8$, find the value of p

A. 2 C. 8

B. 4 D. 10

5. Find the equation of the line which makes intercepts of -3 on the *x-axis* and -5 on the *y- axis*

A. $5x + 3y + 1 = 0$ C. $5x - 3y - 15 = 0$

B. $5x + 3y - 1 = 0$ D. $5x + 3y + 15 = 0$

6. If α and β are the root equation $3x^2 + 5x + 1 = 0$, find the value of $\alpha^2 - \alpha\beta + \beta^2$

A. $\frac{18}{3}$ **C.** $\frac{16}{9}$

B. $\frac{16}{3}$ D. $\frac{21}{9}$

7. Find the ratio of the term in x^5 to the term in cubed in x^3 in the binomial expansion of $(2x + 3)^6$

A. $\frac{x^2}{15}$ C. $\frac{x^2}{5}$

B. $\boldsymbol{\frac{2x^2}{15}}$ D. $\frac{2x^2}{5}$

8. Which of the following statement is false?

A. $x + 3 > 2 \Longrightarrow x > -1$ C. $x = 3 \Longrightarrow x^2 = 9$

B. $x > 5 \Longrightarrow -x < -5$ D. $x + 3 > 4 \Longrightarrow x < 1$

9. If $x = \frac{1}{81}$, $p = \frac{1}{4}$ and $q = 3$ find the value of x^{pq}

A. 27 C. $\frac{1}{9}$

B. $\frac{2}{9}$ D. $\frac{1}{27}$

10. Simplify $(7 + \sqrt{2})(1 + 5\sqrt{2})$

A. $16 + 36\sqrt{2}$ C. $17 + 36\sqrt{2}$

B. $15 + 34\sqrt{2}$ D. $18 + 36\sqrt{2}$

APPENDIX C

SOLUTIONS TO THE PERFORMANCE TEST

UNIVERSITY OF EDUCATION, WINNEBA.

MPHIL MATHEMATICS EDUCATION

PERFORMANCE TEST SOLUTIONS (OBJECTIVES TEST)

THIS TEST IS NOT FOR EXAMINATION PURPOSES BUT PURELY FOR RESEARCH WORK

SECTION A: BIODATA (ABOUT YOURSELF)

1. **Name of school** ……..
2. **Type of school**

   BOYS [ ] GIRLS [ ] MIXED [ ]
3. **Your Gender (if a mixed school, indicate your gender)**

   MALE **[ ]** FEMALE **[ ]**
4. **Academic Program (indicate the program you are reading)**

   Business [ ] General Science [ ] Agric. Science [ ] Gen Arts [ ]
5. Form: One [ ] Two [ ] Three [ ]

DURATION: 20MINS

CIRCLE THE LETTER THAT CORRESPONDS TO THE CORRECT ANSWER

1. Factorize the expression $(x+ y - 1)^2 – (x – y + 1)^2$

   A $2x\ (2y - 1)$ C. $4y\ (x – 1)$

   B. $2y\ (2x – 1)$ **D. $4x\ (y – 1)$**

2. If $\frac{8-3\sqrt{6}}{2\sqrt{3}+3\sqrt{2}} = p\sqrt{3} + q\sqrt{2}$, evaluate (p + q)

   A $-\frac{10}{3}$ C. $-\frac{4}{3}$

   B. $\frac{4}{3}$ D. $\frac{10}{3}$

3. Find the set of values of x for which $3 < 2x – 1$ and $\frac{2}{3}x < 3$

   A. $\left\{x: x < \frac{9}{2}\right\} \cap \{x: x > 2\}$ C. $\{x: x > 2\}$

   B. $\left\{x: 2 < x < \frac{9}{2}\right\}$ D. $\left\{x: x < \frac{9}{2}\right\}$

4. If $(x – 2)$ is a factor of the polynomial $f(x) = x^3 + x^2 – px + 8$, find the value of p

   A. 2 C. 8

   B. 4 **D. 10**

5. Find the equation of the line which makes intercepts of -3 on the *x-axis* and -5 on the *y- axis*

   A. $5x + 3y + 1 = 0$ C. $5x - 3y - 15 = 0$

   B. $5x + 3y - 1 = 0$ **D. $5x + 3y + 15 = 0$**

6. If α and β are the root equation $3x^2 + 5x + 1 = 0$, find the value of $\alpha^2 – \alpha\beta + \beta^2$

   A. $\frac{18}{3}$ ***C.*** $\frac{16}{9}$

   B. $\frac{16}{3}$ D. $\frac{21}{9}$

7. Find the ratio of the term in x^5 to the term incubed inx^3 in the binomial expansion of $(2x + 3)^6$

   A. $\frac{x^2}{15}$ C. $\frac{x^2}{5}$

B. $\frac{2x^2}{15}$ D. $\frac{2x^2}{5}$

8. Which of the following statement is false?
   A. $x + 3 > 2 \Longrightarrow x > -1$ C. $x = 3 \Longrightarrow x^2 = 9$

   B. $x > 5 \Longrightarrow -x < -5$ **D. $x + 3 > 4 \Longrightarrow x < 1$**

9. If x= $\frac{1}{81}$, p = $\frac{1}{4}$ and q = 3 find the value of x^{pq}
   A. 27 C. $\frac{1}{9}$

   B. $\frac{2}{9}$ ***D.*** $\frac{1}{27}$

10. Simplify $(7 + \sqrt{2})(1 + 5\sqrt{2})$
    A. $16 + 36\sqrt{2}$ **C. $17 + 36\sqrt{2}$**
    B. $15 + 34\sqrt{2}$ D. $18 + 36\sqrt{2}$

APPENDIX D

INTRODUCTION LETTER

DEPARTMENT OF MATHEMATICS EDUCATION

UNIVERSITY OF EDUCATION, WINNEBA
FACULTY OF SCIENCE EDUCATION
DEPARTMENT OF MATHEMATICS EDUCATION
P. O. Box 25, Winneba, Ghana
math@uew.edu.gh
+233 (020) 2041076

14th September, 2021

LETTER OF INTRODUCTION

Dear Sir,

I write to introduce to you the bearer of this letter **Mr. Abraham Atsu,** with index number (200013713) a postgraduate student in the University of Education, Winneba who is reading for a Master of Philosophy in Mathematics Education.

As part of the requirements of the programme he is undertaking a research titled – *Gender difference in attitude towards performance in Elective Mathematics Education in Senior High Schools in Accra Metropolis.*

He needs to gather information to be analysed for the said research and he has chosen to do so in your institution. I would be grateful if he is given the needed assistance to carry out this exercise. Thank you.

Yours faithfully,

14/09/21

GRADUATE COORDINATOR
Department of Mathematics Education

DEPARTMENT OF MATHEMATICS EDUCATION
UNIVERSITY OF EDUCATION
WINNEBA