UNIVERSITY OF EDUCATION, WINNEBA

IMPACT OF PERCEPTIONS OF SENIOR HIGH SCHOOL STUDENTS' MATHEMATICS PERFORMANCE IN THE BIRIM CENTRAL MUNICIPALITY OF GHANA

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MASTER OF PHILOSOPHY

2023

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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 fulfilment**

**of the requirement for the award of the degree of
Master of Philosophy
(Mathematics Education)
in the University of Education, Winneba**

OCTOBER, 2023

DECLARATION

Student's Declaration

I, **Frempong Ansong Stephen**, declare that this thesis, except for quotations and references contained in published works which have all been identified and duly acknowledged, is entirely my original work, and it has not been submitted, either in part or whole, for another degree elsewhere.

Signature.....

Date.....

Supervisor's Declaration

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

Name of Supervisor: Professor Charles K. Assuah

Signature.....

Date.....

DEDICATION

To my beloved children: Son Yaw Nyameye Offei Frenpong and daughter Naila Adwoa Kesewaa Frenpong.

ACKNOWLEDGEMENT

Appreciate my supervisor, Professor Charles K. Assuah for his professional guidance and constructive criticism from the beginning to the end of this write-up.

I also wish to register my indebtedness to the authors of books and articles I consulted during the write-up. I thank the entire staff and management of Oda Senior high schoolschoolSchool, Attafuah Senior High, and St. Frances Senior high schoolschoolSchool for according to me ample time and environment during my studies.

To the rest of you whose names could not be written here, I thank you all.

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LIST OF ABBREVIATIONS

B.E.C.E	-	Basic Education Certificate Examination
MoE	-	Ministry of Education
SHS	-	Senior high schoolschoolSchool
W.A.S.S.C.E	-	West Africa Senior Secondary Certificate Examination
NCF	-	National Curriculum Framework

ABSTRACT

The purpose of this study was to investigate students‘ perception of mathematics in senior high schools and its impact on academic performance. The study examines the factors that influence these perceptions and finds contextual factors that underpin innovative mathematics teaching and learning in senior high schools in Ghana. Based on the Social learning theory of Albert Bandura, the study centred on Two hundred ten (210) students from three senior high schools in the Birim Central Municipality. The study was approached quantitatively and based on the positivist paradigm. Structured interviews with Likert-scale responses were used to collect data. The items on the questionnaire were categorised and additively indexed into five variables. Multiple linear regression was used to analyse the first objective followed by Pearson correlation to assess the impact of perception on academic performance in mathematics. The findings in this study according to the data presented argued the students' perception must have a great significance to the students' academic performance in mathematics. The student's socioeconomic background, teacher pedagogy, and mastery of the subject matter all play significant roles in the students‘ perception of mathematics. A positive or negative perception will yield a low or high performance of students in mathematics. The study recommended that mathematics teachers must be proactive in providing a fear-free environment for the teaching and learning of mathematics in secondary schools. Furthermore, teachers, school authorities, and parents have the responsibility of helping students overcome negative perceptions about mathematics from the early stages of their educational lives.

CHAPTER ONE

INTRODUCTION

1.0 Overview

This chapter deals with the background of the study, statement of the problem, purpose of the research, research questions, significance of the study, delimitations as well and organization of the study.

1.1 Background to the Study

In the contemporary world, mathematics is a crucial instrument for progress and plays a significant part in the formation of civilisation (Gulnaz & Fatima, 2019). It is seen as a prerequisite for success in contemporary culture, although most students find it difficult (Chu et al., 2017). As is the case in many African nations, mathematics is taught in Ghana's basic school, senior high school, and colleges of education curriculum (Ampofo, 2019). The Sustainable Development Goals and the African Union's Agenda 2036 have been given top priority by the United Nations and AU due to their significance.

All students at various levels of education are required to take mathematics, which serves as both a steppingstone and a crucial screening mechanism for future education in the nation (Ampofo, 2019). Mathematics is the foundation and a tool for every nation's growth in science, technology, and the economy, according to Umameh (2011) and Tshabalala and Ncube (2013). Because it links to everything in the world, is tied to people's daily lives, and serves as the foundation for growth, mathematics is extremely important not simply for the academic credentials one earns (Mefor, 2014).

Despite the numerous benefits of Mathematics, there have been consistent abysmal performances of students in both the West African Senior High School Certificate Examination (WASSCE) and Basic Education Certificate Examination (BECE) performances in mathematics (WAEC, 2021). The nation's science and technology sector is now even more at risk because of this performance, which has drawn the attention of those with an interest in education (Ampofo, 2019). The problem has many facets and affects everyone.

Studies that have been done thus far on the teaching and learning of mathematics throughout the world have examined pedagogy and teacher-related aspects (Alonge et al., 2020 & Olukayode, 2015). Such studies are supported by the notion that effective teaching and learning of mathematics in modern schools are influenced by the experience, technological expertise, and educational background of instructors. Other studies also outline some characteristics such as teachers‘ attitudes, teacher-student relationships, and beliefs (Evans, 2020; Kosgei, 2013 & Gablinske, 2014).

Educators have not given the impression of mathematics much thought (Chen et al., 2018; Goldin et al., 2016). Perception (Evans, 2020; Kosgei, 2013 & Gablinske, 2014) is the concept that a person's attitude toward an idea or thing influences what that person thinks, feels, and how that person would want to behave toward that idea or object. Due to the perception that previous generations had of mathematics, some pupils hold it in high regard. There are various plausible explanations for these contradictory results and thus this study aims to examine the impact of senior high school students‘ perceptions of mathematics on their academic performance.

1.2 Statement of the Problem

The different learning styles and perspectives of each student make it challenging for them to study mathematics on their own without the assistance of a teacher or a peer. When you consider all the elements that go into teaching and learning, this type of attitude typically evolves because of students' unpleasant mathematical experiences. According to a comparison of the Ghana Educational Management Information System Report from 2012 to 2018, pupils' academic performance in senior high schools' core mathematics is poor and unfavourable (WAEC, 2015–2020).

Studies have examined the aspects such as the teacher, student, and school-related factors impacting performance in mathematics to determine the causes of students' poor performance (Miheso, 2002; Olukayode, 2015; Evans, 2020; Wasike et al., 2013; Gablinske, 2014). Few studies have been conducted to evaluate the effect of student attitudes on mathematics accomplishment in Ghana, even though there has been much research on low performance. It is against this background that this study aims to assess the impact of senior high school students‘ perception of mathematics on their academic performance.

1.3 Purpose of the Study

Numerous reasons for senior high school students' low performance in mathematics stem from government policies, management, and school, affecting their academic performance. The students are the recipients of the knowledge and thus this study aims to access the significant impact of senior high school students' perception of mathematics and its influence on their academic performance in the Birim Central Municipality Senior high school schools in the Eastern.

1.4 Objectives of the Study

The objective is to determine to which extent:

i Learners‘ characteristics, teacher pedagogy, peer influence, and the learning environment impact senior high schools choolstudents‘ perception of mathematics.

ii the impact of students‘ perception of Mathematics affects academic performance.

1.5 Research Questions

The following are the research questions that the research looked to answer:

i. To what extent do learner characteristics, teacher pedagogy, and the learning environment impact senior high school students‘ perception of mathematics?

ii. What is the relationship between senior high school students‘ perception of Mathematics and academic performance?

1.6 Significance of the Study

The study aims to identify the reasons behind low senior high school school students' core mathematics performance and propose strategies to improve it, benefiting all stakeholders in education, particularly at the senior high level, to enhance academic performance.

The study's findings could benefit the Ghana Education Service and the Ministry of Education by offering policy guidelines for teacher pedagogy and enhancing student academic performance.

1.7 Limitations of the Study

The study's findings are limited to the sampled schools and cannot be applied to all students and teachers in other second-cycled schools in Ghana.

The study is limited to the perceptions of students towards the improvement of teaching and learning mathematics at the SHS level. It is therefore not feasible to generalize the results of this study to other teaching and learning institutions in other regions.

1.8 Delimitation of the Study

The study was conducted in public-assisted secondary schools in Akim Oda Municipality, specifically targeting senior high school students who were preparing for final exams. The chosen schools provided adequate subject teachers, facilities, and a conducive environment for investigating other factors affecting subject performance.

1.9 Organization of the Study

This thesis has been organized into five chapters, and each chapter has an introduction and sub-headings. Chapter One discusses the background to the study, statement of the problem, purpose of the study, research questions, significance of the study, limitations, delimitation of the study, and Organization of the study. Chapter Two looks at the theories and Conceptual framework related to the study. Chapter three presents the method of the study. This includes the research design, population, sampling and sampling techniques, research instrument, data collection procedure, and data analysis. Chapter Four discusses the results of the data collected using statistical tools. Chapter Five, Summarizes the entire piece taking into consideration the the main objectives of the study, and concludes with the responses from the data

and discoveries made from the study. This notwithstanding made recommendations for to all and sundry on pertinent areas for further studies.

CHAPTER TWO

LITERATURE REVIEW

2.0 Overview

This chapter reviews the literature on Ghanaian mathematics, focusing on theoretical framework, perception, students' perception, factors influencing perceptions, and their impact on academic performance.

2.1 Theoretical Framework

The attitudes of humans are expressed through behaviours and language (Kela, 2016). The attitudes we portray are developed mostly because of the feelings we tend to have towards a concept, situation, or entity. Rikard and Banville (2006) are of the view that our attitudes are born from views that form our behaviours and figure out how we get ourselves involved in happenings around us. It is therefore relevant that we come to an understanding of the reasons why the factors and situations around us influence the attitudes we develop and why some others have little or no influence at all. Theories are important when it comes to understanding certain concepts and issues. To achieve the objectives of this study, the theory of planned behaviour, Albert Bandura's social learning theory, as well as the theory of constructivism, were explained briefly to understand how these theories define perception.

2.1.1 Albert Bandura's Social Learning Theory

Albert Bandura's social learning theory of 1977 asserts that all learning is acquired because of direct experience with the object, subject, thing, issue, or idea. According to Bandura (1977), people interact with their environment which shapes the behaviour of individuals and vice versa. It emphasizes the immediate social context where an individual observes and interprets the behaviour of other people which in turn would

determine their behaviours. Individuals select models and will only adopt the behaviour of the models they deem like themselves and whom they esteem. In this light, the learner determines the behaviours to adopt and which others to reject without necessarily engaging in the behaviour of the other. Individual behaviour decisions and perceptions also determine the extent to which one will persist in any task which results in either success or failure of the tasks to be accomplished.

Attitudes are learnt experiences through observing, modelling, and imitating the subjects in our environment or the behaviour of others. According to Bandura (1977), some behaviour changes may be mediated through modification of the model itself, through role modelling, the use of reinforcement and rewards, and sometimes through persuasion. For an individual to attempt a modelled behaviour, he must value the observed outcome and perceive it as successful (Schunk, Meece & Pintrich, 2013).

2.1.2 The Theory of Constructivism

Education has to do with the development of a child by using numerous methods, usually introduced by a teacher, who is directed by a syllabus. For education to be operative, teachers, students, and the schools involved must participate actively (Behar, 2014). However, the current educational system emphasizes preparing students for examinations and does not promote effective learning. The central issue is that students are not studying as they should and are focusing more on routine learning and memorization. In this modernized system, schools are encouraged to implement the constructivist approach which is moral and more focused on innovative activities and knowledge acquisition since the academic performance of the students in constructivist classrooms is better than outmoded classrooms (Dagar &Yadav, 2016).

Constructivist theories assume that the process of perception is a highly active process of extracting sensory stimuli, their evaluation, interpretation, and backward organization of sensory stimulus. Perception is the product of the interaction between stimulus and internal hypotheses, expectations, and knowledge of the observer, while motivation and emotions play an important role in this process. A wide range of individual factors influences perceptions which leads to an inadequate interpretation. (Eysenck & Keane, 2008). According to Dagar and Yadav (2016), the principles of social constructivism can be used to develop constructivist learning strategies to improve the social and emotional skills of the students, their academic achievement, and high-order thinking skills. The constructivist environment in a classroom can be created by adopting the following:

1. **Provide experience with the knowledge construction process**

   Here the teacher is expected to present a topic to the students and guide them to explore the topic by investigating it. Later with the aid of the teacher, the students are helped to answer questions through scaffolding.

2. **Experience in and appreciation for multiple perspectives**

   All students are assumed to be different from one another especially the way they perceive issues. Thus, the students are encouraged to work in groups to share their views on the topic.

3. **Provide social and emotional learning**

   The students must be taught the social and emotional aspects of learning. There are five aspects of social and emotional learning. These are self-awareness, managing feelings, motivation, empathy, and social skills.

4. 4. **Use multiple modes of representation**

   The use of varied ways of representation helps to improve learning and provides various ways for students to understand the topic understudy from numerous approaches. In summary, the concepts in mathematics are generally thought of as difficult to understand. Constructivists however have the belief that students will understand concepts better when they direct their learning. The researcher, therefore, adopted this theory as it provides answers to how students can direct their learning patterns to understand concepts better and thus do well in their achievements, the case of the study of mathematics being an example.

2.1.3 Theory of Planned Behaviour (TPB)

The Theory of Planned Behaviour (TPB) commenced as the Theory of Reasoned Action in 1980 and was mainly used for the prediction of an individual‘s intention to behave in a particular way within a specific time and place. The TPB was meant to explain all behaviours within the control of the individual. One main element to this model is that a person‘s intentions to behave in a particular way are motivated by the attitude and the probability that the act will have the anticipated results as well as the subjective assessment of the risks and benefits thereof. The TPB has been instrumental in the prediction and provision of explanations for a wide range of behaviours and intentions related to health such as breastfeeding, smoking, peoples‘ utilisation of health services, alcohol addiction, use of substances, and academic achievements, among others. The TPB explains that behavioural achievement depends on both individuals‘ perceived motivation (intention) and ability (behavioural control) to engage in the act. It consists of three main constructs‟ which are behavioural, normative, and control.

Ajzen (2011) also proposed three main reasons for behavioural intention. These determinants are (1) attitudes (the overall positive or negative assessment toward an item), (2) subjective norm (the social pressures on the person to carry out a behaviour), and (3) perceived behavioural control (the individual‘s perception of his/her ability to control the outcome of a behaviour). Additionally, LaMorte (2019) asserts that the TPB is built out of six constructs that together constitute a person's real control over behaviour.

a. Attitudes

Attitude has to do with the extent to which one has a favourable or unfavourable assessment of their actions of interest.

b. **Behavioural intention**

This concept focuses on factors that influence people to behave and act the way they do. Such that one is likely to demonstrate a certain kind of behaviour if they have a strong urge.

c. **Subjective norms**

This aspect centres on the perception of what people support or not as good or bad. With this people tend to focus on demonstrating behaviours that others expect of them.

d. **Social norms**

This refers to the normal codes of behaviour expected by team members or people from a larger cultural context.

e. **Perceived power**

This focuses on factors that may enable or hinder the performance of conduct.

f. **Perceived behavioural control.**

This differs from one circumstance to the other. Thus, depending on the circumstance, one may demonstrate varied behaviours.

In summary, the TPB indicates that the best predictors for forming behavioural intention that in turn leads to the person displaying the act or not include a person having a positive attitude towards an act or behaviour and being surrounded by favourable social norms and having a high level of perceived behavioural control. As in the case of this study, the researcher seeks to find out various perceptions that students have towards mathematics, how these affect their attitudes towards the study of mathematics, and hence their influence on their mathematics achievements. The Theory of Planned Behaviour supports this work in that, it shows that perceived attitudes of people (in this case students), considering the subjective norms that surround the students as well as their perceived control over mathematics or not, do go a long way to affect their decisions to do mathematics and subsequently influence their mathematics performance.

2.2 Perceptions of Mathematics

The term perception is frequently used in various works and our daily lives, and it is frequently assumed that everyone understands what it means and that it is, therefore, unnecessary to define it. Perception is a complicated concept, and what it means varies greatly depending on the context. Other authors, such as Peterson and Yaakobi (1979), defined behaviour perceptions as how a person sees himself or herself, other

people's behaviour, or a fictitious ideal. Views and perceptions were also used interchangeably by some authors (Barman, 1999).

The word 'perceptions of mathematics' is defined in this study as a mental representation or view of mathematics that appears to have been formed because of social experiences, mediated through interactions at school, or the influence of parents, teachers, peers, or the media. It also refers to a mental image of something based on prior experience, as well as the beliefs, attitudes, and conceptions that go with it. Several studies have been conducted to investigate students' perspectives on mathematics (Aguilar, Rosas & Zavaleta, 2012; Moreau, Mendick & Epstein, 2010). Mathematics is regarded as a tough topic in Ghana, with just a select few having access to it. Adults commonly express disdain for the subject or claim inability in it, while many students opt out of mathematics after high school.

Past experiences shape people's perceptions and ideas about mathematics, which include both cognitive and affective aspects. (Aguilar, Rosas & Zavaleta, 2012). It refers to a person's knowledge, beliefs, and other cognitive representations from a cognitive perspective, whereas it refers to a person's attitudes, sentiments, and emotions about mathematics from an affective perspective. All visual, verbal, and metaphorical ideas and associations, beliefs, attitudes, and feelings associated with mathematics and mathematics learning experiences are included in the broad definition of the term. As a result, the primary goal of this research is to investigate and determine the spectrum of secondary school students' perceptions, beliefs, and attitudes towards mathematics. Negative perceptions and myths about mathematics are said to be pervasive among the public.

Educators try to explain this occurrence by citing common beliefs or mathematical myths such as learning mathematics is an issue of talent rather than effort. (McLeod, 1992, p.575) or that there is an inherent natural ability for mathematics. Many people believe that mathematics is just for smart individuals or those who have 'inherited mathematical skill.' Another common misconception is that mathematics is a male-dominated field. Another prejudice is that boys are superior to girls in mathematics (Ernest, 1995). As a result, many adults regard their lack of mathematical ability as a permanent condition over which they have no control. The views and attitudes of students regarding mathematics are heavily influenced by their parents and other significant persons. According to Sam (2002), parents' attitudes toward mathematics have a significant impact on how they instruct their children. If parents and instructors have opposing views on mathematics, this frequently leads to conflict.

Individual life histories that each student brings to mathematics study are one source of differing student perceptions. These life experiences have an impact on how students behave in the classroom, how they interact with mathematics, teachers, and classmates, and how they perceive mathematical encounters. Contextual factors, on the other hand, are something that students in the same class share. These factors include, for example, the teacher's personality, the quality of instruction and learning support materials, mathematical interests, self-confidence, and overall skill in the subject.

2.3 The Study of Mathematics as a Subject in Ghana

Mathematics is considered a first step in all human action in the current age of globalization and technological transformation. Mathematics is a collection of abilities, techniques, and knowledge that may be applied in a variety of situations. Not

only in Ghana but around the world, mathematics is regarded as a critical topic in the educational curriculum. It is one of the most important subjects, both in and beyond the sciences (UK Essays, 2018; Jones, 2000). Developed countries appear to have excellent mathematics policies that have propelled them to greater heights of development. No country has made any significant progress in its economic development without first developing a basic mathematical foundation. It guarantees that people gain the knowledge and skills they need to become more productive and improve their quality of life. This productivity improvement also leads to new sources of income, boosting a country's economic growth.

The subject's importance has drawn attention to it, and it is because of this attention that instructors, students, parents, and educational specialists have recognized the difficulty with which students learn the subject. It is also worth noting that teachers struggle to teach the subject properly. The start of the Third Wave Project in 2008, according to Seah and Wong (2012), accelerated the large-scale examination of what students value in effective mathematics study. This needs the investigation of what students from less developed nations, such as Ghana, consistently score badly in mathematics value in the study of the subject (Davis, Carr, & Ernest, 2019).

Mathematics is required for students in the basic and second cycles since it is thought to be the foundation for the study of other disciplines. Students in the second cycle learn core mathematics; however, there is an additional mathematics course known as elective mathematics that is generally optional, depending on the program studied—business, science, or the arts. As a result, mathematics is important to a wide range of subjects in our educational system. According to Mereku & Mereku (2015), the use of information and communication technologies in mathematics teaching and learning is

limited. The use of calculators is permitted in the teaching and learning of mathematics at the second cycle level of education, however, students at the basic level are not permitted to use calculators.

Teachers of mathematics at the elementary level are generally educated, which means that primary school teachers teach practically all subjects (Davis, Carr & Ernest, 2019). Teachers who teach mathematics at the junior high school and senior high school levels are highly qualified. Most mathematics teachers in second-cycle institutions hold a Bachelor of Education degree in mathematics or its equivalent. However, it is normal to find teachers at the second cycle level who do not have such qualifications but are still teaching mathematics, owing to teacher shortages or inadequacy. Many of these people may excel in the topic, and their grades determine their fate.

Mathematics at the tertiary level is significantly more complicated and takes a great deal of knowledge and expertise as an instructor, generally at the tertiary level, whereas students who study mathematics study the topic in greater depth than they did in Senior High. Mathematical research has proven to be quite essential in the country, as many scholars and professionals in subjects such as sciences, banking and finance, economics, and business management, among others, use it daily. Traders, bus conductors, and everyday Ghanaians perform rudimentary addition and subtraction in their daily tasks, thanks to the limited mathematics they were taught or learned on their own.

2.4 Students' Perception of Mathematics Teaching and Learning in SHS

Many have identified that the perception of students towards the study of mathematics differs. Mathematics is regarded as a tough topic in Ghana, with just a select few

having access to it. Adults commonly express disdain for the subject or claim inability in it, while many students opt out of mathematics after high school. In general, the conceptions students hold about Mathematics determine how they approach mathematics tasks leading them into either productive or non-productive orientations. In many cases, students have been found to approach Mathematics as procedural and rule-oriented. This prevents them from experiencing the richness of Mathematics and the many approaches that could be used to develop competence in the subject.

There have been numerous explanations proposed to explain the overall deficient performance at all grade levels. Students that excel in mathematics are labelled "nerds" by their peers. Many individuals despise mathematics in general. It is regarded as a topic reserved for a select few. It frequently elicits worry, anxiety, and terror (Atallah, Bryant & Dada, 2009). It is also considered a barrier that prevents students from following their professional goals in math and science-related disciplines.

Many people believe that mathematics is just for smart individuals or those who have inherited mathematical skills.' Another common misconception is that mathematics is a male-dominated field. Another prejudice is that boys are superior to girls in mathematics. As a result, many adults regard their lack of mathematical ability as a permanent condition over which they have no control. The views and attitudes of students regarding mathematics are heavily influenced by their parents and other significant persons.

Contextual factors, on the other hand, are something that students in the same class share. These factors include, for example, the teacher's personality, the quality of instruction and learning support materials, mathematical interests, self-confidence,

and overall skill in the subject. These have an impact on the entire class and are the source of shared experiences. Furthermore, the shared occurrences in the classroom have an impact on students' individual experiences. An arrow from the classroom context to individual experiences illustrates this.

2.4.1 Students' Perception of Mathematics Teachers' Qualifications

Qualification of a teacher is the assurance of the teacher‘s impulse as well as the determinant of his knowledge, attitude, and instructional strategy. A qualified mathematics teacher can easily use different approaches/ methods, styles, illustrations, examples, and improvise materials in teaching students mathematics concepts, principles, or ideas which his counterpart (unqualified mathematics teacher) cannot do. This suggests that student mathematics interest is dependent on the qualification of the mathematics teacher. In Ghana, the Ministry of Education (2015) suggested that all schools should have ways of satisfying themselves so that staff involved with the teaching of learners are qualified and competent to do so. The following is what the body wrote about the qualities of the teaching personnel:

i. All teachers should have the requisite qualifications and licenses.
ii. All schools should ensure that their staff recruitment and appointment procedures include a means of making certain that all new staff have at least the minimum level of competence in inclusive education.
iii. All schools should have qualified special educational needs coordinators (Ministry of Education, 2015).
iv. All staff and learners should respect one another. Teachers should respect all learners including those with Special Educational Needs (SEN). Those learners without SEN should respect their peers with SEN. Staff and

learners should use appropriate language and avoid canning, teasing, and name-calling.

v. All forms of discipline should take cognizance of the needs of learners. Teachers should not isolate learners who are hyperactive or introverts.

vi. Every school should provide continuous in-service training for the teachers.

vii. Teachers who provide services outside normal working hours should be remunerated (Ministry of Education, 2015).

viii. All schools should have qualified supporting staff for lower primary classes that are from kindergarten 1 to class 3.

ix. All schools should provide learners with special needs such as deafness, blindness, autism, attention deficit, and hyperactivity disorders with support assistance.

x. Every school should have adequate qualified related services staff such as Guidance and Counselling Coordinators, Social Workers, and Speech therapists (Ministry of Education, 2015).

A qualified mathematics teacher can arouse students‘ interest in mathematics learning and ensure success in the learning of the subject using appropriate instructional strategies in teaching the student (Anagbo, 2016). Teachers‘ effectiveness in any subject is an important determinant of that subject (Akinoso, 2011). Therefore, engaging a qualified mathematics teacher who is equipped with various instructional strategies in teaching mathematics enhances students‘ interest in learning mathematics. Eshiwani, (1993) states that school quality of teachers is important in school success in terms of examination performance. Studies have identified a variety of constructivist learning strategies (students work in collaborative groups or students

create products that represent what they are learning) that can change the way students interact with the content (Pallant, 2013). A qualified mathematics teacher can easily use different approaches/ methods, styles, illustrations, examples, and improvise materials in teaching students mathematics concepts, principles, or ideas which his counterpart (unqualified mathematics teacher) cannot do. This suggests that student mathematics interest is dependent on the qualification of the mathematics teacher.

A qualified mathematics teacher can arouse students' interest in mathematics learning and ensure success in the learning of the subject using appropriate instructional strategies in teaching the student. Teachers' effectiveness in any subject is an important determinant of that subject (Akinoso, 2011). Therefore, engaging qualified mathematics teachers who are equipped with various instructional strategies in teaching mathematics enhances students' interest in learning mathematics. This can be done through the teacher's application of his teaching styles, good, trained mind, and competencies which invariably eliminates anxiety in the students' learning of the subject. And qualified mathematics teacher uses a variety of mathematics games and improvises teaching materials to drive home mathematics concepts, ideas, and principles competently.

Tayo (2007) investigated the relationship/effect of students' perception of teachers' knowledge of subject matter, attitude to work, and teaching skills on students' academic performance. The population consisted of senior secondary three (SSIII) students in southwest Nigeria senior secondary schools. The study sample consisted of 1600 purposively selected SSS III students from the selected senior secondary school. A questionnaire with four sections was developed and administered to the

subject. The data collected were analysed using simple percentages, Person Product Moment Correlation, and Chi-Square statistics to test the three hypotheses generated in the study.

The result showed that students‘ perception of teachers‘ knowledge of the subject matter and attitude to work significantly affect students‘ performance. Etuk, Afangideh, and Uya (2013) conducted a study on students‘ perceptions of teachers‘ characteristics and their attitudes toward teaching mathematics in Oron Education Zone, Nigeria. The study sought to find out the relationship between how students perceive their teachers concerning knowledge of mathematics content, communication ability, use of appropriate teaching strategies teachers‘ classroom management skills, and students‘ attitudes toward learning mathematics. The population of the study comprised all the second-year students in senior secondary schools in the Oron Education Zone. The study sample consisted of 640 students selected through cluster and simple random sampling techniques. Two instruments- The students‘ perception of teachers‘ characteristics questionnaire and the student‘s attitude towards mathematics questionnaire were developed and administered to the respondents. A trial test of 50 students using a split-half reliability test was carried out which yielded reliability coefficients of respondents. Data collected were analysed by frequency counts, percentages, mean scores, and tabulation. The findings revealed that some teachers were the bedrock of some students‘ low academic performance in mathematics due to their ineffectiveness at work and students‘ lack of interest due to poor background in the subject. Also, it was found that in Nigerian high schools, many students were not studying the courses they intended to; due to the negative attitude they earlier formed against mathematics. Olaleye (2010) investigated the perception of students on teachers‘ characteristics to students‘ academic performance.

The study was carried out in Osun State senior secondary schools. A population of 1600 purposively selected SSS III students from 16 rural and urban schools were used for the study. The questionnaire tagged teachers‘ characteristics and students‘ academic performance to elicit information from students. Data collected were analysed using percentage and Person Product Moment Correlation, Coefficients. The findings showed that there was a significant relationship between teachers‘ characteristics on students‘ academic performance.

2.4.2 Students' Perception of Mathematics Teaching Method

Ampadu (2012) examined students‘ perception of their teachers‘ teaching methods on how it impacted their learning experiences. The sample of the study involved 258 students from 12 junior high schools (12-14 years) who were randomly selected to complete a semi-structured questionnaire. The study revealed that students‘ perception of their teachers‘ teaching varies as the results established that both teacher–centred and student–centred teaching approaches were used by mathematics teachers. The results of the study revealed that teachers‘ actions and inaction impact positively or negatively on students‘ learning experience as most of the respondents reported that their learning experiences are to a larger extent controlled by the teacher. Asikhia (2010) conducted a study on students‘ and teachers‘ perceptions of the causes of poor academic performance in Ogun State secondary schools, in in Nigeria. The study had a targeted population consisting of all (SSII) students in Ogun State. That is 135 (SSII) students and 50 teachers were selected from five (5) secondary schools for the study through stratified random sampling. The instrument used for data collection was a self-designed questionnaire on the perception of students‘ poor academic performance. The data obtained were analyzed using frequency count and chi-square statistical analysis. Findings showed that teachers‘ qualifications and students‘

environment did not influence students' performance, but teachers‘ methods of teaching influenced performance. In addition, some of the factors of poor academic achievement identified were motivational orientation, self–esteem, emotional problems, study habits, teacher consultation, and poor interpersonal relationships.

2.4.3 Students' Perception of Mathematics Instructional Materials

Teaching aids or instructional materials include all physical resources that may be employed in instructions whereby students learn with the aid of objects rather than by reading books or listening to the teacher only. The role of physical experience in concept materials gives children the experience that enables them to form their ideas. However, when they lack such concrete materials, like teaching aids, their comprehension is greatly hindered. Adeluku (2012) investigated the influence of instructional materials in teaching and learning Mathematics in senior secondary schools in Cross River State. A two-group pre-test post-test quasi-experimental design was adopted for the study. One research question and one hypothesis were formulated to guide the study. A total of 100 senior secondary (SSI) mathematics students were selected from five (5) schools in Yankuur Local Government Area of Cross River State through simple random sampling and stratified random sampling techniques. Fifty SSI students (experimental group) were taught with instructional materials and another forty (control group) were taught without instructional materials. A validated mathematics achievement test was used to gather data for the study and split half was carried out using the Person Product Moment Correlation Coefficients to obtain the reliability coefficient of 0.67. Independent t-test was used to test the hypothesis at 0.05 significant levels while the Person Product Moment Correlation Coefficient was used to test the hypothesis at the 0.05 levels of significance. The study revealed that students taught with instructional materials performed significantly better than those

taught without instructional materials and that the use of instructional materials generally improved students‘ understanding of concepts and led to high academic achievements. Maruff and Amos (2011) examined the effect of using standardized and improvised instructional materials on the academic achievement of secondary school mathematics students in Oyo State, Nigeria. The research design adopted was quasi-experimental using a pre-test post-test non-randomized control group. Purposive sampling was used to obtain a sample of three co-educational secondary schools. Each school provided one senior high school class for the study. Two instruments were used in the study, the mathematics achievement test to measure students‘ achievement and the teacher hers‘ instructional guide to train the teachers in the experimental groups. The instrument was pilot-tested to ascertain reliability. The reliability coefficient was 0.76. Three hypotheses were formulated and tested at the 0.05 level of significance.

Data were analyzed using ANOVA and ANCOVA. Findings revealed that there was a significant difference in the achievement of students taught using standard instructional materials, those taught with improvised instructional materials, and those in conventional instruction. Thus, the students taught with improvised instructional materials obtained the highest achievement score on the post-test (74.94), followed by those with standard instructional materials (F=63.07), while the control group scored the lowest (F=39.89). Also, there was no significant effect of gender on students‘ achievement in mathematics. Finally, there were no significant interaction effects of treatment and gender on students‘ achievement in mathematics. The researcher concluded that the utilization of improvised instructional materials promotes and enhances the effective teaching-learning process, thus, mathematics teachers should be encouraged to use them in their lessons. Oluwale (2010) examines the effect of

mathematic instructional materials on the learning and teaching of mathematics as well as the effect of these instructional materials on the academic performance of some secondary school students in Isolo Local Government Area of Lagos State. A well-designed and simple questionnaire was distributed to mathematics teachers in these selected schools to accurately evaluate the effect of instructional materials on the application of mathematics in secondary schools in Nigeria. The researcher adopted the survey research design with a sample of 20 teachers and eighty (80) students selected randomly. A questionnaire was used to collect the data. The findings after testing hypothesis, three indicate that there was a significant positive difference in the performance of secondary school students in mathematics when they were taught the subject with instructional materials in the teaching and learning of mathematics, obviously improving the performance of the students.

2.5 Factors that influence students' perception of Mathematics.

Students who tend to prefer topics over others might gain a broad impression from their experiences in school. Mathematics class has not been an exception, as some students are constantly on the hunt for that class or subject time while others wish they could skip that session. While some students are continuously on the lookout for math lessons, others wish they could avoid them. In the teaching and learning process, attitudes about mathematics are crucial. In most circumstances, how one experiences the learning environment affects how one creates their perceptions. Interpersonal encounters then further strengthen the perceptions that have already been created. Whether the person involved likes or dislikes the stimuli will influence whether a perception is favourable or negative.

Most of the time, a student's interest in a particular subject can be attributed to a variety of factors, such as how interesting or uninteresting the subject or the tutor is, how easily the student can understand what is being taught, what the subject entails, what time of day the subject is taught, among others. However, prior research has demonstrated that some student attitudes toward subjects are a result of some perceived notions. These opinions regarding the subject influence how people feel about studying it.

2.5.1 Gender and Age Factor

Gender and age are vital parts of each human being that cannot be ignored. There are gender disparities that also affect achievement in mathematics. Studies revealed the belief that boys do better in Mathematics than girls. This belief tends to affect the attitude of girls towards Mathematics. In comparative studies, comparing girls to boys, girls lacked confidence, had debilitating causal attributional patterns, perceived Mathematics as a male domain, and were anxious about Mathematics (Kele,2018). Girls were found to have lower self-confidence in Mathematics than boys (Farooq & Shah, 2008). Mutodi and Ngirandi (2014) investigated the influence of students‘ perceptions on mathematics performance at a selected South African secondary school and the results suggest that there were significant differences in the perceptions and beliefs about mathematics between males and females, between mature and juvenile students and among students from different language backgrounds respectively. This is consistent with findings by Hoang (2008) who showed that males consistently reported slightly more positive perceptions and attitudes than females. However, research carried out by Mohamed and Waheed (2011) showed that the students‘ positive attitude towards mathematics is medium and there is no gender difference in their attitudes. Additionally, Josiah and Adejoke (2014) investigated

how college students' math anxiety and gender affected their performance in algebra. Ex-post-facto study design was used, which implies that there was no variable manipulation. Participants in the study were aspiring math educators from the Federal Colleges of Education in Nigeria's Lagos and Ogun states. The study used a questionnaire to gather information from respondents, including their gender, age, mathematics anxiety score (r=0.82), and performance in an algebra course. The results showed that students' Algebra course performance was generally average. In the meantime, it was discovered that there were inequalities in achievement across gender, age, and mathematical anxiety levels (low, medium, and high).

2.5.2 Teacher Factor

To promote positive attitudes toward mathematics, teachers' support is also required (Marchis, 2011; Sakiz, Pape & Hoy, 2012). The significant impact of teachers on students' perceptions of their mathematical aptitude points to the significance of the teacher's role in mathematics classrooms,

which improves students' mathematical performance (Berends, Goldring, Stein, & Cravens, 2012; Charalambous, Panaoura, & Philippou, 2009). Students' academic, emotional, behavioural, and motivational outcomes in the classroom are significantly impacted by the affective dimensions of teacher support (Sakiz, 2007). Concerning students, listening to them, treating them fairly, encouraging them, and having lofty expectations are all listed as teacher support components (Sakiz, 2007). To succeed well, it is necessary, in the opinion of (Zulkarnain, Saim, & Talib, 2011), to promote students' attitudes throughout the teaching and learning process.

An indicator of how well teaching and learning are going is how well students can apply their information. A positive outlook can encourage students' critical thinking,

participation in class activities, teamwork, and the development of their interpersonal and communication skills. The performance of the given subject, particularly in mathematics, will be improved by all those types of attitudes. The use of a variety of teaching techniques and typical learning activities by the teacher as a facilitator in the teaching and learning process is encouraged to increase student interest in and foster a favourable perception of the subject. The lecturers' instruction is one of the aspects that determines students' success in a subject at the highest level of education (Heinze, Reiss & Franziska, 2005).

The look and presentation styles of teaching and learning play a considerable influence in efforts to improve students' understanding (Bakar, Kamarudin & Tan, 2009). Students‘ attitudes toward mathematics tend to be unfavourable when they have low opinions of their teachers (Madar, Kamaruddin & Puteh, 2005). Additionally, teachers and students need to work together to make learning and teaching successful. To encourage the students to practice their preferred learning approach, a conducive classroom environment needs to be implemented by the teachers because perhaps not surprisingly shows a positive correlation between attitude (Osborne, Simon & Collins, 2003) and perception. The teachers are encouraged to try to increase the use of materials and teaching aids to make the process of learning easily understood.

The findings of the study conducted by (Salleh, Yusof &Dawang, 2003) found that students‘ perception of teachers‘ knowledge of the subject matter, attitude to work, and teaching skills have a significant relationship to students‘ academic performance. Moreover, a study conducted in Uganda by Ayebalea, Habaasab, and Tweheyob (2020) revealed that the teachers‘ attitude is strongly mentioned to influence student

achievement in mathematics. This is in line with Mji and Makgato's (2006) assertions that a learner draws from the teacher‘s disposition to form his attitude which may affect her learning outcomes.

In Ghana, Okyere (2013) undertook a study to find out whether teachers‘ attitudes influence students‘ performance, he posited that positive teacher attitude towards Mathematics was significantly related to high achievement in students. Also, studies that specifically focused on teachers‘ attitudes and students‘ achievement in mathematics found that teachers‘ attitudes contributed to students‘ academic performance and behaviour (Ndifor & Ngeche, 2017). Teachers‘ beliefs about Mathematics such as the usefulness of Mathematics, the way Mathematics should be learned, the difficulty or ease of Mathematics, as well as gender ability and beliefs also affect their attitude towards the subject and impact on students‘ performance (Mji and Makgato,2006).

2.5.3 Mathematics Self Concept

The phrase "mathematical self-concept" was coined by Ignacio, Nieto, and Barona (2006) to describe a person's set of thoughts, opinions, and beliefs about the field of mathematics as well as the process by which they have developed these ideas while learning in a classroom setting. Personal views have an impact on a person's interest in arithmetic, effectiveness when executing math activities, motivation and enjoyment in math, attribution of causes to academic success or failure, and self-concept as a member of a particular social group. Hannula (2007) noted that a learner's belief system determines whether they like or dislike mathematics.

These preconceptions influence how students approach mathematical problems, frequently leading them down counterproductive routes. It has been discovered that

students have a strong procedural and rule-oriented view of mathematics and believe that mathematical problems should be easily answered in a short amount of time with the sole focus being on providing the "correct solutions. According to them, a student's responsibility is to learn mathematics and be able to demonstrate it; a teacher's responsibility is to impart this information and make sure students have learned it (Borasi, 1990). Such ideas could impede the students from seeing that there are alternate approaches and strategies to many mathematical problems, as well as various definitions of concepts and even various structures due to various beginning points. They may approach the tasks in the mathematical class with a very narrow frame of mind that keeps them from developing personal methods and building confidence in dealing with mathematical ideas.

Crawford, Godden, Nicholas, and Prosser (1993) found that the majority of students perceived mathematics as ―numbers, rules and formulae" (p. 213). For some students' awareness of mathematics simply involves the recall of facts and the use of formal procedures. These views were associated with what he calls a ―surface approach" to learning mathematics, that is, ―the reproduction of knowledge and procedures" (p. 212). Research revealed that many students relate mathematics mainly with computations (Iddo & Ginsburg, 1994). Many students tend to identify mathematics with arithmetic. Doing mathematics is normally associated with calculations. It is widely maintained in the literature that negative images and myths of mathematics are widespread among students. Many students view mathematics as a difficult, cold, and abstract subject. It is perceived by many students as an exclusive discipline (Buhagiar, 2013).

From epistemological and pedagogical perspectives, it is perceived as a subject that involves a lot of work. The subject is seen as an obstacle, often dreaded, and as challenging work. Mathematics is also viewed as a static and objective discipline, available for discovery by mathematicians, in turn, to be transmitted by teachers and received by the students. There is also a claim that mathematics is only for the clever ones, or only for those who have inherited mathematical abilities (Kimball & Smith, 2013). Being mathematically knowledgeable is often treated as an indicator of general intelligence, as evidenced by the widespread use of mathematics in entrance tests. This view causes many people to believe that learning mathematics is a question of ability rather than effort and that there is an inherent natural ability for mathematics. This perception leads students to accept their lack of accomplishment in mathematics as a permanent state over which they have little control.

2.5.4 Parental Influence

Parental influence is one of the elements impacting attitudes toward mathematics (Mahamood et al., 2012). Direct or indirect parental influences are both possible. Parents' support, expectations, and attitude toward mathematics are examples of indirect parental impacts, whereas direct parental influences include parents helping their kids with arithmetic problems (Cai, Moyer & Wang, 1997). By providing the necessary educational materials in the home and adopting specific attitudes and values regarding their children's education, parents serve as role models and a mentor in encouraging their kids to achieve high educational objectives and ambitions. In this instance, parents' educational level is used as a proxy for the attitudes and values they hold, which in turn influence the learning and achievement of their children at home.

Numerous studies revealed a strong relationship between parental education and their children's performance. For example, students with parents with lower levels of education than a high school diploma received lower grades in mathematics than students with parents with higher levels of education (Campbell, Hombo & Mazzeo, 2000). According to research, parents' educational backgrounds have an impact on their children's attitudes toward learning as well as their aptitude in the subject of mathematics. In a study by Mahamood et al. (2012) on parental attitude and involvement in children's education, specifically parental aspiration among Form Four students in Selangor, Malaysia, it was found that parental involvement is a beneficial and potent source of influence toward the achievement of adolescents.

Numerous studies have also demonstrated that parents of higher socioeconomic status are more engaged in their children's education than are parents of lower socioeconomic status. This increased involvement leads to children developing positive attitudes toward school and learning as well as improving academic performance (Stevenson & Baker, 1987). The low socioeconomic position is thought to have a poor impact on academic achievement, in part because poverty restricts students' access to resources and materials for learning and fosters an unpleasant environment at home (Jeynes, 2002). For these reasons, a student's socioeconomic position is frequently considered when assessing academic performance.

2.6 Effects of student's perception on Their Mathematics Performance

Research on mathematics education has historically focused on the relationship between attitudes toward mathematics and mathematical achievement (Ma & Kishor, 1997). Neale (1969), for instance, characterizes the connection between the two as the result of a reciprocal influence, that is, how performance influences perception and

how perception affects performance. A survey conducted by Ifamuyiwa (2004) on the relationship between students' performance in secondary school mathematics and their perception of the subject was found. despite the disparate viewpoints from which researchers have conceived perception, there was general agreement that perception can influence or affect the achievement of goals and objectives and that a positive perception was more likely to foster achievement.

On the other hand, several studies claim that there is no statistically significant correlation between students' perceptions of their arithmetic achievement and their performance (Ng-Gan, 1987; Papanastasiou, 2002). A study from the last decade further reveals that there is no evidence of a causal connection between perception and performance (Maat & Zakaria, 2010). Also, a study conducted by Hagan, Amoaddai, Lawer, and Atteh (2020) to determine the effect of perception on students' Mathematics performance revealed that the strength of perception did not significantly affect the students‘ performance. It was found from the results that perception did not significantly predict students‘ academic performance in Mathematics ($\beta = -0.027$, $p < .650$). In summary, findings from the study indicated that perception did not significantly predict performance and therefore its inability to affect performance.

However, it is believed that a student's mindset has an impact on how well they perform mathematically in various disciplines. Researchers have discovered a direct correlation between students' attitudes toward mathematics and academic success (Odogwu & Benedicta, 2015; Pakau, 2008). The research on primary school students found a strong link between students' attitudes and academic achievement (Schenkel, 2009). It has been observed that students approach mathematics as a procedural and

rule-oriented subject. This is said to keep children from experiencing the depth of mathematics and the variety of methods that can be employed to become proficient in the subject (Odogwu & Benedicta, 2015; Pakau, 2008).

In Kenya, a study was conducted by Wasike, Ndurumo & Kisilu (2013) to determine the impact of the perception of female students on the performance of Mathematics within secondary schools in Teso District. The main objectives were to establish the effect of the perception of female students on performance in mathematics in secondary schools and to establish the effect of type of school on the perception of female students on the performance in mathematics. The study sample involved a selection of 240 females selected by stratified random sampling method from secondary schools within Teso District to complete an inventory of Mathematics perception. Analysis of data from the questionnaire responses revealed a significant ($P < 0.05$) effect perception of performance in Mathematics among the students. Female students had a negative perception of Mathematics.

Most of the female students with negative perceptions performed poorly in Mathematics. Female students in boarding schools were established to have more positive perceptions of Mathematics and therefore performed better in the subject than students from co-educational schools. This indicates that the performance of Mathematics can be improved by enhancing positive perception towards Mathematics.

In South Africa, Mutodi and Ngirandi (2014) investigated the influence of students' perceptions on mathematics performance at a selected South African secondary school. The influence of factors such as strengths and weaknesses in mathematics, teacher support/learning material, family background and support, interest in

mathematics, difficulties or challenges in doing mathematics, self-confidence, and myths and beliefs about mathematics were identified as constructs of perceptions that influence students‘ performance. The respondents tend to view a lack of proficiency in mathematics as a challenge and attribute success in mathematics to effort and perseverance. Students also perceive difficulty in mathematics as an obstacle, and attribute failure to their lack of inherited mathematical ability.

These findings suggest that differences in myths and beliefs about mathematics success, motivation given by mathematics teachers and parents, mathematics teachers' teaching styles and learning materials as well as self-confidence in mathematics may lead to differences in perceptions about mathematics. These in turn may lead to differences in attitudes towards mathematics and learning mathematics which have a bearing on performance.

Moreover, Bayaga and Wadesango (2014) also investigated South African students' attitudes about mathematical performance based on several structural characteristics, including mathematical self-determination, parental education, home background, education, school climate, and attitudes. The goal of the study was to figure out which of these elements had an impact on student performance in mathematics teaching and learning. The data acquired after interviewing 321 randomly selected respondents revealed that the parameters used in the study had an impact on the acquisition of mathematics among South African schoolchildren to some extent. The fact that this study discovered a full assessment of many aspects that contribute to student success at the personal, school, and structural levels is a major strength. However, the research did not explore the factors that influence the perception of students on mathematics.

Ramirez (2005) found that Chilean students enjoy mathematics but overestimate their mathematical abilities. The study discovered that average performance was much lower in classrooms where students enjoyed the subject. This, according to Ramirez (2005), is due to the rigorous mathematics curriculum and the highest assessment values used in the best-performing classes. This study, like others, did not investigate the elements that influence the formation of mathematical perceptions, nor did it analyze the impact of demographic characteristics on students' mathematics ability.

Tanveer, Rizwan, Ali, Arif, Saleem, and Rizvi (2014) investigated the role of attitudes toward the study of Mathematics among some students at Islamia University of Bahawalpur, and their findings revealed that students who received good grades in Mathematics had a positive attitude and liking for the subject. Furthermore, the study found that the higher a student's grade in Mathematics, the more positive their attitude toward the subject becomes. As a result, teachers must recognize the importance of ensuring that students become more interested in the subject by devising the best methods of teaching it to help them achieve good grades and develop a positive attitude toward it.

A study with secondary school students also showed that those with better academic performance exhibited more positive attitudes towards mathematics than those with low performance (Mato and De La Torre, 2010). Georgiou, Stavrinides, and Kalavana (2007) showed that high achievement could serve to predict a positive attitude toward mathematics, but such an attitude could not predict stronger achievement. However, these authors emphasize the role of teachers and schools in changing attitudes stating that mathematics achievement could be improved by, for example, better teaching

methods, more motivated teachers, or better course books, which were hoped would lead to the improvement of attitudes towards math.

Cheung (1998), in his study of 11–13-year-olds, also discovered a positive correlation between attitude and Mathematics achievement. The correlation showed that the more positive the attitude, the higher the level of achievement in the student (Maria de Lourdes Mata et al, 2012). Some researchers have, however, demonstrated that the correlation between attitude toward Mathematics and achievement in Mathematics was rather weak and could not be of practical significance. In a meta-analysis of 113 primary studies involving elementary and secondary school children, Ma and Kishor (1997), found that attitude towards Mathematics and achievement in Mathematics was positively and reliably correlated but not strong. The correlation was not statistically significant" (Maria de Lourdes Mata et al, 2012).

In Ghana, studies have revealed a link between students' attitudes and perceptions and their mathematics performance. Arthur, Asiedu-Addo, and Assuah (2017) investigated students' perspectives on mathematics and how this influences their interest in the subject. The study analyzed responses from a total of 1,263 students from ten high schools in Ghana's Ashanti region, finding that more than half of the respondents agreed that negative perceptions of mathematics at the basic level of education have a significant impact on students' interest as they progress to higher levels of education.

Addae and Agyei (2018) also explored 210 high school students' attitudes toward the study of mathematics and their perceptions of their teachers' teaching practices. The sample was made up of 102 males and 108 females who were randomly selected from four high schools in the Cape Coast Metropolis of the Central Region of Ghana.

The findings showed high perceived attitudes reported in the students‘ interest in doing mathematics, the usefulness of mathematics, and confidence in doing mathematics; it was unclear whether students perceived mathematics as a male-dominated subject or not. With regards to teachers‘ teaching practices, all three (3) subscales: the use of student-centred approach, classroom management skills, and communication skills studied, were reported to be important in influencing students' learning of mathematics. However, communication skills adopted by teachers in teaching the subject were perceived as the strongest predictor of high school students‘ attitudes followed by teachers‘ classroom management skills. The study concludes that to ensure positive attitudes of students towards the study of mathematics, effective communication and classroom management skills should be integral in mathematics teachers‘ instructional practices; they should be important goals of any mathematics teacher preparation programs.

Ataa (2021) investigated senior high school students' perceptions of mathematics and how these beliefs influenced their arithmetic performance. Three hundred students (300) from three senior high schools participated in the study. Two senior high school chools in the Eastern region and one senior high school in the Greater Accra region were used to create the sample population. Students' perceptions of their self-confidence, interest in mathematics, motivation obtained from their teachers, teacher competence, the difficulty of the subject, myths, and beliefs, and the usefulness of the subject all exist, according to the findings. Three of these constructs, namely students' enthusiasm for learning mathematics, the utility of mathematics, and the difficulty of learning mathematics, were found to be significantly connected to students' performance. It is suggested that mathematics teachers show their students the importance of mathematics to pique their interest in the subject. This will assist

students in overcoming their negative opinions about mathematics study. In addition, senior high schoolschoolschool mathematics teachers must design some innovative and simple strategies to make mathematics more appealing and engaging to their students.

This current study seeks to add to the repository of literature on this subject by identifying specifically the various perceptions that Senior high schools Students have concerning mathematics, how these perceptions were formed, and how they influence their academic performance.

2.7 Chapter Summary

This chapter reviewed the relevant studies already conducted regarding the teaching and learning of Mathematics, not just in Ghana but in other parts of the world. The chapter presented an overview of teaching and learning of the mathematics subject. It discussed the perception of students towards the teaching, learning, and application of mathematics. The numerous factors accounting for these perceptions were also discussed, with theories that help to better explain the phenomenon studied. Finally, the chapter further reviewed the myriad studies undertaken concerning the teaching and learning of Mathematics and the performance of students in the subject.

CHAPTER THREE

RESEARCH METHOD

3.0 Overview

This chapter details the research paradigm, design, setting, population, sampling technique, sample instrument, data collection instrument, data analysis procedure, and data analysis.

3.1 Research Paradigm

A collection of logically related assumptions, concepts, or propositions that guide thinking and research, or the philosophical intent or motivation for a study (Bogdan & Biklen 1998; Mac-Naughton, Rolfe, and Siraj-Blatchford (2001) define a paradigm as a belief in knowledge's nature, methodology, and validity criteria, often referred to as 'knowledge claims' (Creswell, 2003); epistemology or ontology; or even research methodologies (Neuman, 2000) rather than referring to paradigms. The literature explores various theoretical paradigms including positivist, constructivist, interpretivist, transformative, emancipatory, critical, pragmatism, and deconstructivism.

The study adopted the positivistic paradigm, based on Aristotle, Bacon, Locke, Comte, and Kant's rationalistic, empiricist philosophy, recognizing the social world as a concrete, unchangeable reality (Mertens, 2005) and ~~re~~flects a deterministic philosophy in which causes probably determine effects or outcomes" (Creswell, 2003). Positivism suggests that the social world can be studied like the natural world, using a value-free method and providing causal explanations (Mertens, 2005). Positivists use observation and measurement to test theories or describe experiences, aiming to predict and control the forces that surround us (O'Leary, 2004).

O'Leary (2004) defines post-positivism as a constructivist paradigm, recognizing the world's ambiguity and variability. It is intuitive, holistic, inductive, and exploratory, with qualitative findings. Post-positivism's definition contradicts Mertens' (2005) definition, which emphasizes validity through rigorous clarification, pilot experiments, expert validation, and statistical tests. The researcher adopted a quantitative study approach, which can be further sub-classified into inferential, experimental, and simulation research methods (Corbetta, 2003; Marcon & Gopal, 2005; Kroeze, 2012).

3.2 Quantitative Approach

The study utilized a quantitative approach, a strategy that emphasizes quantification in data collection and analysis, as defined by Bryman (2012), which refers to the amount of something being analysed in various educational disciplines like sociology, psychology, and history. The research method emphasizes measuring variables in the social world, starting with how many, how much, and to what extent. Payne and Payne (2004) argued that quantitative methods, typically based on deductive logic, aim to identify patterns in human behaviour through the representation of empirical variables. Quantitative research explores associations through statistical techniques and systematic measurement, focusing on quantifiable aspects of social behaviour rather than interpreting people's actions based on their meanings.

Quantitative research is based on positivism, which emphasizes the separation of person and reality, the objective reality beyond the human mind, and the use of statistics and content analysis for research methods. It also emphasizes the validity, reliability, and inherent qualities of research objects. Bryman (2012) identifies positivism as nomothetic research, generating law-like actions through empirical

testing. Richardson (2012) contrasts this with interpretivism, which is ideographic research, studying individual cases or events, and obtaining knowledge from the meaning of events (Richardson, 2012).

The larger, randomly selected sample and less time-consuming data analysis using statistical software like SPSS allow for generalizable findings to a whole population or sub-population, as noted by Powers D. and Powers A. (2015).

The study relies on a test-taking population for validity, and quantitative research is conducted using a positivist paradigm to measure variables (Kauber, 1986). Language ability assessment research conducted by Carroll and Bailey (2016) The study reveals variations in variables, including EFL and non-EFL students, and tests in four sub-domains: speaking, writing, reading, and listening, as observed in a second language fluency study (Kormos and Johnson, 2016).

Quantitative research, while strong, has limitations. The positivism paradigm overlooks common social phenomenon meanings and deeper underlying explanations. Bouwer et al.'s (2015) study examined the effect of genre on writing scores, considering various variances such as person, genre, task, raters, and random error. The study lacks an explanation for effect reasons and meanings, and quantitative research's limitation is that positivism cannot account for social reality shaping and interpretation (Blaikie, 2007). Quantitative language testing research focuses on estimating language skills, proficiency, and scoring through studies.

A study undertaken by Katzenberger and Meilijson (2014) on the study assessed Hebrew language proficiency in preschool children, identifying language-impaired and developing children, but did not investigate why some children develop language

learning and others are impaired. The study overlooked children's understanding of Hebrew language learning capacity and the quantitative research approach's tendency to take a snapshot of a phenomenon, focusing on a specific moment (Schofield, 2007).

Quantitative research methods are widely used in language testing and assessment, despite potential drawbacks. This approach, traditionally based on psychometric procedures, is primarily focused on test score validity (Purpura, 2011). Spolsky's psychometric-structural phase of language testing emphasizes test reliability and establishes the concept of language testing as a measurement (Morrow, 2012; Creswell, 2013). So, from this concept, the researcher adopts the quantitative approach as it best suits the study than the qualitative approach.

3.3 Descriptive Research

A descriptive search can be interpreted as a situation where the researcher does not currently manage variables. Describes a general method for identifying characteristics and behaviours in a sample population. An essential feature is the use of multiple variables. The main objective of conceptual research is to illustrate and confirm the results. Description studies are intricately linked to observation studies and include methods for collecting attentional data. Studies and research can be identified as data collection methods and technical analysis (Bhagat & Chang, 2015; Browning et al., 2014; de Waard et al., 2015; Knowles, 1975).

3.4 Correlational research

Correlational research examines the degree to which two or more variables are associated or related (Creswell, 2005). It is considered nonexperimental because it involves neither (a) the random assignment of participants to a group nor (b) the active introduction or manipulation of an intervention by a researcher, the central

tenets of group experimental research (L. Cook et al., (2008). Variables can be related in terms of direction and strength. Direction can be either or negative. Strength is the consistency with which the variables correspond with one another.

Correlational research can also be used to examine differences between groups on variables of interest. B. G. Cook, Cameron, and Tankersley (2007) used correlational research to examine the attitudes of general educators toward students in their inclusive elementary classrooms. Correlational research that compares groups uses a variety of data analysis techniques (*t*-tests, analyses of variance) that are also used in group experimental research to examine differences between those who did (experimental group) and did not (control group) receive an intervention introduced by researchers.

However, despite using some of the same data analysis techniques, group experimental and correlational research differs in important ways. Specifically, group experimental research studies involve researchers examining the impact of an intervention that they introduce to a group of randomly assigned participants (the experimental group) in comparison with a randomly assigned control group (L. Cook et al., 2008). Correlational researchers who investigate group differences, on the other hand, do not introduce an intervention and, rather than randomly assigning participants to groups, compare predetermined or intact groups.

Correlational research is not designed to establish evidence-based practices, because correlation does not imply causality. That is, just because two variables are related does not necessarily mean that one caused the other. Correlational research seeks to identify relationships that exist among variables and describe their direction (positive or negative) and their strength without introducing an intervention to change an

outcome variable. Because there is no active introduction of an intervention, findings from correlational research indicating that variables A and B are related strength cannot definitively determine whether A caused B, B caused A, or a third variable caused both A and B. Accordingly, even though correlational research might show that the use of instructional practice is related to high levels of student outcomes, one cannot infer that it caused those outcomes, which generally is considered necessary for establishing an evidence-based practice (B. G. Cook, Tankersley, Cook, & Landrum, 2008).

Nonetheless, correlational research provides important information for special educators in at least three ways; establishing important relations, guiding future experimental study, and identifying nearly causal relationships. First, knowing how variables relate is often important, even if causality is not demonstrated.

3.5 The Setting of the Study

The study was conducted in Birim Central Municipality, one of the Eastern Region's thirty-three districts. Established in 1988, it was initially the first Birim South District and later split into a new Birim South District with Akim Swedru as its capital town. Birim Central Municipal District was renamed on 29 February 2008, with Akim Oda as the capital. On March 15, 2018, the southeast part of the district was renamed the Asene-Manso-Akroso District, leaving the remaining areas with three senior high schools.

3.6 Population of the Study

Researchers gather data from participants in the research population, who possess specific characteristics of interest. These findings are attributed to the population, either by linking them to specific or all participants. Research study population is

crucial for evidence, and credibility is essential due to the efforts of researchers, donors, and stakeholders. Data integrity also influences the credibility of findings. The population's understanding, definition, and choice of data can significantly influence research credibility as the primary source of data (Banerjee & Chaudhury, 2010).

Many researchers (Banerjee & Chaudhury, 2010; Lunsford & Lunsford, 1995) Many studies, including peer-reviewed journal articles, exhibit sampling bias due to researchers' misunderstanding of general, target, and accessible population concepts. Researchers must understand their study population and clearly define it during research documentation. This is crucial for assessing sample credibility, sampling techniques, and research outcomes, as it guides others in evaluating the sample.

The researcher bears the responsibility of understanding the research population and objectively documenting it. Banerjee and Chaudhury (2010) and Pernecky (2016) are researchers who have expressed concern about the significant flaws in the literature related to population specification. The study targets second-year students in Birim Central Municipality, Eastern Region of Ghana, who are purposively chosen and randomly selected from the population of publicly assisted Senior high school students and mathematics teachers. Below is the target population distribution for the study.

Table 3. 1: Target Population of the study

School	Number of students		Number of Teachers
	Boys	**Girls**	
Oda SHS	433	324	98
St. Francis SHTS	413	351	75
Attafuah SHTS	367	337	96
Total	**1213**	**1012**	**269**

Source: Annual School Census Report 2021

From Table 3.1, The municipality has three government-assisted co-educational institutions, offering General Science, Home Economics, Arts, Business, Visual Arts, and Agricultural Science courses, with St. Francis and Attafuah SHTS offering technical courses. Oda SHS has a student population of seven hundred and fifty-seven (757) students comprising four hundred and thirty-three (433) boys and three hundred and twenty-four (324) girls with a teaching staff strength of ninety-eight (98). St. Francis SHTS has a total of seven hundred and sixty-four (764) with 75 teachers. The student population is made up of four hundred and thirteen (413) boys and three hundred and fifty-one (351) girls. Attafuah SHTS has a student population of seven hundred and four (704) with 96 teachers. Of these students‘ population, there are three hundred and sixty-seven (367) boys and three hundred and thirty-seven (337) girls.

3.7 Sampling Technique and Sample

Sampling is a research technique that involves selecting a subset of representative items or individuals from a pre-defined population to serve as subjects for observation or experimentation. Researchers often use sampling as it is representative of the population, cost-effective, convenient, and time-efficient, as it avoids testing every individual in the population (Elfil and Negida, 2017; Shorten and Moorley, 2014).

Researchers should aim to assess all individuals for reliable, valid, and accurate results. Sampling is the process of selecting a representative sample of a population to analyze its characteristics. Sampling is the process of randomly selecting a sample from a population using specialized procedures. The study's sampling design is based on the researcher's judgment of who will provide the best information for the objectives, focusing on those with the same opinion to gather the required information (Curtin et al., 2005; Fowler, 2009).

3.7.1 Purposive Sampling

Purposive sampling is a method used by researchers to trace a process by interviewing a pre-defined set of elites selected based on specific criteria (Tansey, 2007). Purposive sampling allows researchers to create a list of elites to interview before starting their research, making it easy to find respondents' names and professional contact details (Mikecz, 2012).

Researchers using snowball sampling often rely on mediators for sample and access, while purposive sampling requires them to contact and convince interviewees to meet and discuss with them. Purposive sampling, a method involving specific interviews, has a high potential cost for research findings. The target population, second-year students from three senior high schools in the district, was purposively sampled, despite its ease of access.

3.7.2 Random Sampling

Simple random sampling is a commonly used method in quantitative studies, particularly in homogeneous and uniformly selected populations, where all individuals have equal opportunities to participate, based solely on luck. Simple random sampling ensures unbiased, representative, and equal probability of the population, but requires careful definition of the population from which the sample is drawn.

Cohen et al. (2018) emphasize the need for a population inclusion and exclusion framework, stating that generalizing to all males and females in a school is hindered by excluding males from the sample. Simple random sampling is a widely used method in scientific research, used for highly homogenous populations where members are randomly selected to participate (Bhardwaj, 2019). Simple random

sampling is a popular technique for choosing a sample in which each unit has an equal chance of being chosen at each draw (Singh, 2003).

According to Acharya (2013), Simple random sampling ensures that every individual in a population has an equal chance of being selected as a response (Thomas, 2020). Seventy (70) students were randomly sampled from second years in each of the chosen schools.

3.8 Ethical Considerations

Ethical issues are paramount important matters not only in primary research, but Ethical issues are crucial in primary research and secondary data sets, ensuring fair and unbiased selection of sources and analysis. Ethical issues arise when using secondary data sets, as they require a fair and unbiased selection of sources and analysis. Hack emphasizes the importance of considering the impact of actions on others, as it can be damaging to oneself (Farrimond, 2013; Hack (1997 in Blaxter, Hughes, & Tight, 2001).

Ethical considerations involve issues like participant informed consent, research context, research conduct, and results confidentiality. Participants' anonymity is crucial, along with maintaining participant anonymity and maintaining confidentiality of results (Black, 1999). Email confidentiality is uncertain due to easily forwarded and copied material, and hackers can access customer databases of public or private organizations (Blaxter, Hughes, & Tight, 2001).

The International Language Testing Association: ILTA (2016) also Confidentiality is crucial, especially for students competing for admissions and appointments, but it may not be possible to maintain it in every aspect. The ILTA emphasizes the

importance of maintaining a balance between maintaining confidentiality as a fundamental duty of language testers and their societal responsibility, ensuring test takers' privacy and confidentiality. Hammersley and Traianou (2012) The five principles emphasized are minimizing harm, respecting autonomy, protecting privacy, offering reciprocity, and treating people equitably.

Loizos (2000) The ethics committee in medical research must balance patient and public interests, addressing surveillance without consent as a privacy invasion, and overlooking some principles that may be beneficial. Dane (1990) mentioned Humphreys's tearoom trade project should avoid disclosing research nature to participants to prevent potential psychological harm. Besides, Jones's (2011) argument suggests that ensuring confidentiality can be challenging, as it can be challenging to maintain anonymity for a research subject.

Ethical dilemmas emphasize that there are no universally accepted rules for determining the ethicality of a specific research practice or method. (Crano, Brewer, & Lac, 2015). Different cultures have varying concepts of morality and ethics, and morality cannot be complete or absolute, and ethical principles may not be commonly used in all societies (Karavas, 2013).

3.9 Instruments for Collecting Data

The researcher utilized achievement tests and questionnaires for data collection, allowing in-depth knowledge about SHS mathematics teaching and learning, and promoting convergent lines of inquiry and trustworthiness. The table below shows the purpose of this study linked to the data sources.

Table 3. 2: Purpose of the study linked to the data source

Purpose of the study	Data Source(s)
1. The various perceptions of students on mathematics in Senior high Schools	Questionnaire
2. The factors which influence students‘ perception of mathematics teaching and learning.	Questionnaire
3. The effects of student‘s perception on their Mathematics performance	Achievement Test

In Table 3.2 the study's key areas were identified through data sources like questionnaires and achievement tests, which were used to understand students' perceptions of mathematics teaching and learning.

3.9.1 Achievement Test

The researcher used the achievement test. This study utilized the end-of-semester examinations as achievement tests in schools, which are widely used in educational research and the school system to measure mastery and proficiency in various knowledge areas. Tests are instruments used to measure a student's ability, providing critical evaluation through a series of questions, problems, or physical responses to determine knowledge, intelligence, or ability.

3.9.2 Questionnaire

A questionnaire was used to collect primary data from the respondents. According to Stefan (2013), A questionnaire is a tool for gathering and recording information about a specific issue, consisting of a list of questions, clear instructions, and space for answers or administrative details. Harris and Brown (2010) that a questionnaire is a crucial research tool for obtaining direct participant responses on understandings,

beliefs, and attitudes. Its large sample sizes allow for a wide range of responses, making it a more objective and generalizable research tool.

Students were surveyed using questionnaires, structured to collect demographic information and answer a four-point, self-report Likert scale questionnaire. Students' perceptions of mathematics encompass their attitudes, classroom environment, beliefs about the subject, and their perception of teachers' attitudes toward teaching and learning mathematics. Pre-testing was conducted to verify the validity and reliability of the collected data, ensuring the questions were acceptable, answerable, and well-understood, thereby preparing the instruments for the study.

3.9.3 Type of data

Data is facts or figures that can be used to conclude, and it requires a process of gathering and sorting to present and interpret information. Data can be seen as the raw material for information production (Ajayi, 2016). Data is the representation or coded form of existing information or knowledge, collected and analyzed for better usage or processing, resulting in information suitable for decision-making. Data collection is crucial for statistical analysis and can be obtained from primary sources or secondary sources, such as scientific journals, where the researcher is the first to obtain the data. Research employs various methods to collect information, which can be categorized into primary and secondary data (Douglas,2015).

Primary data is collected by a researcher for the first time, while secondary data is already collected or produced by others. Primary data is factual and original, while secondary data is analysed and interpreted. Primary data aims to solve problems, while secondary data is collected for other purposes. Primary data is the data originated by the researcher, while secondary data is pre-existing data collected by

investigator agencies and organizations. Primary data is real-time, while secondary data pertains to the past (Mesly,2015).

Primary data is collected to address the problem at hand, while secondary data is collected for other purposes. Primary data sources include surveys, observations, experiments, questionnaires, and personal interviews, while secondary data is quicker and easier. The study utilized primary data sources collected through questionnaires and tests to analyse and solve the research problem.

3.10 Validity

Validity is the degree to which research accurately measures its intended purpose or the truthfulness of its results (Joppe, 2000). Validity is the extent to which the test measures what it is intended to measure (Brown, 2000). Validity refers to the extent to which assessment results are meaningful and useful, and the instrument accurately measures what it should. This means that the use of a valid instrument is essential to determine the validity of data.

The study conducted a pilot test using 50 respondents to enhance the validity of a questionnaire, providing a warning about the success of the main study at Achiase SHS, a sister school in the Achiase District. Research scholars generally agree that conducting a pre-test of a research instrument is a crucial method for enhancing the validity of results (Malhotra, Kim & Patil, 2006).

Most research academics concur that pre-testing a research instrument is an essential technique for boosting the reliability of outcomes. The validity of the questionnaire was also improved by the research supervisor through validation.

3.11 Reliability

According to Apaw (2009), Reliability refers to the extent to which research findings can be replicated. Golafshani (2003) Reliability refers to the consistency of results over time, accurately representing the total population under study, and if the results can be reproduced under a similar methodology, the research instrument is reliable. If a subsequent researcher replicates the same procedure as an earlier one, they should arrive at similar findings and conclusions. Apaw (2009) The author argued that data reliability in educational studies should be based on consistency with collected data rather than merely the likelihood of recurrence of findings.

Table 3. 3: Reliability of the study

Reliability Statistics	
Cronbach's Alpha	N of Items
.909	62

Table 3.3 shows a strong reliability of 90% from the sixty-two (62) items for the study.

3.12 Data Analysis

The data was analysed using the Statistical Package for Social Sciences (SPSS, version 21.0). The questionnaire and achievement test were analysed using descriptive methods to determine the impact of student's perception on the teaching and learning of mathematics, addressing research question one.

The research question aims to analyse the correlation between senior high school students' perceptions and academic performance.

3.13 Summary

The study investigates students' perceptions of mathematics teaching and learning in senior high schools in Ghana, focusing on factors influencing their perception, their impact on their performance, and contextual factors underpinning innovative teaching methods. The study, conducted in Birim Central Municipality, used explanatory sequential mixed method design, purposive sampling for three schools and teacher participants, and simple random sampling for student participants. The study administered questionnaires and achievement tests for data collection, which were analysed using descriptive statistics like percentages, mean, and standard deviation.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.0 Overview

This chapter explores an in-depth analysis of the data collected and a discussion of the findings supported by the authors. The discussion is based on the study objectives and supported by the recommended reviews. Below are the objectives of the study.

i learner characteristics, teacher pedagogy, peer influence, and the learning environment impact senior high school students' perception of mathematics.

ii the impact of students' perception of Mathematics affects academic performance.

Table 4. 1: Multiple Linear Regression Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics	
					R Square Change	F Change
1	.769[a]	.591	.583	3.09891	.591	74.013

The R^2 value in Table 4.1 indicates that the independent variables (learner characteristics, teacher pedagogy, peer influence, and the learning environment) explained about 76.9% of the variation in the dependent variables (Students' Perception of Mathematics). It furthers the excellent power of the regression model.

Table 4. 2: Anova table for multiple linear regression of …….

ANOVA[a]						
	Model	Sum of Squares	df	Mean Square	F	**Sig.**
1	Regression	2843.036	4	710.759	74.013	**.000[b]**
	Residual	1968.659	205	9.603		
	Total	**4811.695**	**209**			

Dependent Variable: Students' Perception of Mathematics

Predictors: (Constant), learner characteristics, teacher pedagogy, peer influence, and the learning environment

Table 4.2 displays the ANOVA used to explore the null hypothesis of the assumption. The sig-value proves unequivocally that the model is significant at 5%, with a p-value of 0.000<0.05.

Table 4. 3: Multiple regression of the Dependent and Independent variables.

Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	Std. Error	Beta		
1	(Constant)	.173	1.276		.136	.892
	Learner characteristics	.096	.026	.187	3.671	.000
	Teacher pedagogy	.103	.024	.267	4.340	.000
	Learning environment	.488	.056	.508	8.649	.000
	Peer influence	.039	.035	.060	1.109	.269

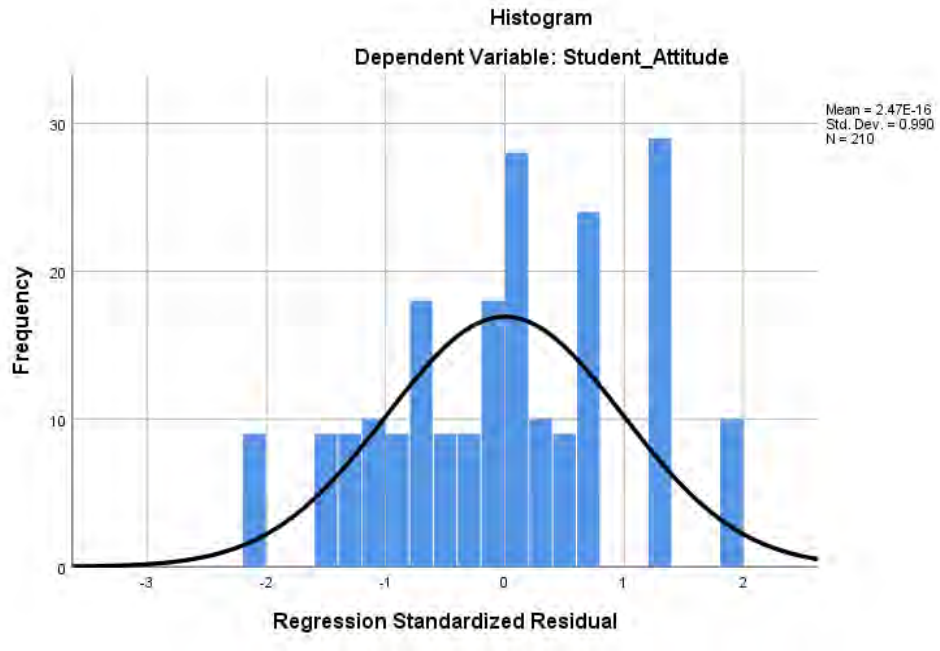

Figure 4. 1: Regression standardised residual of the dependent variable

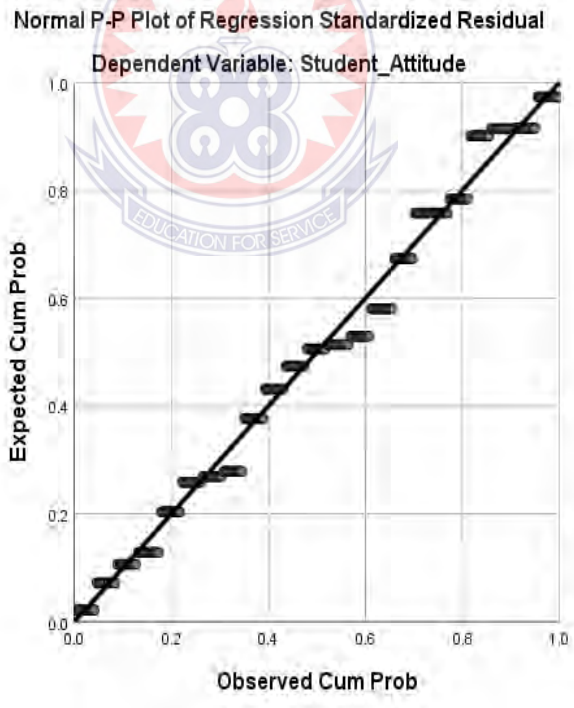

Figure 4. 2: Regression Standardised Residual Plot of the Dependent variable.

Exert from Figure 4.2 shows the cluster observations of the variables around the regression line towards mean = 0

4.1 Objective 1a: Impact of Learner characteristics on student perceptions of Mathematics.

The learner characteristics comprised the learner's socio-economic background, student readiness, and parental support. According to the regression of the learner characteristics as against student perception of mathematics from Table 4.3, the p-value was positively significant, with 0.000 at 0.05 significant value.

4.1.1 Discussion of findings in objectives 1a

The learner characteristics significantly impact the student's perception abilities. According to Kenya (2002), people living below the poverty line have a significant academic impact. This means that family structure, the educational qualification of the guardian or parents, and the support they can give significantly impact their perception of learning. A positive change in socioeconomic responsibilities will increase the positive perception students have in mathematics by approximately 9.6% (Dickson, 2019).

This proves the strong connection between socioeconomic factors on the students' perception of mathematics learning. Change, whether positive or negative, has a greater impact on students' self-learning intelligence.

4.2 Objectives 1b: Impact of Teacher pedagogy on student perceptions of Mathematics.

Teachers‘ pedagogy had a significant impact on students' self-directed learning. Improvement in the teaching pedagogy positively impacts students' self-directed learning at a sig-value of 0.000, and the lower or poorer the pedagogy, the less self-directed the students get involved.

4.2.2 Discussion of Findings in Objectives 1b

Pedagogy influences the development of learning outcomes positively. However, students who learn through a teacher-centered approach achieve higher learning goals and objectives than students who learn through the application process (Emerald, 2017).

In a study by (Ogbeide et al., 2013), Students use open education and believe that open education has better educational value than traditional teaching programs. Most opt for open learning when asked if students use open learning or traditional classes.

4.3 Objective 1c: Impact of Peer influence on student perceptions of Mathematics.

Student influence had no significant impact on students' perception of mathematics. With a sig-value of 0.269 showing no impact of the independent on the dependent variable.

4.3.1 Discussion of Findings in Objectives 1b

This is of the view that the student is the architect of his own and as such there is less impact of their peers on their perception of the learning of Mathematics.

4.4 Objective 1d: Impact of the learning Environment's impact on senior high school students' perception of mathematics

The learning environment of the student shows how conducive it is having a strong impact on how the students perceive mathematics with a sig.-value of 0.000 at 0.05.

4.4.1 Discussion of Findings in Objectives 1b

The learning environment has a strong impact yielding 48.8% of positive or negative perceptions of students in mathematics. This proves the

4.5 Objective Two: The impact of students' perception of Mathematics affects academic performance.

Table 4. 4: The impact of students' perception of Mathematics affects academic performance

		Student Perception	Academic Performance
Self-directed learning	Pearson Correlation	1	1.000**
	Sig. (2-tailed)		.000
	N	210	210
Academic Performance	Pearson Correlation	1.000**	1
	Sig. (2-tailed)	.000	
	N	210	210

**. Correlation is significant at the 0.01 level (2-tailed).

The Pearson product-moment correlation was found significant with a p-value of 0.000>0.05 level of significance. This implies that the student's perception of mathematics strongly correlates to students' self-directed learning of mathematics and vice versa. Table 4.4 above explains the significance and correlation of the two variables.

4.5.1 Discussion of Findings in Objectives 1b

Although students' academic performance and student perception of mathematics were statistically significant in learning mathematics, except for first-year undergraduate studies, which was insignificant (Ejubović & Puška, 2019; Rashid & Asghar, 2016). This proves that the students ought to develop a positive perception

towards the learning of mathematics which also impacts the performance in mathematics. According to Agustiani et al. (2016), the significant value for academic performance and student perception was significant at a p-value of 0.000 at a 0.05 level. This further adds learner characteristics, teacher pedagogy, peer influence, and the learning environment significantly impact students‘ perception which thus affects the students‘ performance.

4.6 Summary

This chapter focused on the research findings and discussions supported by previous literature. The impact of various variables on the students‘ perception of mathematics where analysed and discussed. Based on the evidence shared the researcher was able to draw various conclusions which were discussed in the next chapter of the study.

CHAPTER FIVE

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

5.0 Overview

This chapter presents the summary of the research findings, conclusion as well as recommendations and suggestions for further research works.

5.1 Summary of the Findings

The purpose of the study was to assess the significant impact of senior high school students' perception of mathematics and its influence on their academic performance in the Birim Central Municipality Senior high schools in the Eastern. the factors which influence students‘ perception of Mathematics teaching and learning, the effects of student‘s perception on their Mathematics performance, and the correlation between students‘ perception and academic performance in mathematics.

The following research questions guided the study:

i learner characteristics, teacher pedagogy, and the learning environment impact senior high school tudents‘ perception of mathematics.

ii the impact of students‘ perception of Mathematics affects academic performance.

The summary of the study is enclosed below.

5.1.1 Impact of Learner characteristics on student perceptions of Mathematics.

The learner characteristics variable in the study comprises the socioeconomic background of the student, the support, and readiness to study mathematics. The study thus showed a strong relationship between the learner characteristics and the

independent variable, students‘ perception. This proves that a percentage change in the learner characteristics has a 9.6 percent impact on their perception of mathematics.

5.1.2 Impact of Teacher pedagogy on student perceptions of Mathematics.

Teacher pedagogy comprising the teaching and learning methods and content knowledge of the subject proved a strong significance to the perception of the study. With the adoption of constructivism, the student‘s involvement in the learning process plays a significant role in their perception of the study. The impact of teacher pedagogy affects positively the perception of students by 10.3 percent.

5.1.3 Impact of Peer influence on student perceptions of mathematics.

Peer influence has no significant impact on the perception of students learning of mathematics. The sig.-value of 0.269 showing insignificance at 0.005. Students‘ peer influence has no relation as the student is the sole architect of their learning and thus pertains to the students in the district. Thus, the study concluded peer influence has no impact on students‘ perception of mathematics.

5.1.4 Impact of the Learning Environment's impact on Senior high School Students’ Perception of Mathematics

The serenity of the learning environment had the strong significance of which a point in the right direction could cause a 48.8% increase in a positive perception of students in the study of mathematics. This proves that the teacher must create cordiality in the room to enable students to question the learning to aid in understanding. It is therefore imperative that the classroom environment is in line with the first and second sections of objective one.

5.1.5 The impact of students' perception of Mathematics and on their academic performance.

The second objective of the study is to inquire about the correlation between students' perception of mathematics and the performance of students in mathematics. It is with no doubt the strong correlation found. There is a high significance or correlation between students' perception and academic performance.

5.2 Conclusion

According to the data presented and argued the students' perception must have a great significance to the students' academic performance in mathematics. The students' socioeconomic background, teacher pedagogy, and mastery of the subject matter all play significant roles in the students' perception of mathematics. A positive or negative perception will yield a low or high performance of students in mathematics.

5.3 Recommendation for Practice

Exerts from the present study offer several recommendations to all and sundry some of which are detailed below.

- first, it is for the mathematics teachers in the various schools to facilitate lessons but not treat students as tabular rasa through motivation and the use of appropriate methodologies to teach the students. Challenging students to be proactive in fostering a safe, fear-free learning environment teaching-learning process.
- school authorities and parents have the responsibility of helping students overcome negative perceptions about mathematics from the early stages of their educational lives. As indicated in this study, most students revealed that

they formed negative perceptions towards the subject from experiences at the early stages of their lives.

- Teachers must ensure students do not become over-complacent in their learning of the subject so that their passion for the study of the subject truly leads to higher achievements in mathematics.

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APPENDIX A

UNIVERSITY OF EDUCATION WINNEBA

DEPARTMENT OF MATHEMATICS AND ICT EDUCATION

CONFIDENTIALITY STATEMENT

Dear respondent, I am **STEPHEN ANSONG FREMPONG (200027366)**, an MPhil student at the University of Education, Winneba researching the **SENIOR HIGH SCHOOL STUDENTS' PERCEPTIONS TOWARDS MATHEMATICS AND ITS EFFECT ON ACADEMIC PERFORMANCE**

I would appreciate your responses in this regard to attain accurate conclusions. This is strictly for academic research purposes, and you are assured confidentiality.

The questionnaire is sectioned into two main categories for which you are to answer all. The first part deals with student demography. Please tick where applicable to you from the five-point Likert scale from 1-4 where 1-Strongly Agree, 2-Agree, 3-Disagree, and 4-Strongly Disagree

Your response to these statements is keen to inform district and school policies to enhance performance. Thank you

APPENDIX B

STUDY QUESTIONNAIRE

Topic: SENIOR HIGH SCHOOL STUDENTS' PERCEPTIONS TOWARDS MATHEMATICS AND ITS EFFECT ON ACADEMIC PERFORMANCE

QUESTIONNAIRE

SECTION A: DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

1. Age : 11 – 15years ☐ 16 – 20years ☐ Above 20years ☐
2. Gender : Male ☐ Female ☐
3. Level : SHS2 ☐ SHS3 ☐
4. Programme of Study …….

Part I

Instructors Teaching and Learning Methodology

Statements	Strongly Agree	Agree	Disagree	Strongly Disagree
1. my instructors use texts and readings that are relevant to student success in the course.				
2. my instructors possess the appropriate experience and qualifications to teach their courses.				
3. my instructors begin class on time and follow the course schedule.				
4. my instructors provide students with stimulating and interesting class sessions that enhance the learning process.				
5. my instructors grade and return tests and assignments by the time they promise to do so.				
6. my instructors keep accurate records of student scores and attendance.				
7. my instructors should be responsive to students‘ questions and comments.				
8. my instructors should be willing to help students.				
12. my instructors are NOT too busy to listen to students‘ requests.				
13. my instructors instill confidence in students.				
14. my instructors evaluate students consistently and fairly.				
15. my instructors should be courteous to students.				
16. my instructors know how to answer students‘ questions.				
17. my instructors want their students to succeed in the course.				
18. my instructors offer to give students individual attention.				
19. my instructors assist me to understand the specific needs				
20. my instructors have my best interests at heart.				

Part II

Please tick (√) and rate yourself honestly in the appropriate column for your response to the following statements.

STUDENTS' ATTITUDES TOWARDS MATHEMATICS LEARNING

#	Statements	Strongly Agree	Agree	Disagree	Strongly Disagree
1	I would study mathematics if it were optional				
2	I do not revise previous notes to get me ready for any mathematics class				
3	I study mathematics every day to help me get more understanding				
4	I consult others when am struggling with a mathematical problem				
5	I do not research extensively to get solutions to my homework				
6	I verify my class exercise, and homework and try questions with correct answers				
7	I do not partake in class discussions whether in groups or whole class discussions				
8	I usually help my classmates when they need help in mathematics				

SECTION B: STUDENTS' PERCEPTION OF THE MATHEMATICS CLASSROOM LEARNING ENVIRONMENT

#	Statements	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
9	Mathematics periods are not enough for the lessons					
10	Teacher rushes in lesson delivery to catch up with time					
11	The teacher does not involve students in lesson delivery					
12	The teacher does not allow students to ask questions					
13	The teacher allows the students to interact with other students during mathematics lessons					
14	Teacher uses teaching learning materials in lesson delivery to stimulate students' interest in mathematics					
15	Mathematics textbooks and other necessary materials are not made available for students to have access to them					
16	The teacher does not give try questions, exercises, and homework					
17	Teacher gives feedback for class exercises and homework					

SECTION C: STUDENTS BELIEF ABOUT MATHEMATICS

#	Statements	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
18	Mathematics is a difficult subject to study.					
19	I have always been afraid of mathematics					
20	Only intelligent students can study mathematics.					
21	I will never do well in mathematics even if I am taught by the best teacher.					
22	Mathematics is a boring subject.					
23	Mathematics is an irrelevant subject and not related to our lives.					
24	I am not highly motivated to study mathematics.					
25	Mathematics is a subject for males.					

SECTION D: STUDENTS' PERCEPTION OF TEACHERS' ATTITUDE TOWARDS THEM IN LEARNING MATHEMATICS

#	Statements	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
25	My teachers increased my passion for Mathematics					
26	My Mathematics teachers demonized difficult concepts.					
27	I have learner-friendly Mathematics teachers.					
28	My teachers think further studies in Mathematics is a waste of time for me.					
29	I have a hard time getting teachers to talk seriously with me about Mathematics.					
30	My teachers have encouraged me to study more Mathematics.					
31	I feel that Mathematics teachers ignore me when I try to talk about something serious					
32	Mathematics teachers have made me feel I could go on in Mathematics					

SECTION E: FACTORS INFLUENCE STUDENTS' PERCEPTION OF MATHEMATICS

#	Statements	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
33	Gender plays a role in how people perceive maths.					
34	Age plays a major role in how one perceives maths.					
35	Society in general contributes greatly to the perceptions I have about maths					
36	My teachers made me form these perceptions about maths.					
37	My parents contribute(d) to these perceptions I have about maths					
38	The experiences I went through at the early stages of my educational life made me form these perceptions about maths.					
39	My peers influence(d) me to form perceptions about maths.					
40	I formed these perceptions about maths myself.					

APPENDIX C

SEMESTER EXAMINATION FOR STUDENTS IN DIFFERENT S.H.S

ST. FRANCIS SENIOR HIGH SCHOOL

END OF SECOND SEMESTER EXAMINATION

SECTION A

Answer all questions.

1. a) Solve for x in the following base two equation leaving your answer in base two

$\frac{10x-11(1+x)}{10} = 101$

b) If $2^{-n} = x, find\ 2^{n+1}$

2. a) Given that $\log_2 3 = 1.585$, find without using tables the value of $\log_2 72$.

b) Factorise $5(x+y)^2 - 5$

3. An operation $*$ is defined by $m * n = (m\ x\ n) + 2$in arithmetic modulo 7.

$*$	1	3	5	6
1	3	5	0	
3	5	4		
5	0		6	4
6		6	4	3

i. Copy and complete the table for operation on set {1, 3, 5, 6}

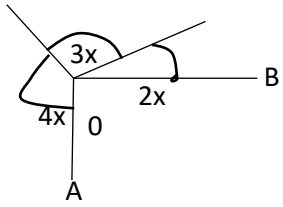
ii. From the table in (i) find the truth set of

a) $3 * n = 3$

b) $m * m = 4$

4. a) If $\frac{3\ x\ 10^4}{8\ x\ 10^{-2}} = 3.75\ x\ 10^n$, what is the value of n.

b) In the diagram below OA is perpendicular to OB. Find 5x



5. a) Find the sum of the first five terms of an AP of the form

0.03 0.06 0.09 0.12…

b) Three quantities P, Q, and R are connected so that P varies directly as R and inversely as the square root of Q. If P = 6, when R = 12 and Q = 25, find the expression for P in terms of Q and R.

SECTION B

Answer five (5) questions from this section

6. Mathematics, English, and life skills books were distributed to 50 students in a class 22 had mathematics books, 21 English books, and 25 life skills books. 7 had mathematics and English books, 6 mathematics and life skills books, and 9 English and life skills books. Find the number of students who had

a) all the three books

b) exactly two of the books

c) only life skills books

7. a) Copy and complete the following table for the relation

$y = 3 + 2x - x^2 \; for \; -2 \leq x \leq 4$

x	-2	-1	0	1	1.5	2	2.5	3	3.5	4
y		0	3				1.75			-5

b) Taking 2cm as 1 unit on both axes, draw the graph of the relation for the given interval.

c) Draw on the same graph, $x - y = 0$

d) Using your graph

i. Solve the equation $3 + 2x - x^2 = x$

ii. Find the value of x for which $3 + 2x - x^2 = 2$

8. a) The cost c of running a training course is partly constant and partly varies as the number of candidates (n) and number of weeks (w) that the course lasts. When 110 candidates attended a course for weeks, the running

cost was ¢120,000.00 and when 150 candidates attended the course for 6 weeks the running cost was ¢100,000.00, Find

i. the equation connecting c, n, and w.

ii. the cost of running the 100 candidates for 12 weeks.

b) If the organizers wish to make a profit of 10% of the cost of running the course for 160 candidates for 7 weeks, how much should each of the 160 candidates pay?

9. a) In an arithmetic progression, the thirteenth term is 27 and the seventh term is three times the second term. Find

i. the first term and the common difference.

ii. the tenth term of the sequence.

b) Owura Oman starts a job with an annual salary ¢6400.00 which increases by ¢240 every year. After working for eight years Owura Oman is promoted with an annual salary of ¢ 9500.00 which increases by ¢360 every year, calculate

i. Owura Oman's annual salary in the eight years in service.

ii. Owura Oman's annual salary in the fifteenth year of service.

10. a) The total cost of 74 bags of maize and 47 bags of beans is GH¢ 6184.00. The cost of 39 bags of maize is the same as that of $33\frac{3}{7}$ bags of beans. How much will a trader pay for 12 bags of

maize and 17 bags of beans.

b) A man is now twice as old as his son. If the sum of their ages ten years ago was fifty-two, find the sum of their ages six and a half years ago.

11. a) Simplify $\log_5\left(\frac{3}{5}\right) + 3\log_5\frac{5}{2} - \log_5\frac{81}{8}$

b) Madam Eunice spends $\frac{1}{9}$ of her monthly salary on rent, $\frac{1}{2}$ on food and $\frac{1}{4}$ on clothes and other items. If Madam Eunice has GH¢40.95 left at the end of the month how much does she earn in a month?

12. a) Without using a calculator, simplify $\frac{7-3\frac{1}{5}}{\left(3\frac{1}{2}+\frac{2}{3}\right) of\ 1\frac{1}{5}}$

b) Find the solution set of the equation $5^{2x-1} - 6.5^{x} + 25 = 0$

13 If $\frac{3}{t} + \frac{t}{q} = \frac{t}{r}$

i. express t in terms of q and r.

ii. calculate t, and leave your answer in standard form when q = 0.04 and r = 0.03

iii. Find the exact value of x if $\sqrt{300} + \sqrt{27} - \sqrt{75} = x\sqrt{3}$

(b) Solve the inequality $\frac{5x}{8} - \frac{1}{6} \leq \frac{x}{3} + \frac{7}{24}$

5 (a) Find the positive value of x that makes the expression $\frac{(x^2 + 9x)}{(x^2 + 6x - 27)}$ undefined

(b) A circle is inscribed in a square. If the **sum** of the perimeter of the square and the circumference of

the circle is 100cm, calculate;

i. radius of the circle

ii. the area of the square [take $\pi = \frac{22}{7}$]

SECTION B

[60 MARKS]

Answer **five** questions **only** from this section. All questions carry equal marks

6 (a) The second, fifth, and fourteenth terms of a linear sequence are the first three terms of an exponential

sequence. The fourth term of the linear sequence is 14

Find ;

i. the common difference of the linear sequence

ii. the common ratio of the exponential sequence

(b) If $\frac{l+a}{n-1} = d$ and $2s = n(a + l)$, express s in terms of n and d only

7 (a) Solve for the value of x if $2^{x+1} = 2^x + 8$

(b) A surveyor stands at some distance away from the base of a tower and observes the angle of elevation

to the top of the tower is 46^0. He then moved 85m towards the tower and found that the angle of

elevation has increased by 14. Find correct to the nearest whole number ;

i. the height of the tower

ii. the distance of the top of the tower from the surveyor's initial position

8. The table below shows the masses of some patients in a hospital.

Mass (Kg)	51 – 55	56 – 60	61 – 65	66 – 70	71 – 75	76 – 80	81 – 85
No. of patients	7	10	24	6	2	1	10

x	2	3	4	5	6	7	8	9	10
A		27			36			27	

iii. Using a scale of 2cm to 1 unit on the x-axis and 2cm to 5 units on the y-axis, draw the graph of $A = x(12 - x)$

iv. When is the area a maximum?

13. (a) A binary operation $*$ is defined on the set R or real numbers by m $* n = mn - \frac{m}{n}$. If $4 * y = 6$, find the values of y

(b) The velocity of a car moving with a constant acceleration is partly a constant and partly varies as the time taken.

The velocities of the car after 8s and 12s are 9m/s and 11m/s respectively.

Find

i. The relation between the velocity and the time taken

ii. The time taken when the velocity is 15m/s

5. (a) Solve: $\frac{x}{3}-\frac{1}{4}(x+2)>3x-2\frac{1}{5}$

(b) Three interior angles of a polygon are 160^o each. If the other angles are 120^o each, find the number of sides of the polygon.

8. (*a*) In a class of 50 students, 24 like football, 21 like basketball, and 18 like cricket. Six liked football and basketball only, 3 liked basketball only, 5 liked all three games and 14 did not like any of the three games.

(i) Illustrate the information on a Venn diagram

(ii) Find the number of students who like;

(α) football and cricket only

(β) exactly one of the games.

(*b*) Given that $f: x \to 2x^2 - 8x + 5$ and $g: x \to x - 2$.

Find (i) $f(-3)$

(ii) the values of x such that $f(x) = g(x)$

9. (a) Copy and complete the following table for the relation: $y = 2(x+2)^2 - 3$ for $-5 \le x \le 2$.

x	-5	-4	-3	-2	-1	0	1	2
y			-1	-3		5		

(b) Using scales of 2 cm to 1 unit on the *x*-axis and 2 cm to 5 units on the *y*-axis, draw the graph of the relation $y = 2(x+2)^2 - 3 \quad -5 \le x \le 2$.

(c) Use your graph to find the solution of:

(i) $2(x+2)^2 - 3 = 0$

(ii) $2(x+2)^2 = 5$.

(d) For what values of *x*, from the graph, is *y* increasing in the interval?

10. (*a*) The table below shows the number of limes and apples of the same size in a bag.

	Lime	**Apples**
Good	10	8
Bad	6	6

If two of the fruits are picked at random, one at a time without replacement, find the probability that

i. both are good limes

ii. both are bad fruits

iii. one is a good apple and the other a bad lime

(*b*) A clerk spends $\frac{1}{5}$, $\frac{1}{3}$ and $\frac{1}{8}$ of his annual salary on rent, transport, and entertainment respectively. If after all these expenses he had GH¢ 4,100.00 left, find how much he earns per annum.

11. (a) In a boarding house, the housemistress gives each girl either 20p or 50p each week. There are 70 girls in the house. If a total of GH ¢22.40 was given out in one week, how many girls had 20p and how many had 50p

(*b*)(i) Draw the table for addition $\oplus$ and multiplication $\otimes$ modulo 7 on the set {0, 1, 2, 3, 4}

(ii) From your tables, evaluate

(α) $m \otimes m = 2$

(β) $m \oplus (m \otimes 4) = 5$

12. (a) The operation $*$ is defined on the set of real numbers, **R**, by: $x * y = \frac{x+y}{2}$, $x, y \in R$.

(i) Evaluate $3 * \frac{2}{5}$

(ii) If $8 * y = 8\frac{1}{4}$, find the value of y.

(b) A number consists of **two digits** whose sum is 5. When the digits are reversed, the number becomes greater by 9. Find the number.

(c) Derive the equation whose roots are -7 and ½

13. (a) there are 5 more girls than boys in a class. If 2 boys join the class, the ratio of boys to girls will be 5:4.

Find the:

(i) number of girls in the class

(ii) total number of students in the class

(iii)probability of selecting a boy as the class prefect

(b) If $\frac{5x-4y}{3x+2y} = \frac{9}{4}$, find the ratio $x : y$

APPENDIX D

PERMISSION LETTER FOR DATA COLLECTION

UNIVERSITY OF EDUCATION, WINNEBA
FACULTY OF SCIENCE EDUCATION
DEPARTMENT OF MATHEMATICS EDUCATION
P. O. Box 25, Winneba, Ghana
maths@uew.edu.gh
+233 (0)20 2041078

February 23, 2022

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

LETTER OF INTRODUCTION

I write to introduce to you the bearer of this letter, Frimpong Ansong Stehpen with index 200027366, a postgraduate student in the University of Education, Winneba. He is reading for a Master of Philosophy degree in Mathematics Education and as part of the requirements of the programme, he is undertaking a research titled – ***teacher's perception and contribution to improving the teaching and learning of mathematics in the Senior High School in Eastern region of Ghana.***

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,

Dr. Jones Apawu

Graduate Coordinator