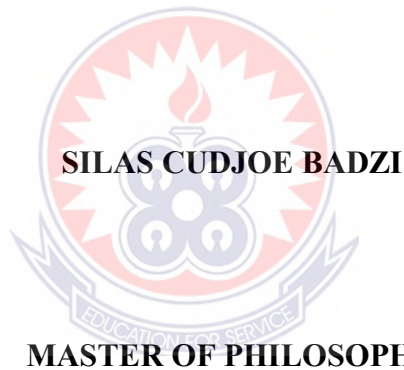


UNIVERSITY OF EDUCATION, WINNEBA

**AN INVESTIGATION INTO FACTORS INFLUENCING THE ATTITUDE OF
SENIOR HIGH SCHOOL STUDENTS TOWARDS THE STUDY OF
MATHEMATICS IN THE KOMENDA EDINA EGUAFO ABREM (K. E. E. A.)
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**A Thesis in the Department of Mathematics Education, Faculty of Science
Education, submitted to the School of Graduate Studies,
in Partial Fulfillment
of the Requirements for the award of the Degree of**

**Master of Philosophy
(Mathematics Education)
in the University of Education Winneba**

APRIL, 2023

DECLARATION

Student's Declaration

I **Silas Cudjoe Badzi** declares that the Thesis, with the exception of quotations and references contained in published works which have been identified and duly acknowledge, 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 was supervised in accordance with guidelines for supervision of Thesis laid down by the University of Education, Winneba.

NAME OF SUPERVISOR: MR. JOHN BIJOU AGBEMAKA

SIGNATURE:

DATE:

DEDICATION

This thesis is dedicated to my lovely wife and children



ACKNOWLEDGEMENTS

I would like to express my sincere gratitude and thanks to the Almighty God for divine support and protection throughout the study.

A countless number of personalities have influenced my academic life in various positive ways. While I may not be able to mention the names of all of these people, I wish to express my profound gratitude to Mr. John Bijou Agbemaka (my supervisor) for his wonderful mentorship and support in getting me through this research. Mr. John Bijou Agbemaka, God bless you.

I also want to express my thanks to all the Eguafo-Abrem senior high school, Edinaman senior high school, and Komenda senior high technical school students and teachers, involved in this study, most of them gave quite detailed and serious responses to the questionnaires.

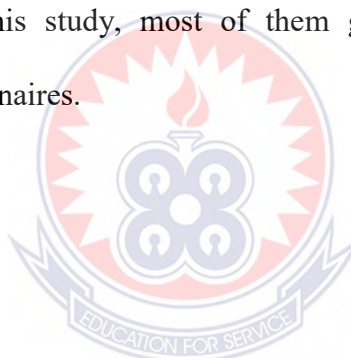


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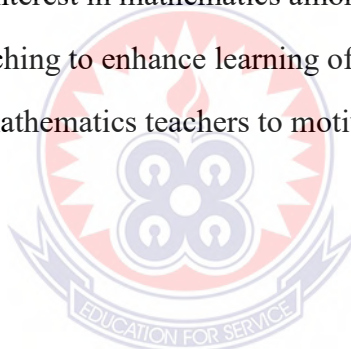
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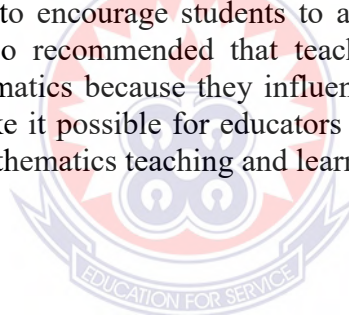
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ABSTRACT

The purpose of this study was to investigate the factors influencing the attitude of students towards the study of mathematics in the public senior high schools in Komenda Edina Eguafo Abrem (K.EEA) Municipality. The study adopted a descriptive survey design. Data were collected using Mathematics Teachers Questionnaires (MTQ) for teachers and Mathematics Students Questionnaires (MSQ) for students. These were administered on a sample of 13 teachers and 340 students respectively selected from three public senior high schools in KEEA municipality. The MSQ was given to senior high school students to identify their attitude towards mathematics. The results indicated that the senior high school students exhibited positive attitude towards mathematics. According to the findings, the issues associated with attitudes toward mathematics study among senior high school students was a lack of confidence and interest in the ability to learn and perform well in mathematics. The study also found that the teachers' method of teaching, the number of lessons taught by the teacher, years of experience in teaching mathematics, method used by teachers to motivate the students, the teachers own attitude toward the subject, the parents and siblings of the students and the friends or peers of the students appeared as main factors that influence or reinforce student attitude towards the study of mathematics. It was therefore recommended that since students in senior high school had a positive attitude towards mathematics, mathematics educators should make use of this positive attitude to encourage students to appreciate the process of learning mathematics. It was also recommended that teachers must be aware of students' attitudes towards mathematics because they influence how the subject is taught and learned. This would make it possible for educators to create effective methodologies and plans to improve mathematics teaching and learning



CHAPTER 1

INTRODUCTION

1.0 Overview

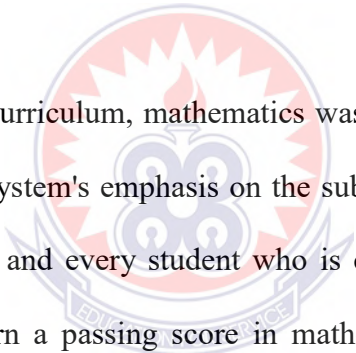
This chapter presents the background to the study, statement of the problem, purpose of the study, objective of the study and research questions. The chapter also discusses significance, limitation and assumptions of the study.

1.1 Background of the Study

We live right now in a world that is making significant advances forward in the fields of science and technology. The scientific and technological process of any nation that is still in the process of developing has a significant impact on that nation's economic wellbeing. The fundamental goal of modern science and technology is the organized exploration of nature for the benefit of mankind. As a developing nation, Ghana is now encouraging the study of science and technology in schools in order to be able to meet the man-power needs of the nation. This could be evidenced by the introduction of STEM (Science, Technology, Engineering, and Mathematics) education in senior high schools throughout Ghana.

The various strategies implemented by the government each have merit on their own. There is a question that needs an answer, and that question is, "what of the students and their attitude to the subjects that will be used to achieve this purpose?" No matter how much money the government discharges into education in the name of ensuring that we advance scientifically and technologically, it will be for naught if students continue to have a pessimistic outlook on the subject of mathematics. This is because mathematics is the language used in scientific inquiry (Tella, 2008). Thinking is facilitated through the use of mathematics. Without access to the resources provided

by this fact, genuine scientific investigation is impossible. According to Omenka and Kurumeh (2013), "as a subject, mathematics is at the base of all the science and environmental professions." (p.187). In the business world, mathematics is essential for the manufacturing of guided missiles and is helpful in the field of aerospace technology. Mathematics is also very useful when it comes to communication. Because mathematics teaches one to think in a logical way, having a good understanding of it enables one to communicate precisely and to present their argument in a manner that is logical. In point of fact, mathematics is applicable in virtually every other subject area as well. Even if they are unaware of it, people in a wide variety of occupations, including farming, hunting, and housework, all use mathematics.



In the Ghanaian school curriculum, mathematics was given a prominent place due to the country's education system's emphasis on the subject. Before being accepted into senior high school, each and every student who is currently enrolled in junior high school is required to earn a passing score in mathematics on the Basic Education Certificate Examination (BECE). To put it another way, mathematics is a subject that is considered to be of fundamental importance in both the junior and senior high school levels in Ghana. (Mensah, Okyere & Kuranchie, 2013). In addition, a student must earn a credit pass in mathematics in order to meet the prerequisites for admission to any program of study offered at a college or university.

However, according to Morgan, H. (2016), the results of the standard test and evaluation showed that the students' performance was not up to the level that was expected of them. Concern over low levels of mathematical achievement among

students is no longer limited to a single nation; rather, it has evolved into a problem that affects countries all over the world. (Pisa, 2003).

Despite the importance of mathematics in today's world and the efforts made by the government to boost students' mathematical abilities, the current outcome is not considered to be satisfactory. According to the report by the Chief Examiners of the West African Examination Council, WAEC (2018), there were a total of 286,544 candidates who participated in the West Africa Senior Secondary Certificate Examinations (WASSCE) in 2017, but only 42.73% of them passed. (A1 – C6). In 2018, out of 314,401 candidates that sat for the examination only 38.33% passed. This result shows a drop in performance in core mathematics as presented in Tables 1.1

Table 1.1: Summary of 2017 and 2018 WASSCE Core Mathematics Results

Grades	2017		2018	
	Number of candidates (N)	Percentages (%)	Number of candidates (N)	Percentages (%)
A1 – C6	122,450	42.73	120,519	38.33
D7 – E8	106,024	37.00	94,607	30.09
F9	58,070	20.27	99,275	31.58
Total	286,544	100.00	314,401	100

(WAEC, 2017, 2018)

Comparing the results, there was a 9.73 percent drop from 2017 to 2018 of the number of candidates who got university qualifying grades (A1 – C6). Besides, there was 6.91 percent drop of the number of candidates who got passes (D7 – E8) and 11.31 percent increase in the number of candidates who failed (F9).

Several studies and researches have been conducted in Ghana and many countries to find the factors that influence the students' performance in mathematics. For instant, a

study conducted in Ghana by Enu, Agyeman, and Nkum, (2015), Mensah, Okyere and Kuranchie, (2013), and other African countries such as Joseph (2013), Mutodi and Hanganipai (2014) among others all seeks to find factors influencing students' performance in mathematics.

Among these factors, students' attitude towards is one important factor that has been consistently studied. Often, the studies on relationship between students' attitude and the students' academic performance shows a positive relationship (Enu, Agyman, & Nkum, 2015; Mohd, Mahmood, & Ismail, 2011; Bramlett & Herron, 2009; Nicolaidou & Philippou, 2003; Papanatasiou, 2000). Hence students' attitude towards mathematics is a major factor that might influence the performance of the students. Due to this several studies have been conducted in different countries in order to find out students' attitude towards mathematics (Tahar, Ismail, Zamani & Adna, 2010; Tezer & Karasel, 2010; Fennema & Sherman, 1976).

The attitude of students to mathematics education whether positive or negative are affected by other factors. Most students have preconceived notions about mathematics education before they begin to study it. They are informed that mathematics is extremely difficult. With this in mind, they believe that no matter how hard they try, they will never understand the subject. (Kola, 2014; Taylor & Graham, 2007).

According to Mensah, Okyere, and Kuranchie (2013), another factor that influences students' attitudes is those students' career expectations. Many students who want to be doctors, engineers, or other professionals develop an interest in the subject as early as possible. The effort made to understand the subjects demonstrates this interest. Although some of these students may struggle to understand the subjects due to their level of aptitude, the interest they have already developed helps them perform well.

Attitudes toward mathematics may also be influenced by parental social status and peer group.

The method of teaching mathematics in secondary schools is another factor that can influence students' attitudes. The traditional method of verbal learning and memorization had resulted in a formal and abstract approach to mathematics teaching. (Kim and Schallert, 2014). The purpose of this study was to explore the factors that influence senior high school students' attitudes toward mathematics in some senior high schools in Komenda, Edina, Eguafu Abrem (KEEA) Municipality, Central Region. The study aims to discover students' attitudes toward mathematics as well as the factors that reinforce those attitudes in terms of academic performance.

As a mathematics teacher at a public senior high school in the municipality of Komenda Edina Eguafu Abrem (KEEA), the researcher has first-hand experience with the mindset that many of the students bring to the subject and how it affects their academic achievement.

For instant, the WASSCE mathematics results in KEEA municipality indicate poor performance among students as shown in Table 1.2

Table 1.2: Student's performance in mathematics in WASSCE in KEEA municipality, 2017-2019

Year	Entry	A1	B2	B3	C4	C5	C6	D7	E8	F9
2017	1487	12	25	74	112	161	63	250	309	483
2018	1621	13	41	20	109	175	243	284	284	454
2019	1682	11	42	71	140	155	140	294	308	521
Total	4790	36	108	165	361	491	446	828	901	1454

Source: Municipal Education Office, KEEA

As can be seen in Table 1.2, there has been a worrying trend in the performance of WASSCE mathematics scores over the past few years.

1.2 Statement of the Problem

The student's attitude towards an academic subject is a crucial factor in learning and achieving in that subject. Whether a student views himself or herself as a strong or weak person in a specific subject may be an important factor in his or her academic achievement. Papanastasiou (2000) showed that there is a positive relation between Mathematics and mathematics achievement. According to Schreiber (2002), those who have positive attitude towards Mathematics have better performance in the subject. In Kenya, a study done by Achieng (2007) looked at the relationship between teacher factors and student Mathematics achievement as factors affecting Mathematics performance but did not consider student's attitude.

Senior high school students in Ghana take the West African Secondary School Certificate Examination (WASSCE) administered by the sole examination body for pre-tertiary education, the West African Examination Council. (WAEC). This external exam is a high-stakes assessment that all senior high school students must pass to attend any tertiary institution in the country.

Most senior high schools nationwide have had poor math results on this exam. The General Resumé on Ghana's Chief Examiner's report for WASSCE on senior high school mathematics noted the student's poor math performance (WASSCE 2018). Over the years, these discouraging results have raised questions about what teachers are teaching, what students are learning, how students feel about the subject, and what learning opportunities schools are providing. If these exams, written by students

believed to have gone through a common curriculum, show a discrepancy, it's worth studying how students' attitudes toward math affect their performance.

1.3 Purpose of the Study

The purpose of this study was to investigate the attitudes that senior high school students form towards study of mathematics in the public senior high schools in Komenda Edina Eguafo Abrem (K.EEA) Municipality.

1.4 Objectives of the Study

The objectives of this study were to:

1. investigate the attitudes that senior high school students form towards study of mathematics.
2. find out the problems that are associated with attitude affecting study and performance in mathematics
3. investigate the factors that influence formation of attitudes towards study of mathematics among senior school students in KEEA municipality.

1.5 Research Questions

The study was guided by the following research questions:

1. What attitudes do students in senior high schools' form towards study of mathematics?
2. What problems are associated with attitude affecting study and performance in mathematics?
3. What factors influence attitudes formation towards study of mathematics among senior high school students?

1.6 Significant of the Study

The finding of this research upon completion will help students to understand how their attitude towards mathematics can affect their performance in the subject and how their interaction with the peers, parents and society can also influence their attitude and hence their performance in mathematics. And also, to determine the extent to which the teacher's attitude towards teaching the subject can affect the students' performance in mathematics. It will also serve as a resource material for those who like to carry out research into problems encountered in the teaching of mathematics in senior high schools.

1.7 Delimitation of the Study

The study was restricted to only three public senior high schools within the KEEA Municipality in the Central Region of Ghana because of time and proximity. It was also delimited to only final year students of those selected senior high schools. This was because the final year students have been exposed to almost all the contents in the mathematics curriculum and will be the best to respond to the questions on their attitude towards the subject. The design of this study was also on restricted to descriptive survey design only.

1.8 Limitation of the Study

According to Best and Kham (2007), limitations are circumstances that are outside of the control of the researcher and that place restrictions on the conclusion of the study as well as its application. The inability to generalize the findings of the study to all senior high schools in Ghana was the most significant limitation that could be placed on this study. Due to constraints regarding both time and resources, the researcher was unable to cover all Senior High Schools in Ghana. As a result, the researcher

relied on data from just three public senior high schools, which is a relatively insignificant fraction of the total population of senior high schools in Ghana.

1.9 Organization of the Thesis

There are five chapters in this thesis. The first chapter is the Introduction, which explains the study's context. The review of related literature is covered in chapter two. The third chapter describes the study's design as well as the technique utilized to conduct it. The data that was obtained is presented and analyzed in chapter four. It also contains the results' interpretations and debate. The fifth chapter contains a summary of the findings based on the study objectives, as well as conclusions, recommendations, and research ideas. At the conclusion, there are references and appendices.

1.10 Operational definition of terms

1. **Achievement:** Reach or attain a certain level, especially by effort. Accomplishment. Specifically, it is the level of academic performance in a given examination. It could be very good, good or poor depending on a set pass mark. For example, grade C6 and above in WASSCE in mathematics is regarded as a very good achievement while D7 and below is a poor achievement in WASSCE
2. **Attitudes:** Opinion or way of thinking. Generalized feeling towards a particular object, subject or situation. A perception that one forms towards an event, object or subject. It can either be favourable, neutral or unfavourable towards the event, object or subject.

3. **Performance:** Accomplishment in a particular subject area of a course, usually by reasons of skill, hard work or interest and attitudes. **Good performance** implies successfully attaining set cut-off marks in examination of a subject. While **poor performance** means attaining marks deemed to be far below a designed cut-off mark.
4. **Learning:** Gain skill. Relatively persistent change in an individual's potential behaviour due to experience. The experience a student gets when he or she is exposed to mathematics activity or any other activity aimed at causing a change in an individual's behavior.



CHAPTER 2

LITERATURE REVIEW

2.0 Overview

This chapter reviewed literature related to the study on attitudes towards learning and performance in mathematics among senior high school students. Literature reviewed is cited both from within Ghana and from studies done outside Ghana. In particular, issues discussed include: Factors that are likely to reinforce attitudes such as, students' own experiences; societal influence, school setting; teacher influence and gender factor. Also discussed in more detail include: possible intervention, students/teacher interaction; possible expected results and achievement in mathematics examination, theoretical literature and conceptual framework.

2.1 Theoretical Framework

In an effort to provide an explanation for the process of change that takes place in the attitudes of students, which in turn affects their performance, a number of different theories have been proposed. The multicomponent model of attitude proposed by Eagly and Chaiken, as well as the Yale Attitudinal Change Theory, are two examples of these theories.

2.1.1 The Eagly and Chaiken Multicomponent Model of Attitude

According to Eagly and Chaiken (1993) multicomponent model of attitude, attitude are influenced by three components. They are cognitive (belief, thoughts, attributes), affective (feelings, emotions) and behavioral information (past, events, experience) (G. Maio et al., 2010). When reviewing the related literature on students' attitude towards mathematics, it reveals that several factors play vital role in influencing students' attitude. These factors can be categorized into three distinctive group. Firstly, factors

associated with the students themselves. Some of these factors include students' mathematical achievement score (Kogce et al., 2009) anxiety towards mathematics, student's self-efficacy and self-concept, extrinsic motivation (Tahar et al., 2010). And experience at high school (Klein 2004; Basis and Cusworth, 1994). The anxiety and fear may elicit negative attitude towards the subject among students and these general unfavorable perception and attitude about mathematics are passed on to children from adults. Society that treats and views mathematics as an unknown territory made-up of x's and y's society also view mathematics teachers as sarcastic and important didactic and scornful (Mac nab and Cummine 1986). These views are unconsciously picked by students and they come to mathematics classroom with an already distorted perception and attitude towards learning of mathematics.

Secondly, the factors that are associated with school, teacher and teaching. Some of these factors that influences attitude are teaching materials used by teachers, teachers' classroom management, teachers' content knowledge and personality, teaching topic with real life enriched examples, other students opinion about mathematics courses (Yilmaz, Altun & Olkun, 2010) teaching methods reinforcement (Papanastasiou, 2000), receiving private tuition (Kogce et al, 2009), teachers' belief towards mathematics (Cater & Norwood, 1997) and teachers attitude towards mathematics (Ford, 1994, Karp, 1991), developed negative attitude towards mathematics.

In any given year of learning, students spend more time in school than at home. Much influence on a students' learning could be in school given this much time spend therein. While at school he/she goes through a planned school program. He/ she is subject to curriculum of mathematics which is administrated in a classroom. Eshiwani (1984) emphasized the need to have adequate resources in school to ensure students effectively learn mathematics. These resources include adequate an appropriate 3-

dimensional models, geo-boards and textbooks among others. Access to these learning resources will determine how students learn mathematics. National schools are well equipped but district school lack basic resources (Twoli, 1986). If the school administrative has not provided sufficient resources, learners, especially girls are likely to resent mathematics as being too involving and too much competitive. Russel (1983), also found out that manipulative teaching models are preferred by boys.

Hence mixed classroom boys lord over them while girls, lost out in the use of these apparatus and materials. Use of textbook with sexist orientation has not helped things either (Costello 1991). Textbook written by some authors have examples of boys doing very well. Frequent use of boys name in the end of topic exercises make girls to feel that they are passengers in mathematics learning while boys can rumble and mumble and yet the teacher still wait for him to finish (Twoli, 1986).

Thirdly, factors from the home environment and society also affect students' attitude towards mathematics. Factors such as educational background of parent's, occupation of parents' (Kogce et al., 2009) and parental expectations, social belief, social tradition, social culture (Tobias, 1993) play a crucial role in influencing student attitude towards mathematics. By the time of students joins from one he/she will have interacted with his/her parent, who to a great extent, influence his/her perception of learning in school in general and specifically learning mathematics. Orten (1994), attributed the noticeable difference in learning among boys and girls to "society attitude and expectation". He asserted that influences of society and from the environment affect mathematical development of the students. Boys are engaged in more vigorous activities while girls take more passive roles. This scenario is replayed in school and in class while learning. On the other hand, difference in parental expectations and desires and pressure they exert at home on their sons and daughters has been

attributed for attainment variations among the sexes (Orten, 1994). Society views mathematics as a male subject as Costello (1991) found out. This especially when parents react and reinforce daughter and sons differently. When their children do something mathematically daughter are told "you really tried" meaning nothing much is expected from the female child. But to their sons, they are told "you can do far much better" (Costello 1991) meaning male children are expected to do a lot more in mathematics, such comments said by parents consciously or without much thought are registered in sub-conscience of child and may influence how he/she perceives mathematics. Hence formation of attitudes among students may have been unconsciously registered from parents particularly and from society in general.

2.1.2 The Yale Attitudinal Change Theory

The Yale Attitudinal change approach is the social psychological study of the condition under which people are most likely to change their attitudes. This theory was propounded by Philip Zimbardo at Yale University in the year 1991. Zimbardo (1991) defined attitudes as an evaluative disposition towards some object based upon cognitions and affective reactions that can change. He went on to say attitudes are latent and not directly observable. They are related to how people perceive the situations in which they find themselves. Attitudes vary in direction (either positive or negative) and intensity (the amount of commitment with which a position is held). This means that in this case, students' attitude towards mathematics changes differently in direction and intensity. The evaluative disposition that students have towards mathematics influences their attitudes and perception in the subject.

2.2 Conceptual Framework

A conceptual framework provides a guidance of the study on the basic of theoretical review. Theory and conceptual framework are interrelated. The main propose of this study was to explore the senior high school students' attitude towards mathematics and to find the factors affecting students' attitude towards mathematics. In the above theory, Tehar et al. (2010) emphasized on the factors, anxiety towards mathematics, student' self-efficacy and self-concept, extrinsic motivation. In their views, Klain (2004); Bosis and Cusworth (1994) also added the factors experience at high school also influences the students' attitude towards mathematics.

Similarly, Yilmaz, Altun and Olkum (2010) emphasized that attitudes are influenced by teaching materials used by teachers, teacher classroom management, teachers content knowledge, teacher personality, teaching technique etc. and Kogce et al. (2009) emphasized in the factors as educational background of parents, occupation of parents and Tobiax (1993) added in these factors as parental expectation, social belief, social tradition, social culture etc.

On the basis of these literature, the following framework was derived as shown in figure 2.1

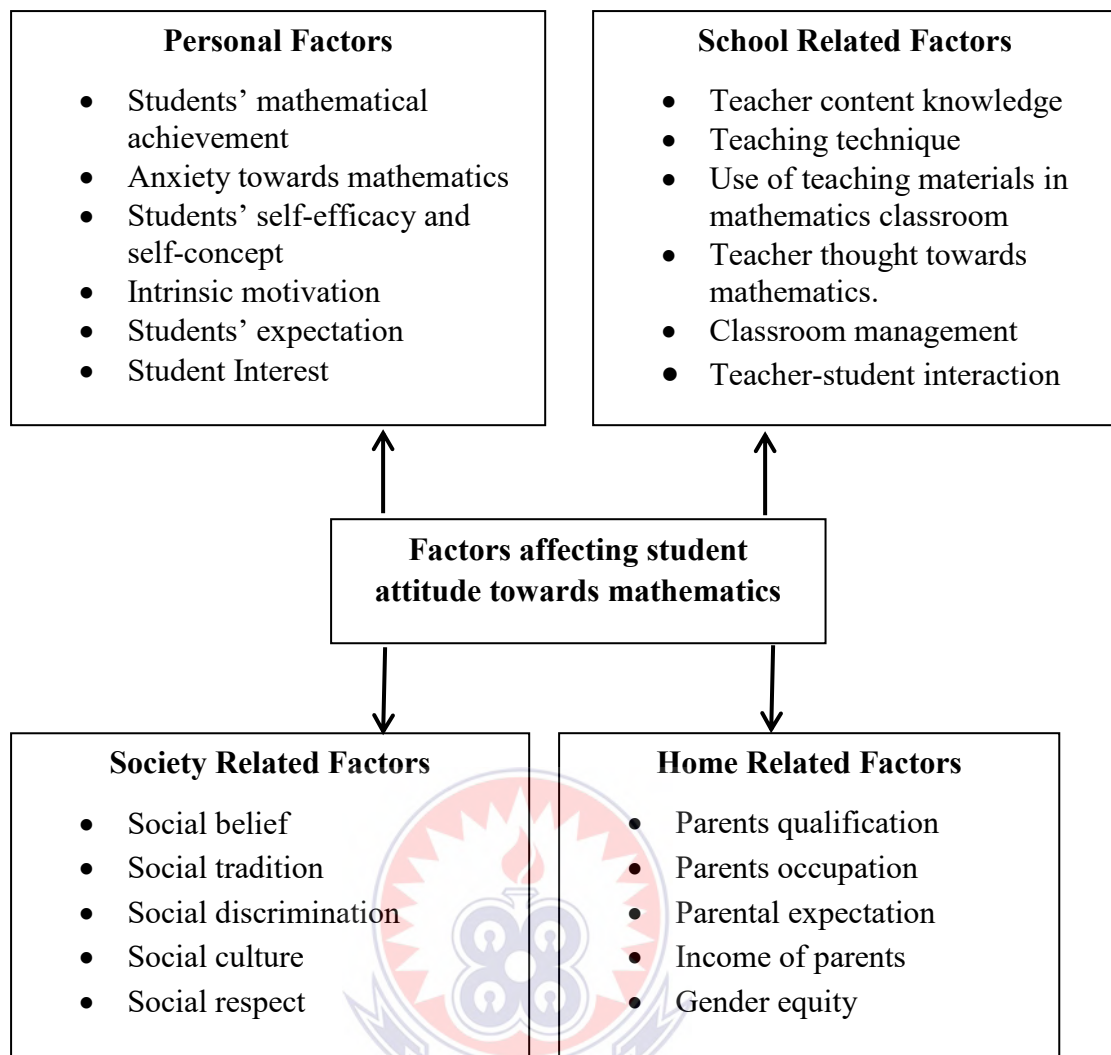


Fig. 2.1: Conceptual framework

The above framework was constructed on the basis of the above-mentioned theory. From the above theory it is found that there are some factors associate with personal factors, school related factors, home related and social factors. On the theory home related factors and social factors are described as a one factors. On the theory home related factors and social factors are described as a one factor but researcher described them separately on the basis of his experience. Also, researcher added some factors according to his experience under these factors. Under the personal factors theory includes students' mathematical achievement score, anxiety towards mathematics, student's self-efficacy and self-concept, intrinsic motivation and experience at senior high school. The second factors in the theory is school related factors. These factors

include classroom management, teaching technique, use of teaching materials in mathematics classroom teacher thought towards mathematics and teacher-students interaction. The third factor in the framework is home related factor. These factors are parent qualification, parent occupation, parental expectation, income of parents, parental behavior with children and gender equity at home. The last factor mentioned in the theory is social factor. Under this factor researcher added six factors as social belief, social tradition, social discrimination, social culture, social through and social respect to students. These factors play a crucial role in effecting students' attitude towards mathematics.

2.3 Components of Attitude

Attitude is a psychological tendency that is expressed by evaluating a particular entity with some degree of favour or disfavour (Mensah, Okyere. & Kuranchie, 2013). It is a predisposition or a tendency to respond positively or negatively towards a certain idea, object, person, or situation or an attitude object. Attitude influences an individual's choice of action, and responses to challenges, incentives, and rewards (Business Dictionary). Zelle, Marianne and Elaine (2005) postulate that attitudes are generally positive or negative views about a person, place, thing or event which are often referred to as the attitude object. Wasiche (2006) defines attitude as a feeling towards something or somebody which is sometimes reflected in a person's behaviour. Attitudes formed by an individual mostly depends on his/her experience in the learning environment. Attitudes are further enhanced by interpersonal interaction. Njue (2005) explain that attitude is either positive or negative depending on whether a person likes or dislikes something or someone.

Implicit in the various definitions is that attitude is a psychological orientation developed as a result of one's experiences, which influences how a person views situations, objects or people, and how she appropriately responds to them. The response may be positive or negative; favourable or unfavourable; neutral or ambivalent.

Research suggests that there are three different components of attitude. These are the cognitive component, the affective component, and the behavioural component (Eagly & Chaiken, 1998; Maio & Haddock, 2010). The cognitive component of attitude is what the individual thinks or believes about the attitude object. An example is that a person might think that a snake is a dangerous reptile. The affective aspect of attitude is the feelings or emotions of the individual associated with the attitude object. For example, the sight of a snake may evoke the feeling of fear in the individual. The behavioural component is the tendency to respond in a certain way to the attitude object. An example is a person choosing to run away or scream upon seeing a snake. Hence the cognitive, affective and behavioural components of attitude are interrelated and interconnected

2.3.1 Formation of Attitude

Research has shown that formation of attitude is experiential. People form attitude through their experiences in life. Social psychology explains how attitudes are formed using three major learning theories which are classical conditioning, operant conditioning and observational learning. Propounded by Ivan Pavlov, classical conditioning is a procedure for modifying behaviour in which repeated pairing of conditioned stimulus with an unconditioned stimulus leads to the development of a conditioned response (Ntim, 2010, Linero & Hinojosa, 2012). Classical conditioning

entails neutral stimuli that naturally elicit a response. Children, for instance, become fans of football clubs of their fathers. They grow up believing that those particular football clubs are the best and develop the same passion for the clubs. Hence, we form attitudes according to how we are conditioned or how our experiences condition us.

B.F. Skinner's Operant Conditioning theory is a form of learning in which a response is made in anticipation of a stimulus. In operant conditioning, reinforcement increases the likelihood that behaviour will be repeated (Ntim, 2010). Behaviours that are followed by positive consequences are reinforced and are more likely to be repeated than are behaviours and attitudes that are followed by negative consequences (Moris & Maisto, 2001). Operant conditioning requires the use of reinforcement and punishment. A case in point is if a child's mother smiles at her anytime she picks something up for her, the child begins to realise that it is good to be helpful and she is likely to repeat the behaviour. Conversely, if a mother screams at a child for picking up a puff of a piece of cigarette, the child will grow up having an unfavourable attitude towards smoking and probably those who smoke. This is due to the negative consequence of her action.

Finally, people also learn attitude through observation of people around them, especially if they are people they admire, respect or hold in high esteem. Children therefore invariably observe the attitude of parents and teachers and learn a lot from them. Observational learning theory propounded by Albert Bandura (1997) posits that behaviours are acquired by watching another or the model that performs the behaviour (Yara, 2009). The model displays the behaviour and the learner observes and tries to imitate it. Teachers are, invariably, role models whose behaviours are easily copied by students.

2.3.2 Attitude towards Mathematics

Research has shown that, some authorities regard attitude towards Mathematics as just a like or dislike for Mathematics, while others extend the meaning to embrace beliefs, ability, and usefulness of Mathematics. According to Zan and Martino (2007), attitude towards Mathematics is just a positive or negative emotional disposition towards Mathematics. On the other hand, Neale (1969), defines attitude towards Mathematics as an aggregated measure of “a liking or disliking of Mathematics, a tendency to engage in or avoid Mathematical activities, a belief that one is good or bad at Mathematics, and a belief that Mathematics is useful or useless” (p. 632). Equally, Hart (1989) also considers attitude towards Mathematics from multidimensional perspectives and defined an individual’s attitude towards Mathematics as a more complex phenomenon characterised by the emotions that he associates with Mathematics, his beliefs about Mathematics and how he behaves towards Mathematics. It continues that, attitude towards Mathematics includes the tendency to be fearful of and anxious about Mathematics.

Review of other writings suggest that, attitude towards Mathematics has cognitive, affective and behavioural components; and like any other kind of attitude, it can be formed through any of the three processes described earlier. A student can develop positive attitude towards Mathematics because he or she learns to associate positive experiences or events with it. Also, positive reinforcement creates room for the formation of positive attitude for Mathematics. And by no means is students’ observation of teachers and teachers’ behaviour especially in relation to Mathematics among the least of the factors that influence their attitude towards Mathematics.

2.3.3 Student Attitude towards Mathematics

According to Borasi, (1990) the conceptions, attitudes, and expectations of students regarding Mathematics and Mathematics teaching have been considered to be very significant factors underlying their school experience and achievement. Generally, the concepts students hold about Mathematics determine how they approach the subject. In many cases, students have been found to approach Mathematics as procedural and rule oriented. He said this might have prevented them from experiencing the richness of Mathematics and the many approaches that could be used to develop competence in the subject.

Attitude can also be gender related. There are many who hold the view that boys do better in Mathematics than girls. This belief tends to affect the attitude of girls towards Mathematics. Farooq and Shah (2008) in a study of secondary school students in Pakistan found that there was no significant difference in confidence of male and female students towards Mathematics at secondary school level. They rather found that students' success in Mathematics depended on attitude towards the subject. Nonetheless, some studies have found gender difference in students' confidence in Mathematics. Compared to boys, girls lacked confidence, had debilitating causal attributional patterns, perceived Mathematics as a male domain and were anxious about Mathematics (Casey, Nuttal & Pezaris, 2001). In the study, girls were found to have lower self-confidence in Mathematics than boys.

Instructively, research on the relationship between student attitude and performance has also been inconclusive. Researches that have been conducted to determine the relationship between students' attitude towards Mathematics and achievement in Mathematics have yielded contradictory results. The findings have thus lacked

consistency on the subject. Some studies have demonstrated a strong and significant relationship between Mathematics attitude and Mathematics achievement (Minato & Yanase, 1984, Randhawa & Beamer, 1992, Schenkel, 2009). In the Schenkel's (2009) study of elementary school pupils, positive correlation between student attitude and student performance was found. Student beliefs and attitudes were found to have the potential to either facilitate or inhibit learning. In a comparative study of factors influencing Mathematics achievement, Burstein (1992) found that there is a direct link between students' attitudes towards Mathematics and student outcomes. Cheung (1998), in his study of 11-13 year old, also discovered 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.

Other researches have, however, demonstrated in their findings that the correlation between attitude towards Mathematics and achievement in Mathematics was rather weak and could not be considered to be of practical significance (Vachon, 1984; Wolf & Blixt, 1981). 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. Following from the preceding findings, studies in different cultural settings are eminent to realise the influence of student attitude towards Mathematics on student learning outcomes in the subject.

2.3.4 Teacher Attitude towards Mathematics

An understanding of how attitudes are learned should establish a connection between teachers and students' attitudes, and attitudes and performance. Schofield (1981)

reports that positive teacher attitude towards Mathematics was significantly related to high achievement in pupils. Bridget, Vemberg, Twemlow Fonag, and Dill (2008) studied how the teachers' attitude contributed to students' academic performance and behaviour. The study unveiled, among other things, that students with more devoted teachers were regarded by their peers as helpful to victims of bullying relative to students with less devoted teachers. The study also disclosed that students with the devoted teachers had the courage and determination to face difficulties in school life. Teachers were recognized as those who provided support, encouraged students and their value for love eradicated unwanted behaviour in students. Teachers are, invariably, role models whose behaviours are easily copied by students. What teachers like or dislike, appreciate and how they feel about their learning or studies could have a significant effect on their students. Unfortunately, however, many teachers seldomly realize that how they teach, how they behave and how they interact with students can be more paramount than what they teach (Yara, 2009).

Clarke, Thomas and Vidakovic (2009) postulate that like all other kinds of attitude, a teacher's attitude towards Mathematics can be measured by the emotional response towards Mathematics (affective), beliefs about Mathematics (cognitive), as well as behaviour. They continued that attitudes and practices of teaching Mathematics are complexly affected by beliefs, emotions, social context and content knowledge. Studies confirm that emotional responses toward Mathematics that are found in teachers include like and dislike of Mathematics, anxiety associated with Mathematics and self-confidence in relation to Mathematics (Phillipou & Christou, 1998, Brady & Bowd, 2005, Henderson & Rodrigues, 2008). These emotional factors have been found to have an impact on student performance. In their study of teachers' self-esteem connected to Mathematics, Henderson and Rodrigues (2008) found that

approximately half of the participating pre-service teachers, some of whom were highly qualified, lacked self-esteem in relation to Mathematics. Mensah, Okyere, and Kuranchie, (2013) disclosed that teachers' exhibition of self-confidence when teaching Mathematics motivates student achievement in Mathematics. The learner draws from the teacher's disposition to form his own attitude which may affect her learning outcomes.

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. According to Philippou and Christou (1998), teachers' beliefs about the utility of Mathematics are often found to correlate with either a more positive or negative attitude towards the subject. It is believed that a teacher who sees no usefulness of Mathematics in the real world and believes that Mathematics should be learnt as a set of rules and algorithms will require his students to memorize procedures and rules without meaning. This is a negative outlook that will make his students develop a negative attitude towards the subject. Also, a teacher who believes that girls are poor in Mathematics is likely to impact negatively on girls in his class who will begin to believe that they cannot do Mathematics.

Some other researchers have identified another aspect of the teacher's attitude towards Mathematics as the teacher's behaviour in relation to Mathematics. Such Mathematics-related behaviour as avoidance of Mathematics, pursuit of Mathematics and instructional behaviour in the classroom all affect student attitude and performance. Generally, the way that Mathematics is represented in the classroom and perceived by students, even when teachers believe they are presenting it in authentic

and context dependent way stands to alienate many students from Mathematics (Barton, 2000, Furinghetti & Pekhoren, 2002). Ogunniyi, as cited in Yara, (2009) stipulates that students' positive attitude towards Mathematics is enhanced by the following teacher-related factors: teachers' enthusiasm, teachers' resourcefulness and helpful behaviour and teachers' thorough knowledge of the subject-matter and their making Mathematics quite interesting. It is inferred that teachers can foster in students the positive attitudes about Mathematics that help to build confidence by: encouraging the belief that everyone can "do" Mathematics –emphasizing effort, not innate ability; modelling enthusiasm for teaching and learning Mathematics; addressing the learning styles of students by providing a variety of ways for students to gain an understanding of difficult concepts; helping students to appreciate the value of Mathematics in their lives; and choosing activities carefully (not too easy, not too hard), so that students can be both challenged and successful (Ministry of Education, Ontario (2004).

2.3.5 Relationship between attitudes towards mathematics and mathematics achievement

Individual factors such as attitude towards mathematics significantly affect the mathematics achievement of the students (Andaya, 2014). This conforms to the conclusion in the research conducted by Patena and Dinglasan (2013) where the attitude towards the subject is a significant factor that affects students' achievement. Moreover, it was indicated that the respondents have a positive attitude in Mathematics. Positive attitudes towards mathematics denote interest or feeling towards studying mathematics. However, even if the students try to develop positive attitudes in Mathematics, they find it hard to learn the subject.

The study of Suan (2014) agrees as it was concluded that student factors, like study

habits, attitudes and interest towards mathematics, and time management, significantly contribute to success in mathematics. This is the same as the study conducted by Dela Cruz (2018). The study claims that students who manifest a positive attitude and belief towards the subjects tend to perform better.

Hemmings, Grootenboer, and Kay (2011) studied the probable correlation between mathematics achievement and attitude towards Mathematics among Australian secondary school students. Their study disclosed that female learners are more likely to have a better perception of Mathematics compared to their male counterparts. Additionally, the relationship between mathematics achievement, as reflected in the LANNA Numeracy and Reading test results, and attitude towards mathematics is found to be to a great extent.

Supporting the previous studies, a significant relationship between achievement and attitude towards mathematics was also found in the study conducted by Mohd, Mahmood, and Ismail (2011). The overall attitude towards mathematics was seen to be at a medium level. Moreover, the study showed that the level of patience towards problem-solving and mathematics achievement have a significant relationship but the student's level of confidence towards problem-solving posted no significant relationship with their achievement.

On the other hand, Al-Agili, et al. (2012) found a weak association between mathematics achievement and attitude towards the subject. Though the correlation coefficient was positive, it yields no significant relationship. It was supported by Barham (2002), who found out that one's attitude towards Mathematics does not affect his/her achievement in the subject. Concerning attitude towards mathematics, Flynn (2013) found inconsistency in the results of some studies. She added that results are only representative of the population.

Ayuman-Valdez and Guiab (2015) studied the possible predictors of mathematics performance of grade six pupils of Cauayan Northeast District. Most of the pupil-respondents obtained a general average described as 'Approaching Proficiency', numerically 80–84, while next in number are those whose average is described as Proficient or 85–89. In this study, it was found out that the impression of the mathematics teachers significantly influences the achievement of students. A possible intervention program to attain a better impression of the students to their teachers was asserted to obtain a better performance. Predictors like attitude, success orientation, and self-confidence to mathematics performance yielded a slight correlation while defense orientation and Math self-perception showed no relationship; all are insignificant.

Despite the excellent performance of Singaporean students in TIMSS assessments, self-concept in learning mathematics and valuing mathematics is low among the Singaporeans compared to the international average (Mohammadpour, 2012). Results indicated that attitudinal factors are the strongest predictors of achievement which leave personal, family background factors, and self-concept following. From the study of Hamid, et al. (2013) it was found that math anxiety and test stress significantly affect mathematics achievement of Brunei secondary school students. It is stated that these two psychological factors are effective barriers to the performance of the students.

The results of studies relating to mathematics achievement of the students at any level of learning show the factors which may contribute to the success or failure of students in this particular subject. This current study eyes the probable correlation between attitude towards mathematics and the student's mathematics achievement.

2.4 Factors Reinforcing Attitudes

Attitude is a central part of human identity. Everyday people love, hate, like, dislike, favour, oppose, agree, disagree, argue, persuade etc. All these are evaluative responses to an object. Hence attitudes can be defined as a summary evaluation of an object of thought (Bohner & Wänke, 2002).

He went further to state those attitudes are inclinations and predispositions that guide an individual's behaviour and persuade to an action that can be evaluated as either positive or negative. Attitudes develop and change with time. According to Multicomponent model of Attitude (Eagly & Chaiken, 1998), attitudes are influenced by three components. They are cognitive (beliefs, thoughts, attributes), affective (feelings, emotions) and behavioural information (past events, experiences) (Maio, Verplanken, & Haddock, 2018). When reviewing literature on students' attitude towards mathematics, it reveals that several factors play a vital role in influencing student's attitude. These factors can be categorized into three distinctive groups.

Firstly, factors associated with the students themselves. Some of these factors include student's mathematical achievement score (Köğçe et al, 2009), anxiety towards mathematics, student's self-efficacy and self-concept, extrinsic motivation (Tahar et al, 2010) and experiences at high school (Klein, 2004; Bobis & Cusworth, 1994).

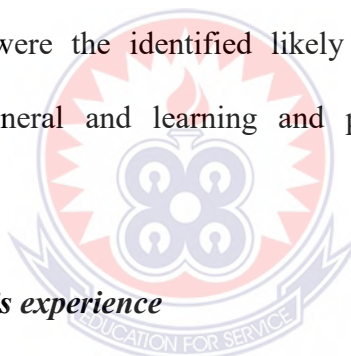
Secondly, the factors that are associated with the school, teacher and teaching. Some of these factors that influence attitudes are teaching materials used by teacher, teachers' classroom management, teachers' content knowledge and personality, teaching topics with real life enriched examples, other student's opinions about mathematics courses (Yilmaz, Altun & Olkun, 2010), teaching methods, reinforcement (Papanastasiou, 2000), receiving private tuition (Köğçe et al, 2009),

teachers' beliefs towards mathematics (Cater & Norwood, 1997) and teachers' attitude toward mathematics (Ford, 1994, Karp, 1991).

Thirdly, factors from the home environment and society also affect students' attitude towards mathematics. Factors such as educational background of parents, occupation of parents (Köğçe et al, 2009) and parental expectations (Tobias, 1993) play a crucial role in influencing students' attitude towards mathematics. Due to these several factors students have different attitude towards mathematics. More often, the public image of mathematics is labeling it as a difficult, cold, abstract, theoretical and ultra-rational subject (Ernest, 2004). However, some studies show that students have a relatively positive attitude towards mathematics (Tezer & Karasel, 2010; Yilmaz et al, 2010; Fan, Quek, Yan, Mei, Lionel & Yee, 2005). Sometimes, Mathematics is also considered as very important and largely masculine subject (Ernest, 2004). Several studies give evidence that compared to boys, girls lack confidence in doing mathematical sums and viewed mathematics as a male domain (Meelissen & Luyten, 2008; Odell & Schumacher, 1998; Hyde, Fennema, Ryan, Frost, & Hopp, 1990). However, there are many studies that suggest that there is no significant difference between attitude towards mathematics among male and female students (Mohd et al, 2011; Köğçe et al, 2009; Nicolaidou & Philippou, 2003). And there are some other studies which suggest that the attitude of the participants of their study towards mathematics was more positive in the third year than the first year (Grootenber & Lowrie, 2002) and there is a difference between attitude in the grades 6, 7 and 8 (Köğçe et al, 2009). Hence it can be said that students' attitude towards mathematics are very subjective and varies among the students. Several studies had been conducted to find out the relationship between attitude towards mathematics and academic achievement of the students. Most of these studies showed that there is a positive

correlation between students attitude towards mathematics and academic achievement of students (Mohd et al, 2011; Bramlett & Herron, 2009; Papanastasiou, 2000; Ma & Kishor, 1997) and also achievement in problem solving (Nicolaidou & Philippou, 2003), The studies has also shown that students attitude towards problem solving in terms of patience, confidence and willingness has a positive relation with students' mathematics achievement (Mohd et al, 2011)

The question which came to mind was what would be the likely sort of such attitudes among students in senior high schools and what could be the reinforcing factors? Sources of negative or positive attitudes may not be pin-pointed. Their source may overlap depending on an individual's learning environment. For the purpose of this review, the following were the identified likely reinforcing factors of attitudes towards learning in general and learning and performance of mathematics in particular.



2.4.1 Individual student's experience

Twoli (1986) asserts in his work that there is a relationship between achieved grades in earlier examinations at same level and attitudes formed by students towards learning sciences and mathematics. Repeated low academic achievement might lead to negative attitudes towards the subject which in turn may influence how a student will learn the subject in the subsequent years of education. The challenge though to this assertion is whether the repeated low grades achieved earlier influence attitudes formation or do attitudes formed earlier influence how a student learns mathematics and consequently how the student will perform in final examination. But “learned helplessness” (Twoli, 1986:34) due to repeated low achievement in mathematics examination may lead to unfavourable attitudes towards mathematics learning. This

study intended to identify existence of such cases among students in KEEA municipality.

Documented reports in Britain indicate that fewer girls than boys participate in mathematics courses in tertiary levels. HMI Survey (1977) indicates that girls on average score lower marks than boys at the end of course examinations. As boys and girls interact at school in general and particularly in class, they get to know of this scenario and form varied attitudes towards learning of mathematics. In support of this, a study by (Costello, 1991) on 11-16 years old shows that students formed different attitudes towards mathematics. According to the research, he said some students described mathematics as hard or difficult. Some girls in particular believed that mathematics is a boy's subject. However, there was little identifiable difference in attitudes towards learning of mathematics amongst girls and boys below 11 years old (Costello, 1991 and Beagle, 1973). Despite this assertion, examination results show disparities in performance among boys and girls. This implies that primary school children join Form One while having positive or neutral attitudes towards learning of mathematics. But one wonders what might be happening to these students as they learn in senior high schools. Such that by the time they prepare for WASSCE, they seem to have formed unfavourable attitudes towards mathematics. As students interact with each other in senior high schools, they influence each other with regard to their perception of mathematics. Peers may influence others, that mathematics is unfeminine (Costello, 1991). At this stage of learning, image issue is so pertinent that a student will not wish to be different from his/her peer group. This could lead to formation of attitudes which are also compounded by stereotyped slogan "bright girl fear success" or "nice girls don't do mathematics" (Costello, 1991). Other unfounded statement is, "mathematics is done by real men". This could be internalized in the

students' minds; hence they view mathematics differently from other subjects. Similarly, provision of appropriate education for gifted children may not be easy. Her Majesty Inspectorate (HMI) Survey (1977) in Britain reported a variety of attitudes formed by very able students. They included; indifference and even hostility to any special attention exhibited in class by other students or by teachers. May be, they think that it is not them who need attention but the weak students. As these gifted students and low achievers interact, diverse attitudes towards learning of mathematics may be formed unless appropriate attention is given to each category of students and an adequate intervention made. In Ghana senior high schools, no special attention is given to students with specific learning needs hence a scenario similar to the one mentioned above is replayed frequently in classrooms and may result in formation of attitudes towards learning. Callahan (1981) stated that students are very important and that their feelings have a strong effect upon the amount of work, the effort put therein and the learning that is finally acquired. Students' experience of negative feelings towards learning of mathematics may lead to unfavourable attitudes to the subject. Such negative feelings could be as a result of excess work load or poor teachers teaching method and the teacher's failure to attend to individual difference. Stanic (1995) while quoting Fennema (1976) stated that some boys enjoy more learning mathematics than girls. This is so depending on their earlier experience. But he asserted that if the learning environment created by the teacher is enabling, both sexes persist in doing mathematics. The various attitudes formed by students as they interact in school, have determined how they learn mathematics. Consequently, this determines their achievement in senior high school mathematics examinations. Whenever attitudes are formed, especially negative attitudes, girls are usually the ones who are on the receiving end. Research by Kaino (1998) in Botswana found out that

girls had more negative attitudes than boys. He also found out that girls feel harassed by boys when they do not answer questions correctly in class. This was so in mixed classes. That they feel shy when with the opposite sex, learning mathematics together. Boys on the other hand indicated that they cannot concentrate when they learn while sitting next to girls. Worse still, they claim girls make noise (Kaino, 1998). While this may be challenged, differences in achievement in mathematics amongst the sexes bear witness that attitudes formed may differently influence learning among the two sexes. This study attempted to identify attitudes formed by students as a result of their own individual experience.

2.4.2 Peer Influence

Much of the research on adolescent peer influence focuses on how and when kids engage in negative behaviors such as smoking, alcohol use, and sexual activity. There is, nonetheless, a substantial body of research that focuses on how peers influence academic achievement and attitudes toward school, a small portion of which focuses particularly on mathematics achievement and attitudes. In their literature review of studies involving academic achievement and motivation, Urdan and Maehr (1995) cite “considerable research that has shown a link between students’ social relationships and their beliefs and behaviors in school” (p.218).

A major criticism of earlier research about mathematics education has been the failure of researchers to incorporate a socio-cultural perspective in favor of a focus on how individuals develop mathematical understanding (as cited in Stinson, 2006). While peer influence on attitudes toward school and academic achievement in general has been studied for some time, such socio-cultural studies with emphasis on mathematics have emerged, with few earlier exceptions, only in the last decade (Hickey, 2003;

Stinson, 2006; Elliot, Hufton, Illushin, & Lauchlan, 2001). Unlike the literature on teacher and parent influence, the body of research on peer influence incorporates student voice far more frequently through interviews and focus groups. The increased use of qualitative and mixed research methods with adolescent subjects highlights the socio-cultural nature of these studies which I will now discuss in further depth.

In the academic context, an individual student can be influenced by peers in a variety of ways. Some peer influence results in increased academic achievement and more positive beliefs about school and learning while other forms of peer influence can have the exact opposite effects. Central to the orientation of peer influence is the individual student's associations:

In particular, peers can either encourage adolescents to view their school experiences positively, or encourage them to see school as an uninteresting or hostile place. The outcomes for any specific adolescent depend on the characteristics of the peers with whom the adolescent spends most of his time (Berndt, & Keefe, 1992, p.51).

Peer influence on student attitudes toward school is mediated by the closely related concepts of social-efficacy and self-regulation. Social-efficacy involves an individual's belief that s/he can successfully establish social relationships including those with peers (Bandura, Barbaranelli, Caprara, & Pastorelli, 1996). Self-regulation is one's ability to resist engaging in risk-laden behaviors espoused by peers and his/her inclination to adopt any higher academic aspirations articulated by peers (Bandura, et al., 1996). Both concepts are integral to the discussion of peer influence as the former influences the student's peer group associations and the latter influences behavioral decision making.

Negative aspects of peer influence emerge in the form of pressure to mask academic ability in an effort to avoid negative peer responses (Sullivan, Tobias, & McDonough,

2006). This type of peer influence is particularly prevalent among African American males (Steinberg et al., 1992; Stinson, 2006). Hufton, Elliott, and Illushin (2002) conducted extensive interviews with 154 fifteen year-olds to determine, among other things, the impact that peers have on mathematics classroom behavior and work rates. Among the subjects were students from three high schools in Kentucky who reported that students who were perceived by peers to work *too* hard were assigned negative labels such as “nerd” (Hufton, et al., 2002). The uncomplimentary depictions carried across the classroom borders to general in-school and out-of-school domains (Hufton, et al., 2002). As a result, “It was normative for pupils to adopt the role of unwilling learners and to try to undermine the efforts of teachers to set and maintain the direction and pace of learning” (Hufton, et al., 2002, p.277). Interestingly, these same students esteemed what appeared to be effortless academic achievement among peers (Hufton, et al., 2002). Evidently, adolescent students feel it is socially acceptable to achieve in school provided one does not overly exert him/herself to do so. As Sullivan, et al. (2006) describe, this attitude is endemic to society as a whole but also to particular classroom cultures. Student interviews indicate that, in the classroom environment, adolescents feel teachers should mediate the attempts by peers to debase effort and achievement (Sullivan, et al., 2006).

Peer influence also manifests itself negatively when students are unable to align themselves with any peer group and when students align themselves with “dissocial” peer groups (Bandura, et al., 1996). Dissocial peer groups are inclined toward deviant behavior (as cited in Bandura, et al., 1996). Students who participate in peer groups that devalue achievement (as many dissocial peer groups do) may purposely disengage from learning as a means to maintain association (Urduan & Maehr, 1995; Bandura, et al., 1996). In addition, association with dissocial peer groups results in

rejection from academically inclined peers which is also correlated to lower academic achievement (Bandura, et al., 1996). Students who have low social-efficacy have trouble making friends. This decreases the student's inclination to seek academic help from peers and results in lower academic achievement (Bandura, et al., 1996).

Assuming an individual student is able to associate with *some* peer group, the discussion in the preceding paragraphs can be oriented in a positive direction. Nardi's and Steward's (2003) research involving interviews with seventy high school students found that students report working with peers in their mathematics class to be helpful in developing conceptual understanding. The students describe asking peers for help to be less intimidating than asking teachers for help (Nardi, & Steward, 2003). This research relates to teacher influence in the context of the types of activities in which the teacher chooses to engage students. Working with peers can enhance self-efficacy beliefs as students feel more positive about their ability to complete a task when they observe a similar peer's success (Bandura, 1997; Schunk, 1987). As indicated above, some level of positive social-efficacy is a pre-requisite to seeking help from peers (Bandura, et al., 1996). Students who identify their school environment, including peer relationships, as positive indicate more positive attitudes toward school in general and demonstrate greater academic achievement (McNair & Johnson, 2009). This supports the findings by Bandura, et al., (1996) that higher levels of social-efficacy promote positive school attitudes. Even association with dissocial peer groups is better than no association at all in terms of attitude orientation as acceptance from *some* peers results in more positive attitudes toward school than does utter rejection (Bandura, et al., 1996). Thus, individual adolescent attitudes toward school are influenced by peers simply through the individual's social-efficacy – his/her

ability (or inability) to *cause* inclusion in peer groups. Further, the *type* of peer group(s) with which one associates will impact access to peer help, inclination to seek peer help, and academic achievement.

The literature on peer influence informs practice in urban schools. Urban educators who are aware of the importance that peer group associations have on student achievement can take steps to help students form positive alliances with peers. Because so many students transfer into urban schools during the school year, these schools contain far more students without peer group associations at any given point in time. Urban educators should consider programs, both at the classroom level and at the school level, that facilitate peer group association when new students arrive.

2.4.3 Parental influence

Parent beliefs about mathematical ability have a strong influence on their children's attitudes toward mathematics and their achievement (Eccles & Jacobs, 1986). Prior to age 18, students spend 85% of non-school time with parents (Shirvani, 2007). Research has long demonstrated the significant impact that parents have on the development of adolescents' school attitudes. Parents who value achievement model behaviors that impart to their children the belief that achievement is important (Hwang, 1995; McNair & Johnson, 2009). Virtually all of the research involving parental influence on adolescent attitudes toward school focuses on *parental involvement*. How researchers define parental involvement varies from simply providing encouragement, to discussing issues, to assisting in the completion of academic tasks, to participation in school activities – or some combination of these activities.

Gonzalez-DeHass, Willems, and Doan Holbein (2005) conducted a literature review of existing research on the relationship between parental involvement and student motivation. They found positive correlation between many aspects of parental involvement and student attitudes toward school including motivation, locus of control, and self-concept. As the authors indicate, their search of ERIC and PsychINFO online databases yielded hundreds of articles (Gonzalez-DeHass et al, 2005). However, when the scope was narrowed by various constructs including language, focus on students in US public schools, and valid research methods, only thirteen studies remained (Gonzalez- DeHass et al, 2005). The fact that only three of the thirteen articles focus on high school students indicates the lack of research in this area. In addition, all three articles are grounded in psychology as opposed to education. I point this out not to imply diminished validity in these studies; rather to highlight the fact that these studies are not solely education based and do not specifically address mathematics. A major focus of all three articles is parenting *style* which informs but is not a primary concern in the current study. Still, these studies are relevant to the current study as they show parental involvement impacts student beliefs about school and self.

Steinberg Lamborn, Dornbusch, and Darling (1992) found that parental involvement, which they define as including helping kids with homework, attending academic and extracurricular school programs, helping kids with course selection, and monitoring progress, increases student achievement and student engagement in school. The correlation was significantly less pronounced among African-American students. The authors cite research that indicates peers have a stronger influence on the academic performance of African-American adolescents as a possible reason for the weak

correlation between parental involvement and African-American students' achievement and engagement in school (Steinberg et al., 1992).

Trusty and Lampe (1997) also conducted research involving high school students and their parents. They extend the relationship between parental involvement and student achievement to include *locus of control*. Trusty's and Lampe's work cites the Steinberg, et al. (1992) study significantly and generalizes parental involvement to "how often parents did things with the student...discussed school, jobs, current events, and troubling things with their adolescent." (p.377). The broad focus of this definition demonstrates the nature of the study which is less focused on educational constructs and more focused on adolescent development in general. However, it informs the current research in that locus of control is highly related to self-efficacy and academic success (Bandura, 1997; Ross & Bruce, 2007). Trusty and Lampe (1997) found that students who perceived higher levels of parental involvement also tended to be internal in their locus of control. That is, such students had a stronger sense that they control the events that affect them (Rotter, 1990).

In a 2002 study by Gonzalez, Doan Holbein, and Quilter, the relationship between high school students' goal orientation and parenting style is explored. The study positively correlates parental involvement to mastery goal orientation. Gonzalez et al (2002) define two types of goals: mastery goals "whereby students are interested in learning new skills and enhancing understanding" (p.451) and performance goals "in which students are concerned with proving their ability or avoiding negative judgments of their competence" (p.451). Students who are oriented toward mastery goals seek out difficult tasks, persist through them, and demonstrate inherent motivation while students who are oriented toward performance goals exhibit

opposite behaviors (as cited in Gonzalez et al., 2002). Gonzalez et al. (2002) do not specifically define parental involvement, which is a limitation to their study; however, they cite both Steinberg et al (1992) and Trusty and Lampe (1997) in their discussion of parental involvement. I must be presumptuous and assume that Gonzalez et al. take some composite of the definitions of parental involvement described in the preceding paragraphs as theirs. Gonzalez et al. (2002) found that parental involvement was positively related to mastery goal orientation. This is significant in that students with mastery goal orientation exhibit behaviors that are associated with positive self-efficacy and positive self-concept. Thus, parental involvement is positively correlated to student self-efficacy and self-concept beliefs.

Hosiin Shirvani (2007) conducted a study involving ninth grade Algebra students and their parents. Shirvani's research is of particular interest because the subjects are high school students and their parents and because the study is situated in the mathematics classroom. The researcher administered surveys to parents and students in treatment and control groups (Shirvani, 2007). The surveys were administered prior to and after parents in the treatment group received increased communication from the Algebra teacher about their child's performance (Shirvani, 2007). Results showed that "students in the experimental group had significantly higher self-confidence in their abilities of doing mathematics work" and "had significantly improved their conduct and engagement in the classroom" (p.42). These findings support the extension of the generalized findings about parental involvement in children's education described above to the specific context of parental involvement in mathematics education.

Overall, this body of research demonstrates that parental involvement impacts student attitudes. Parental involvement increases achievement and student engagement in school (Steinberg et al., 1992); it develops in students an orientation toward internal locus of control (Trusty & Lampe, 1997); and it fosters mastery goal orientation (Gonzalez et al., 2002). Internal locus of control and mastery goal orientation foster positive self-efficacy beliefs and positive self-concept which increase student engagement and achievement (Karjalainen, 1989; Wilkins, 2004). Because any degree of parental involvement requires a commitment of time, the importance of parental involvement has implications in urban contexts where many parents do not have the time to give. Often, the parents of urban school students work multiple jobs in an effort to support their families financially. In addition, many urban school students are living in one parent homes where the single parent must meet the financial and time demands typically distributed between two parents. The financial constraints faced by the parents of students living in poverty inhibit parental involvement (Gutman, & Eccles, 1999).

2.4.4 School influence

In any given year of learning, a student spends more time in school than at home. Much influence on a student's learning could in school given this much time spend therein. While at school he/she goes through a planned school program. He/she is subjected to a curriculum of mathematics which is administered in a classroom. According to Eshiwani (1984), there is the need to have adequate resources in school to ensure students effectively learn mathematics. These resources include adequate and appropriate 3-dimensional models, geo-boards, and textbooks among others. Access to these learning resources will determine how students learn mathematics. Most private schools are well equipped but most public schools lack basic resources

(Twoli, 1986). If the school administration has not provided sufficient number of these resources, learners, especially girls, are likely to resent mathematics as being too involving and too much competitive. Russell (1983) also found out that manipulative teaching models are preferred by boys. Hence in a mixed classroom, boys “lord” over them while girls “lose out” in the use of these apparatus and materials (Twoli, 1986). Use of textbooks with sexist orientation has not helped things either (Costello, 1991). Textbooks written by some authors have examples of boys doing very well. Frequent use of boys names in the end-of-topic exercises make girls to feel that they are “passengers” in mathematics learning. While in school, girls are given less airtime to express themselves while boys can rumble and mumble and yet the teacher stills waits for him to finish (Twoli, 1986). Fennema and Sherman (1976) while discussing on gender-difference in mathematics achievement suggested that successful programs need to be established in schools to ensure adequate access to learning resources. They assert that clubs and symposiums in school increase hands-on activities during mathematics session and suggest more mathematical questions asked should be from the hands-on activities. The two authors also suggest that the subject should be gender neutral activity especially in school. While these are good suggestions, and that hands-on activities have also been recommended for senior high school teaching and learning of mathematics, the students still perform dismally. This required a study to find out whether students’ experience in senior high school has contributed to formation of attitudes towards learning of mathematics.

2.4.5 Societal influence

According to research by Orton (1994) it was disclosed that by the time a student joins Form One, he/she will have interacted with his/her parents, who to a great extent, influence his/her perception of learning in school in general and specifically learning

of mathematics. He further attributed the noticeable difference in learning among boys and girls to “societal attitudes and expectations”. He further asserted that influences of society and from the environment affect mathematical development of students at various levels amongst boys and girls. Boys and girls are socialized differently while playing children games. Boys are engaged in more vigorous activities while girls take more passive roles. This scenario is replayed in school and in class while learning. If no deliberate steps are undertaken to counter this mind-set, students may form unfavourable attitudes towards any learning activity and this may lead to variation in what is learned in a subject. On the other hand, difference in parental expectations and desires and pressure they exert at home on their sons and daughters has been attributed for attainment variations among the sexes (Orton, 1994). Society views mathematics as a male subject as Costello (1991) concluded. This is especially when parents react and reinforce daughters and sons differently. When their children do something mathematical, daughters are told “you’ve really tried” meaning nothing much is expected from the female child. But to their sons, they are told “you can do far much better” (Costello, 1991). Meaning male children are expected to do a lot more in mathematics. Such comments said by parents consciously or without much thought are registered in the sub-conscience of a child and may influence how he/she perceives mathematics. Hence formation of attitudes among students may have been unconsciously registered from parents particularly and from the society in general.

Dislike of mathematics found in both adults and students is associated with anxiety and fear. This anxiety and fear may elicit negative attitudes towards the subject among adults and these general unfavourable perceptions and attitudes about mathematics are passed on to children from adults. Society treats and views

mathematics as an unknown territory made up of x 's and y 's. Society also views mathematics teachers as sarcastic and impatient, didactic and scornful (Mac nab and Cummine, 1986). These views are unconsciously picked by students and they come to mathematics classroom with an already distorted perception and attitudes towards learning of mathematics. Ying et al (1991) did a study comparing 894 students from 26 schools in Hong Kong. They undertook a study to identify correlations between mathematics achievement and expectations from parents and of students themselves. After conducting multiple regression analyses, they revealed that the parental expectation and students' achievement in mathematics had a strong correlation. Whether societal and parental expectations influence attitudes formation amongst senior high school students was the contention of this study.

2.4.6 Mathematics teachers

It was observed that new curriculum implementation and syllabus re-arrangement become a challenge to teachers to acquaint themselves and this impacts negatively on how students learn mathematics while in class (Russell, 1983). Fishbein and Ajzen (1975) argue that whenever a new concept is introduced in the syllabus or taught for the first time in class, an attitude towards it is formed both by the students and the teachers. The teacher's attitudes reinforce the attitudes formed by the students towards learning of the new concept or the consequent similar concepts. Twoli (1986) in his work on sex-difference in science achievement, found out that teachers' characteristics influence learning. A teacher's way of looking at issues generally and in particular, mathematical concepts influence the learner. A student would like to learn a new concept depending on how the teacher presents it. Flanders (1965) also found that students of teachers who vary their teaching style have positive attitudes and these teachers are able to teach a concept (in mathematics) better and learning is

made easier. She added that it is paramount for such a teacher to have a mastery of content being taught. If this be the case students' attitudes towards learning of mathematics may be enhanced.

Flanders (1965) adds that teachers who show acceptance, clarifications of students' feelings and praise have been associated with more positive attitudes towards a higher achievement by the students. Costello (1991) agrees that many teachers often unconsciously reinforce and validates students' perceptions of appropriate gender-related behaviour. He further asserts that boys are assigned assertive roles and when they do well they are told they have a talent. But girls may be assigned less assertive roles and when they do well in mathematics, they are reminded that they have at least worked hard to achieve such grades. Because of this unconscious reinforcement from teachers, boys and girls form different attitudes towards learning of mathematics. Costello (1991) also found out that advice given to girls by teachers is too restricted in scope, usually too little and given too late when a female student is almost completing her senior high school education. Teacher's gender may determine how he/she portrays mathematics. Unconsciously male and female teachers form attitudes towards the subject they are teaching. These attitudes formed by teachers depending on their own gender influence how their students will learn the subject being taught, mathematics included. Fennema and Sherman (1976) assert that teachers are a major determinant in students' learning of mathematics and to a large extent determine what the students might achieve (Eshiwani, 1984). This is because of the teacher's inherent attributes; his/her qualification and training, his/her general behaviour and attitudes towards mathematics, other subjects and towards the students themselves. Worth noting is that most female teachers prefer to teach language subjects and in arts subjects. But male teachers mostly prefer science and mathematics. This scenario is

consciously registered in minds of the students and in the process they unconsciously form attitudes towards learning in general and particularly learning mathematics (Tsuma, 2018). Cockcroft (1982) noted aptly that there is no area in knowledge, where a teacher has more influence over the attitudes as well as the understanding of his/her pupils than he/she does in mathematics. During his/her professional life, a teacher of mathematics may influence for good or bad the attitudes towards mathematics of several students and decisively affect many of their career choices. Orton' (1987) works found out that teachers pay more attention to boys than girls while teaching mathematics because of their own prejudiced believe that boys achieve better than girls in mathematics. Hence the type of class set up became this study's contention.

2.4.7 Gender factor

According to a study by Stanic (1995), he identified that sex-difference in achievement in mathematics was related to a sex-difference favoring males in terms of confidence in doing mathematics. He asserts that teachers consciously or unconsciously reinforce the confidence of students while teaching mathematics. He further asserts that girls are reinforced differently from boys, an idea similarly shared by Costello (1991). Consequently, this will determine how the students will learn the subject and in turn reflect how they achieve in their end of the course examinations.

However, the assertion of Stanic (1995) may not necessary mean that teacher reinforcement on students learning is the sole reason for better achievement in examination. Girls can perform as well as the boys, so long as they are given an enabling environment of learning of mathematics. Stereotyped perception of the gender should be discouraged by all education stakeholders. Attitudes may be formed

by students particularly when they get to form one since research amongst 11 years old and below indicate little or no difference in attitudes between boys and girls Costello (1991). By the time some girls prepare for WSSCE in Form Three, they expect not to do well but are surprised by success or count themselves lucky to have passed when results are released. But when boys do well in WASSCE it is taken as expected and not as a surprise. More specifically, difference between sexes in achievement varies depending on topic. Girls do significantly better than boys on questions demanding computational skills. But on the other hand, boys do better in areas dealing with measurement and problem-solving (Costello, 1991).

Since marks in WASSCE or in whichever examination are awarded in total regardless of the topics tested, girls and boys should on average be performing equally well. But this is not the case. This study attempted to identify this disparity. Gender difference in achievement in mathematics also comes as a result of sex difference in attitudes at senior high school where students' views of the difficulty of mathematics vary. Boys tend to underrate the level of difficulty, and over rate their own competence. Consequently, they do less well than they expected. But senior high school girls are more likely to over rate the difficulty and devalue their own expertise and they often achieve better results than they expected (Costello, 1991). Worth noting also is that students' emotional response to mathematics is more evident in girls than among boys. They exhibit intense anxiety and become vulnerable and may misunderstand questions in an examination. In general girls are doubtful of their competence in mathematics and are less confident in their mathematics ability (Fennema et al, 1976). Any academic decline in mathematics has got to do with a drop-in self-confidence especially in girls as confirmed by Fennema and Sherman (1976). This decrease in self-confidence and lack of interest leading to formation of attitudes towards learning

of mathematics is as a result of the differential treatment of girls and boys receive while in school. Females have been found to be superior in manual dexterity and in rote learning ability while males do well in tests involving divergent thinking (Orton, 2007). Hence success should not be viewed only on what grade one achieves in examinations but should rather be how much mathematics one has learned while in high school. The unfortunate thing though, is that mathematics is being used as a “filter” in career choices (Kaino, 1998). Those who opt out of mathematics when joining university are denied some important opportunities. This may influence attitudes towards learning of mathematics high schools. More so with the girls who develop “learned helplessness” (Twoli, 1986). Whether gender determined students’ attitudes and consequently his/her achievement in mathematics was the contention of this study.

2.5 Possible interventions

Since attitude formation by students seems almost inevitable and since mathematics is one of the compulsory subjects in GES syllabus and that the subject is examinable under WASSCE regulations and policy; all education stakeholders might have no choice but to ensure that a better learning environment is created for the students.

2.5.1 Learning resources

Sufficient learning resources for mathematics and equal access to these resources by all students are important. They may include books, teaching aids, calculators and computers. The teacher concern may need to ensure proper utility of the equipment. Where there’s shortage, a well set program should be made to ensure all students access library, mathematics practical rooms and any other facility meant to promote mathematics learning.

2.5.2 Role of the society

The general public should desist from viewing mathematics as if it were unknown territory where one is expected to venture without tools to guide. Mathematics should be viewed with a more positive attitude. The same public presumably views mathematics teachers as with little or no human feelings (Mac nab and Cummine, 1986). Since the students are first in the society before they are in school, they unconsciously form attitudes towards mathematics and towards anyone who teaches mathematics. Unless deliberate effort was made to counter any unfavourable attitudes being formed by students as they enter Form one (Orora, 1986), the attitudes may overshadow a student's interest in mathematics.

Parents should deliberately attempt to treat their children equally, make unbiased comments regarding learning of mathematics and avail equal opportunities to both daughters and sons to pursue mathematics (Costello, 1991). This is with an effort to negate the unfavourable attitudes from being formed, especially by the girls. Parents who achieved well in education and other role models in the society should make deliberate effort to popularize the subject. They should go out of their way to convince the young ones about the importance of the subject. This withstanding, some students, especially boys know that mathematics is a very important subject especially in choosing career and application later in life and yet fail to develop interest and learn the subject while in school.

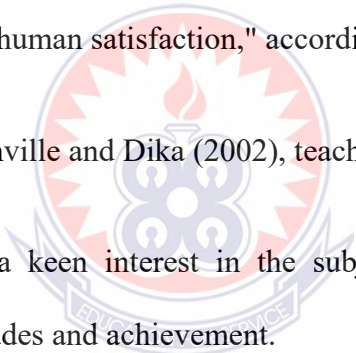
2.5.3 Teacher-students interaction

Students learning mathematics do so with assistance from their teachers. Teacher-learner interaction in classroom should be geared towards achieving a goal; to learn mathematics, teachers should be conscious of their own attitudes towards

mathematics and other subjects and towards his/her students regardless of their gender. He/she should provide guidance and counseling to students with repeated under-achievement. He/she should reinforce them accordingly and motivate them by providing for the individual differences. Teachers in Ghana are recruited and posted to teach in high schools by ensuring that such teachers have received adequate training; are in-serviced where necessary and proper supervision is done in schools. Despite all these, learning of mathematics in senior high schools is wanting.

Once more, some math teachers in our secondary schools today do not sufficiently inspire their students to learn or study math. Numerous studies "indicate that positive motivational policies and techniques produce not only greater levels of productivity but also greater levels of human satisfaction," according to Ogunsola (2006).

According to Singh, Granville and Dika (2002), teachers who

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- i. Demonstrate a keen interest in the subject have a positive impact on students' attitudes and achievement.
 - ii. Express a desire for students to comprehend the subject.
 - iii. Exercise effective class management without being overly strict.

According to Addae and Agyei (2018), "the teacher's attitude toward a subject area and the teaching of the subject are unquestionably important variables to consider when describing the teacher's function within the classroom." Improvement in teachers' interactions with students, in the words of Hotaman (2010), "can affect the students' achievement and attitude." In regards to attitudes, they said that "dues about the characteristics of classrooms where students own description of their eight classrooms where instruction move at a slower pace, are more goal directed, are less

difficult and where there is better physical environment and less favoritism" should be taken into consideration. Students of all abilities respect teachers who are obviously passionate and knowledgeable about their subjects, according to Hamblini (2006). They respect someone who is willing to put in a lot of effort on their behalf, whether it be through less preparation, presentations at their level of understanding, or preparation for external exams, and they will respond by giving it their all.

In his research on the issue of teaching mathematics, Idang (2005) discovered that some instructors dissuade their pupils, particularly those who are "undecided," by creating the impression that the subject is so challenging that only a select few can master it. By contributing to the myth that mathematics is esoteric and intimidating the lazy and the undecided, they merely mystify the subject. He attributed this to the teachers' lack of training in the appropriate psychological approach to mathematics instruction. In order to hide their shortcomings, they thus scare away students.

We discovered that the majority of teachers' approaches to teaching the subject are flawed. They claim that most teachers do not do enough to engage their students in the material by making it enjoyable. They go on to say that the majority of teachers favor the learning by rote-method. They simply hammer home the laws and instruct their students to memorize them.

He also criticized the "teacher-centered" approach to education and advocated for "student-centered" math instruction. This is his way of saying that students, not teachers, should be in charge of the classroom. He supported the so-called inquiry method, according to which the teacher should guide or pilot the students as they seek out their own rules.

According to Osigwe (2007), "it has only recently come to light that many teachers, in some cases, develop the habit of avoiding some topics that are prescribed in the syllabus, thereby allowing for half-baked knowledge of the subject."

According to Kalejiaye, the size of the current mathematics classes should be reduced so that teachers can effectively supervise the class. This was stated by Kalejiaye in Idang (2005).

In order to account for any potential interactions between teacher attitude and student achievement, William (2006) sought to ascertain "if a class size student attitude did exist among subjects in the database of a large-scale evaluation project. The study's findings showed that there was no conclusive evidence to support the notion that smaller instructional units at the high school level are directly related to better generation of a positive attitude toward science. This observation will seem to imply little support for theories that assert that effective reactions of students to subject matter may be invoked, such as maintaining one's own identity, developing a personal connection with the teacher, and providing opportunities for participation.

In his population, Southerland (2002) found that parental attitudes, academic achievement, and grade level were the most significant predictors of students' attitudes toward mathematics. Furrer and Skinner (2003) also stated that expectations for daughters were directed by perceived material variables, and that this expectation was found to be significantly higher in girls than in boys with regard to the mean level of career expectation.

The way that students are introduced to mathematics in many primary schools has been more than anything else responsible for the dread (and at times hatred) that many

of them have for the subjects by the time they reach secondary school, according to Taiwo (2001). He claimed that it was impossible to ignore the negative effects of teaching in a foreign language in primary schools. Even using his mother tongue, a primary school teacher finds it challenging to explain concepts to his students in a way that they will comprehend. not to mention forcing him to do it in a language he can hardly be said to be proficient in.

More than any other subject, he claimed, a teacher's ability to impart knowledge in mathematics is improved when he or she speaks to students in a language they can easily understand. This gives the teacher a better understanding of the idea they are trying to convey.

Fakuade (2004) stated that when thinking about children's issues, it's important to remember the limitations of using a language other than one's mother tongue as a teaching and learning tool. The few studies and surveys that are currently available in this field support the idea that using a foreign language for teaching and learning severely hinders students' ability to learn. The Commonwealth Association for Science and Mathematics Education sponsored a workshop on language and the teaching of science and mathematics with a focus on Africa, which revealed how difficult a problem language is in the teaching and learning of mathematics in Africa.

2.6 Empirical Review of Attitude Research

From the literature, a lot of attitudinal studies have been carried out which includes among others; attitude and its influence on students' achievement in mathematics and investigation of gender differences (Fennema & Sherman, 1976; Mason, 2003; Sandman, 1980 & Tapia; Marsh, 2004). McLeod (1992) indicated that affective background factors play a central role in learning mathematics and in maintaining a

continued interest in the subject. With regards to the effect of attitude on students' learning, Mallam (1993) indicated that, "negative attitude ... can powerfully inhibit intellect and curiosity and keep us from learning what is well within our power to understand" (p.223) which lends credence to the necessity in appreciating senior high school pupils' attitude towards mathematics as a discipline. Ruffell, Mason and Allen (1998) indicated that students who hold positive attitude towards mathematics tended to express a generally favourable perception towards mathematics although Fraser and Butts (as cited in Ruffell, et al, 1998) found no significant correlation among students' attitude and mathematics. Also, Hammouri (2004) in a study of the effects of student-related variables on achievement in mathematics of 3736 Jordanian 8th-graders reported that attitude was among the affective variables that led to variation in mathematics achievement of the students. Whereas a lot of such studies have reported gender differences at the secondary school level, quite a few of these studies have found differences in attitude towards mathematics among early elementary students although noticeable differences begin to appear in their attitude as they age (Taylor, 2004). Rathbone (1989) noted that children at the elementary school like mathematics and that there are no significant differences in attitude of girls and boys, however, differences begin to appear as students' progress in school.

The Fourth National Assessment of Educational Progress (NAEP) Mathematics Assessment report indicated that males were more likely to report being good in mathematics, even though both genders were equally likely to report enjoying mathematics (Steinback & Gwizdala, 1995). They also reported significant gender differences in attitude towards mathematics, self-confidence, and perceived usefulness, in favour of males.

Taylor (2004) in a study of 745 students in four high schools in Southern California attitude towards mathematics reported that students' attitude towards mathematics was positive. This followed an investigation he carried out concerning students' attitude towards mathematics using The Test of Mathematics Related Attitude (TOMRA). Students' attitude towards mathematics was found to be influenced by two factors on the TOMRA namely enjoyment of mathematics and normality of mathematicians.

Mallam (2002) in a study involving 240 female students drawn from five co-educational and six all-girls' secondary schools in Plateau State, Nigeria, reported that females attending all-girls' schools had more positive attitude towards mathematics than females attending co-educational schools. This finding indicates that even among the same gender, differences in attitude towards mathematics may exist based upon school-type.

Eshun (2000) in a study of attitude of senior high school students involving 1419 students from 12 secondary schools in the Central and Western Regions of Ghana reported that students' attitude towards mathematics was positive on all the eight variables measured namely: usefulness of mathematics, confidence in learning mathematics, success in mathematics, effective motivation, mathematics anxiety, mathematics as a male domain, understanding mathematics and, like doing mathematics.

The three highest responses were on the variables: like mathematics, confidence in learning mathematics and usefulness of mathematics in that order. The least positive response was for mathematics anxiety followed by motivation. He further reported differences in attitude towards mathematics based upon school-type. Girls in single-

sex schools expressed more confidence in doing mathematics compared to boys in single-sex schools while girls in mixed schools expressed far less confidence than boys from single and mixed schools.

2.7 Determinants of Students' Attitude towards Mathematics

The issue of students' attitude in senior high school mathematics cannot really be attributable to a particular variable. There are several ways to evaluate a student's "quality" attributable to formal education but the most tractable is how he or she performs in tests. (World Bank, 2003). According to Nzabihimana (2010), teachers are central to any consideration of schools, and majority of education policy discussion focus directly or indirectly on the role of teachers. Some of the possible determinants of students' attitudes and perception in the context of mathematics are discussed below under three areas, which happens to be Teacher related determinants, School related determinants and Home related determinants of students' attitude.

2.7.1 Teacher as determinants of students' attitude towards mathematics

The role or impact of teachers on the attitude of student' in mathematics can hardly be doubted. Sanders (2000), in a study concluded that "differences in teacher effectiveness are the single largest factor affecting academic growth of the population of students". According to Betts, Zau & Rice (2003), the most important school resource is the teacher and the many dimensions of their training, including years of teaching experience, their official teacher certifications and Subject authorizations, their highest academic degree, and their filed(s) of study at college. The teacher related determinants to be discussed in this paper are gender and teacher academic qualifications.

The gender of teacher appears to be one variable to play a role in the students' attitude towards mathematics. Unfortunately, most of the earlier studies carried out on the influence of gender and students' attitude and perception of students appear to be concentrated in mathematics and science either than other disciplines. Over the years, however, a number of studies have shown the perception that males do better than females in mathematics needs to be re-thought (Eniayeji, 2010 & Abubakar, 2011). Fitchett (2010) found that, previous researches on gender within mathematics have indicated that the male orientation of the mathematics dissuades many young women from entering the field. From the point of view of Fitchett, it may not be fair to compare the influence of female gender on attitude and perception of students' in mathematics when there is numerical advantage to the male gender. The discussion so far has given a clear indication of the influence of gender on students' attitude and perception of mathematics. Besides, it appears all the studies conducted to determine gender influence both on mathematics and science. It may not be adequate based on this to state that a particular gender has a better influence on attitude and perception of students in senior high schools. According to Arain (2011), the importance of teacher is widely accepted because of their impact on students' attitude and perception. He contended further that, research has shown that improved teacher variables were most likely to produce substantial gains in students' attitude and perception in mathematics. One of these teacher related variables that could lead to gains in students' attitude and perception in mathematics is teachers' academic status. In a study to determine the effect of different teacher certification levels on students' achievement, Goldhaber & Brewer (2000), found that the type of certification a teacher held was related to students' outcomes. For instance, they found that students of teachers with standard certification in mathematics did better than students with teachers that had either no

certification or private school certification in mathematics. Goe and Stickler (2008) supported earlier findings from Frome, Lasater and Cooney (2005) which indicated that completion of an undergraduate or graduate major in mathematics was associated with higher students' achievement in high school and middle schools. These findings may not be conclusive as there are private senior high schools in Ghana who employ relatively unqualified teachers in terms of certification and yet their students in some instances perform better than some public senior high school students with very qualified (certification wise) teachers. This therefore indicate that, certification aside there are other teacher related variables that account for the achievement of students in mathematics in senior high schools in Ghana. It is important to add that, the problem of non – specialists' teachers teaching mathematics is not peculiar to Ghana.

2.7.2 School related variables as determinants of students' attitude towards mathematics

The school and the classroom are the laboratories from where the teacher operates. Therefore, the skills and knowledge a mathematics teacher carries to the classroom would make further impact if the school and classrooms(s) from where he / she teaches were conducive for teaching and learning. According to Lai, Sadoulet and Janvry (2009), common sense suggests that school quality should affect students' attitude and perception; however, there is limited rigorous supporting evidence. According to Lai, Sadoulet and Janvry (2009), in explaining students' performance, they predominantly explained teacher characteristics, leaving very little role for other school resources and peer quality. There have therefore been great challenges in rigorously assessing the impact of school quality on students' attitude and perception. According to Asikhia (2010), the importance of the location of the school, the appearance of the physical structures of the school cannot be overemphasized in

accounting for the attitude and perception of students in schools. The location of the school according to Asikhia (2010), will determine the patronage and to some extent the caliber of students and teachers, it will attract. It is common knowledge that students who perform well at the Junior High Schools (JHS) level may not be tempted to go to schools in an obscure location with poor physical structures. Indeed, schools such as these will most probably not attract highly qualified students and teachers. Betts, Zau and Rice (2003) found in earlier research that, schools in less affluent areas tended to have less experienced, less educated teachers who were less likely to hold full academic credentials and these were schools likely to have the students with poor attitude and perception. Highly qualified and experienced teachers are more likely to move to schools with good – looking infrastructure and located in an area that is easily accessible. When this happens, the probability is that unqualified teachers and students with poor grades at the Junior High School level will be compelled to go to schools that are outlandish and have poor infrastructure. This will further de-motivate both teachers and learners leading to poor attitudes and perception in subjects taught. Although from research, teacher experience and qualifications are not the only determinants of students' attitude and perception, they play vital roles in determining the level of a student's performance in mathematics. The quality and level of teacher motivation will determine largely the performance of the students. A school that for one reason or the other has a crop of uncommitted teachers will suffer in terms of academic performance of the students. The school system determines largely the level of communication and cordiality that exist between teachers and students; teachers and teachers; and finally, also between students and students. When the school is run in a manner that teachers are dissatisfied, the students then become the ultimate losers, because, teachers are no longer paid by the result of their students as it used to happen

in Ghana in the 1930's and 1940's where teacher's payment was linked to the percentage pass of students / pupils in schools. One other school factor that could trigger poor attitude and perception of students is the classroom environment. Sometimes when a school is reputed to be a good school because of the location, quality of teachers, appearance of the physical infrastructure among others, enrolments tend to be very high. With time, if not well managed, the learning environment will become uncondusive as there will be overcrowding in the classroom. In a study, Porter (2002) found that, students made gains that were more academic when instruction was effectively connected to assessment. However, where there were large classes, teachers moved away from giving adequate assignment to students because of the workload of marking. It also affects classroom management and class discipline. Teachers cannot also individualize in their teaching. This according to Nzabihimana (2010), teaching subjects that need great concentration like Geography, Physics, Chemistry, Mathematics among others, are likely to be negatively influenced by a high pupil – teacher ratio. When this happens, students are not properly assessed and this affects them ultimately. Having explored some of the teacher and school related variables as determinants of students' attitude and perception of students in mathematics in senior high schools, it will be also worthwhile looking at the extent to which some home factors that also determine students' attitude and perception of students in senior high schools.

2.7.3 Home related variables as determinants of students' attitude towards mathematics

The home of the students as a determinant of his or her attitude and perception in school is apparent. A close look at the types of home, the Socio- Economic Status (SES) of the family among others, will indicate that, there is a relationship between

the home and students' attitudes. Brecko (2010) contended that, a key goal of education is to ensure that every student has a chance to excel, both in school and in life. She argued further that, children success in school determines their success as adults, determines whether and where they go to college, what profession they enter and how much they earn. According to Loop (2012) the actual schooling is not the only contributing factor that could assist a child's learning and achievement in school. Loop (2012) contended further that, although the academic environment is important, each student's individual home situation greatly influences educational goals and progress. Therefore, attitude and perception in high schools do not depend on a student's mental and physical abilities alone. The family and social background of students greatly influence student's attitude and perception (Paul, 2012). The relationship between the child and the parent is a crucial home factor that influences the child learning and achievement. Parents who are responsive to their children needs can influence the attitude and perception of their children in schools. Parents' educational aspirations exert a significant influence on students' achievement. Therefore, all other things being equal, parents who have aspiration that challenge, inspire and motivate their children should correlate with their children's attitude and perception in school. If a child comes from a home where parents are not responsive to their physical and emotional needs, such students become depressed and if the situation is not handled well, it will go a long way to affect their performance. Students belong to home of different Socio- economic backgrounds and this affects them in diverse ways (Paul, 2012 & Loop, 2012). The school according to Paul (2012) is not doubt important in a student's achievement. Recent researches however indicate that, parents are even more important in terms of students' performance in schools. According to Paul, recent researches has shown that, parental involvement in

checking the homework of their children, regular attendance of school meeting, discussing school activities with their children has more powerful influence on students' academic attitudes and perceptions, causing good academic performance than anything about the school the student attends. Students of varied family backgrounds attend educational institutions in Ghana like other countries. These differences range from parents' level of education, interests in education, support to their children among others. It is most probable that educated parents will be more inclined to giving good education by providing the needs of their children. It must however be added that, there are some parents who are well educated yet pay very little attention to the education of their own children. If this scenario persists, students of parents who pay little attention to their children education will perform poorly in schools due to negative attitude they might put forward. It must also be added that, there are situations where illiterate parents pay more attention to their children education even though they are illiterate themselves. Such illiterate parents, they do not want their children to suffer the deprivations they had to endure. It may therefore be that parents' level of education is a strong determinant of students' attitude and perception of students' in school. A home that encourages learning is perhaps the most accurate predictor of success at school.

2.8 Possible Expected Learning Environment

Several studies on attitudes towards learning of mathematics and achievement in the subject indicate that attitudes play a major role in a student's effort to learn. Attitudes formed could genetically be predisposed (according to Orton, 2007) or being influenced by societal expectation (according to Mac nab and Cummine, 1986), especially parents (Ying, 1991), as a result of unconscious reinforcement by the teachers (Russell, 1983) or could be as a product of student-student or teacher-

students interaction while in school (Costello, 1991). These attitudes formed could be positive or negative towards learning of mathematics. Whatever nature of attitudes formed by the students, they may determine their confidence in learning mathematics and may also help them perceive the usefulness of mathematics hence enjoy mathematics as they learn Fennema and Sherman (1976). There may be no simple and clear relationship between specific attitudes and achievement as Stanic (1995) asserts. But it seems attitudes influence how a student learns mathematics. It becomes even more difficult to describe clearly the connection between attitudes and achievement in the subject. But attitudes can lead one to learn less mathematics and consequently achieve little in the WASSCE or any other examination. Costello (1991) and Mac nab (1986), both asserts, though differently, that mathematics examinations are unique in providing the possibility of obtaining 0% or 100%. This, in the process of learning the subject, may cause much anxiety. Mac nab (1986) particularly stress the need to improve perceptions of mathematics in the minds of students by stressing on the creative aspect of mathematics and its applicability rather than on what one achieves in the examination. When this study was conducted, the findings were an addition to findings on relationship between attitudes and learning and performance of mathematics. More specifically, the study concentrated on identifying attitudes influencing the learning process in mathematics class among high school students and their effectual performance in the subject. The study investigated the sources of such attitudes and the factors reinforcing them. Whatever the attitudes formed and whether these attitudes influenced learning and performance of mathematics was the contention of this study.

The following conclusions can be drawn from this review:

1. Many students "Fear" mathematics and think it's an insurmountable challenge.
2. That the attitude of students will improve if mathematics is taught effectively in primary schools, according to authorities.
3. There are a number of factors that influence student attitudes, including the teacher's attitude toward the subject, his own knowledge gaps, the lack of teaching resources, parental attitudes, class size, and the use of foreign languages when teaching mathematics.



CHAPTER 3

METHODOLOGY

3.1 Overview

This chapter outlines the procedures and strategies that were used to collect and analyse data. It focuses on research design, variables, location of the study, target population, sampling techniques and sample size, description of research instruments, description of pilot study and an outline of methods and techniques that were used to collect, analyse and present data.

3.2 Research design

Research designs are plans and the procedures for research that span the decisions from broad assumptions to detailed methods of data collection and analysis (Creswell, 2009).

Descriptive survey design was employed for the study. According to McMillan and Schumacher (2010), it is a design whereby responses of participants are presented statistically involving the collection and analysis of data, and finding out the answers concerning the current status of the subject. Also, it is a study of variables in their natural setting or under usual circumstances. This comprises observation of facts, formulation of hypothesis, collection and classification of data, interpretation of data, formulation of theories, application of facts and predictions. Denscombe (2003) underscored this by intimating that the notion of a survey suggests that the researcher intends to get information “straight from the horse’s own mouth” and is purposeful and structured. He maintains that surveys are associated with large scale research covering many people.

The descriptive survey was therefore employed to help produce a good number of responses from the sampled Senior High School students within the Komeda Edina Eguafo Abrem (KEEA) Municipality. The strategy allowed the use of questionnaires which generated large volumes of data that were analyzed statistically and also enabled the researcher to observe, describe and document certain occurrences that existed. It is as a result of this that Best and Khan (1993) postulate that descriptive statistical analysis limits generalization to the particular group of individuals observed and that no conclusions are extended beyond this group. Further, the researcher employed descriptive statistical tools such as percentages, frequencies and the mean in the analysis of data collected. McMillan (2000) agrees that descriptive study simply describes and provides an understanding of a phenomenon usually with simple descriptive statistics and it is particularly valuable when an area is first investigated. He further elaborated that, descriptive survey seeks at describing, observing and documenting aspects of a situation as it naturally occurs rather than explaining it. The wide and suitable coverage gave credibility to generalized statements made on the basis of the research.

The stages of the research process that were used are shown in Figure 3.1

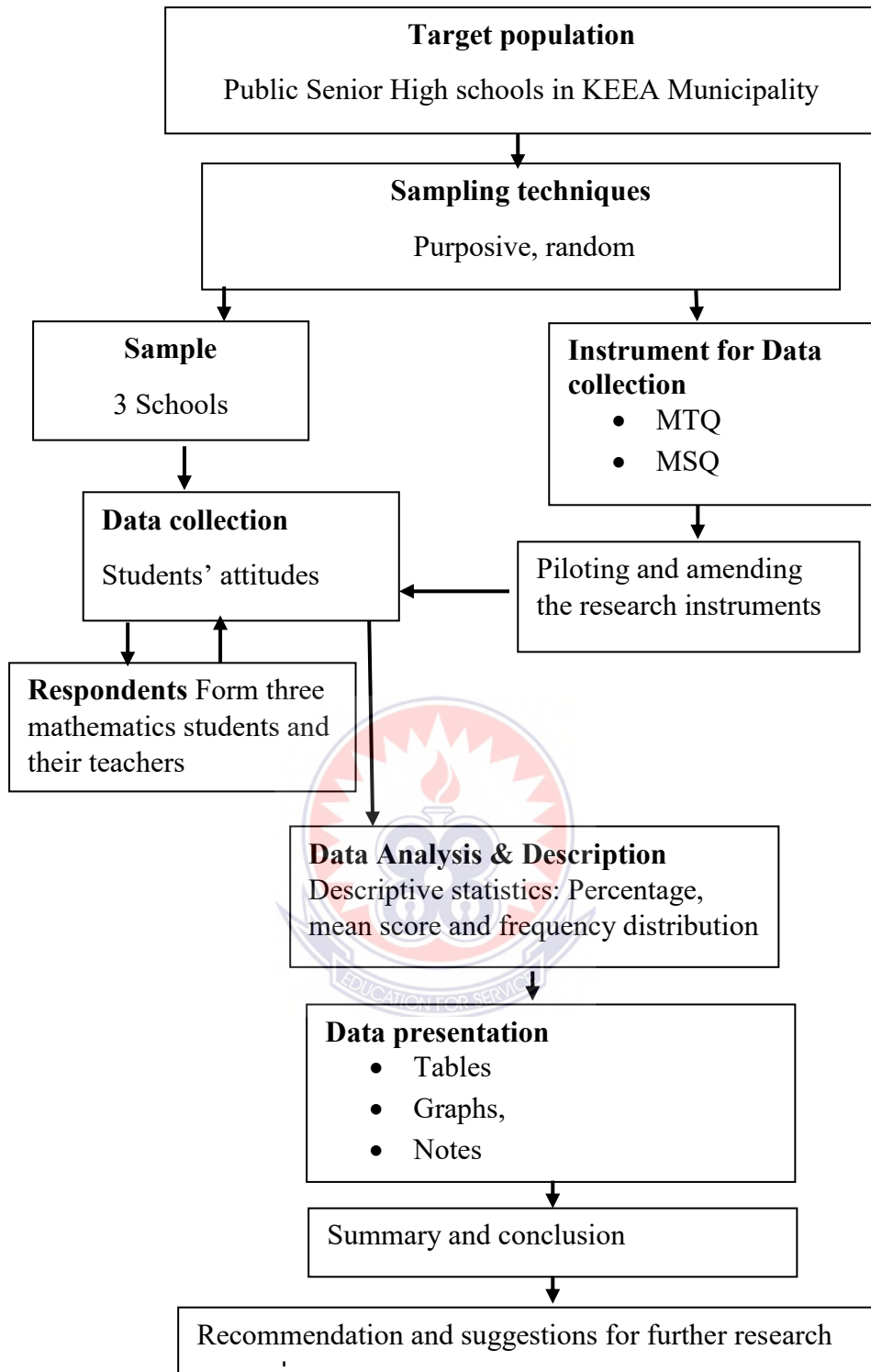


Figure 3.1: Study process

Source: Adapted and modified from (Cohen and Manion, 1994: 89)

Figure 3.1 shows the target population from which the sample of 3 schools was picked. Shown in the diagram also are the methods of sampling that were used.

Instruments that were used have been identified and the entire process that was used in the research has been shown.

3.3 Population

Population in research refers to the aggregate or totality of objects or individuals regarding which inferences are to be made in a sampling study (Seidu, 2007).

Population as used in this study refers to the people with common characteristics that the researcher decided to involve in the study.

The target population comprised form three students of three (3) senior high schools in Komenda Edina Eguafo Abrem (KEEA) municipality in the Central region of Ghana. All three (3) schools were mixed public schools. There were forty-six (46) mathematics teachers and two thousand two hundred and fifty-four (2,254) form three students

3.4 Sampling Techniques and Sample Size

3.4.1 Sampling Techniques

Category of schools: Only public senior high schools in in Komenda Edina Eguafo-Abrem (KEEA) municipality were purposively selected. They were considered since they all follow the same Ghana Education Service (GES) syllabus and pursue the same curriculum offered by GES system of education. Regardless of the category of school, all students sit for the same WASSCE at the end of Form Three.

Form Three students: Boys and girls were randomly selected from all the three public senior high schools in the municipality. This ensured that each student regardless of gender had equal chance of being selected for the study. From the three levels of senior high school, Form three classes were purposefully selected. This was

because; the researcher contended that at this level, a student had formed attitudes towards learning of mathematics. They would have been exposed to much of the mathematics content as stipulated in the syllabus. In Form three, students would have chosen their subjects in preparation for career choice. The career choice could be as result of how a student perceived mathematics.

Mathematics teachers: They were purposively selected from the sampled schools depending on whether they taught the selected class or not. The reasons for adopting a purposive sampling are based on the assumption that, given the purpose and objectives of the study, specific kinds of people may hold different and important views about the ideas and issues at question and therefore need to be included in the sample (Mason, 2002; Robinson, 2014; Trost, 1986). Mathematics teachers were involved in the study because they could be a factor in influencing attitudes towards learning of mathematics amongst students. They were the ones charged with the responsibility of implementing mathematics curriculum.

3.4.2 Sample size

The sample size was determined by a prior calculation of the sample size required to meet specified confidence limits for the population values. According to Gorard (2001) a sampling fraction of between 10-20% of total population in descriptive research is acceptable. Therefore, a total of thirteen (13) mathematics teachers were selected for the study out of the 46 mathematics teachers in all the public senior high schools in the municipality. This constituted approximately 29% of the total mathematics teachers' population in the municipality. Similarly, three hundred and forty (340) form three students were selected from the two thousand two hundred and fifty-four (2,254) Form Three students. Hence the sample constituted approximately 15% of all

the Form three students in the municipality. The sample size of 340 was arrived by the use of Yamane's formula for sample size calculation.

$$n = \frac{N}{1+Ne^2}$$

n = the sample size,

N = the population of the study

e = the margin of error in the calculation

$$n = \frac{2254}{1+2254(0.05)^2}$$

$$n = 339.71 \approx 340$$

The distribution of the schools that were sampled and the respondents of the study are summarized in Table 3.1.

Table 3.1: Sample grid of school, students and Mathematics teachers in KEEA

<i>Municipality</i>				
Schools	Form 3 Students	Sample Size Students	Mathematics Teachers	Sample Size Teachers
A	667	100	17	5
B	793	120	14	4
C	794	120	15	4
Total	2,254	340	46	13

As indicated in Table 3.1, a total of three hundred and forty (340) Form Three students were considered during the study out of two thousand two hundred and fifty-four (2254) Form three students in the municipality and also a total of 13 mathematics teachers were considered in the study out of 46 mathematics teachers in the municipality

3.5 Research Instruments

Data were collected using the following two instruments:

3.5.1 Mathematics Teachers' Questionnaire (MTQ)

MTQ was used to obtain data from mathematics teachers in senior high schools. The data were consequently used to identify attitudes formed by their students towards study and performance in mathematics and also identify factors reinforcing such attitudes. MTQ (Appendix A) was divided into five sections. Section A contained items on background information of the respondents while the other sections had other items that were developed on the basis of the research questions. MTQ was administered to selected mathematics teachers. The purpose of this questionnaire was to find how frequent mathematics teachers encouraged their students to learn mathematics and identify which motivation methods they used to encourage students to participate in mathematics lessons. Their responses enabled the researcher to find out what they do to enhance students' attitudes towards the study of mathematics.

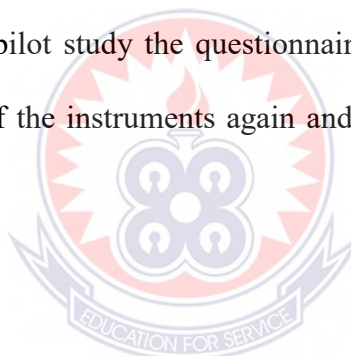
3.5.2 Mathematics Students' Questionnaire (MSQ)

MSQ was used to obtain data from mathematics students in senior high schools. The data were consequently used to identify attitudes formed by these students towards study and performance in mathematics and also identify factors reinforcing such attitudes. This questionnaire was administered to the randomly selected Form Three students in the selected senior high schools. MSQ contains two major sub-sections; general information about the student/school and students' feelings towards mathematics. A 5-point Likert Attitudes Scale ranging from "strongly agree" to "strongly disagree" was used to determine students' feelings. The Likert Scale

contained three sub categories of items namely, items on mathematics as a subject, items on mathematics teachers and their teaching methods and items on the students, peers and family members (Appendix B)

3.6 Pilot study

This was done to determine the validity and reliability of the instruments. The instruments were piloted in one of selected senior high school. The pilot school was not included in the main study. The researcher administered the questionnaires to 4 randomly selected mathematics teachers and 12 students of Form three in the selected school. The data was analysed for pilot study. The pilot study revealed some ambiguities and flaws in the questions and inadequacies in the coding system. Based on the results from the pilot study the questionnaires were evaluated and modified. There was a re-testing of the instruments again and it modified finally before it was used for the main study.



3.6.1 Validity

The researcher was concerned with the degree to which MSQ and MTQ were measuring attitudes towards study and performance in mathematics. Ascertaining the content validity involved consultations with my research supervisors and experts in this area of study especially lecturers in the department the researcher is from.

3.6.2 Reliability

The research instruments were subjected to reliability test. Reliability of the instruments was ensured after the pilot-test. The items of the instruments were split into two subsets after a single administration of the instruments. The total set of items was divided into two halves and the scores on the halves were correlated to obtain and estimate reliability

Pearson correlation was used to calculate the correlation coefficient. The goal was to find out the correlation coefficient of the two set of data. The result showed a positive Pearson Product Moment correlation coefficient of 0.825. This figure is quite high, since 0.667 indicates an acceptable reliability coefficient (Jackson, 2003), the coefficients of all sections were found to be reliable hence the safe conclusion that the questionnaire used in this study as main data collection tools was reliable.

3.7 Data collection Procedures

Data collection was done in the sampled schools. The researcher visited the sampled schools first to familiarize with the school authority and explain the purpose of the study and secondly make necessary arrangement for actual administration of the instruments and data collection. Repeated familiarization visits were done before the actual visit for data collection. During each visit the researcher talked and mixed freely with both teachers and students to try and minimize Hawthorne effect (Borg and Gall, 1971). The researcher then collected data by issuing the research instruments for mathematics teachers and Form three students. The two sets of questionnaires were administered when the teachers and students were relaxed enough to provide reliable information (Eggleston et al, 1975).

3.8 Data analysis Procedure

The data used for the study were responses from the questionnaires. The responses from the questionnaires were analyzed quantitatively. Basically, quantitative analysis in educational research is of two types; descriptive data analysis and inferential data analysis (Daramola, 1998; Durrheim, 1999). Descriptive analysis seeks to organize and describe the data by investigating how the responses are distributed on each construct, and by determining whether the responses on different constructs are

related to each other (Durrheim, 1999). In this study, descriptive and statistics was employed in the analysis of data collected. The quantitative data was obtained from both student and teacher instruments. They were coded and entered in the computer using SPSS program. Specifically, the data were analyzed using simple descriptive statistics: percentages, means and frequencies. The data was presented with the aid of tables, graphs.

3.9 Ethical considerations

A research permission was also sought from the respective senior high school Heads before talking to teachers and students. Before the actual issuing of questionnaires, the consent of mathematics teachers and students was also sought and the information that was collected was treated confidentially.



CHAPTER 4

DATA ANALYSIS, RESULTS AND DISCUSSIONS

4.1 Overview

The findings of the study are presented in this chapter based on the data collected from the respondents and as per the research objectives. These included

4. investigating the sort of attitudes that senior high school students form towards study of mathematics.
5. finding out problems that are associated with attitude affecting study and performance in mathematics
6. investigating the factors that influence formation of attitudes towards study of mathematics among senior school students in KEEA municipality.

Three hundred and thirty-two (332) students' questionnaires were filled out of the three hundred and forty (340) given out, giving a response rate of approximately 98 percent which was adequate for analysis. On the other hand, all the thirteen (13) teacher questionnaires given were filled. Discussion of the results was done as per the objectives of the study.

4.2 Background information

This section covers the gender distribution of the respondents, type of schools studied, and attitudinal problems affecting learning of mathematics according to the respondent students.

4.2.1 Gender distribution

The sample selected for the study constituted 42% boys and the rest (58%) girls as indicated in Figure 4.1

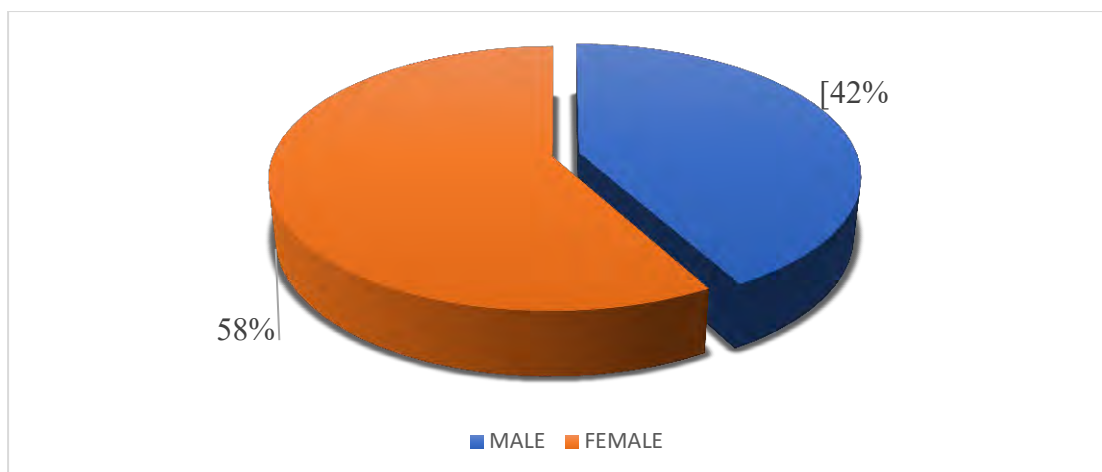


Figure 4.1: Gender Distribution

To be able to capture the students' attitudes towards learning in mathematics, the researcher selected respondents from the three public schools in the municipality although there were some private schools in the municipality. However, it emerged that the boys were few as compared to girls.

Several studies have reported that there are gender differences in attitude towards mathematics with girls showing more negative attitudes than boys. For instant, a study conducted by Adebule, and Aborisade, (2014), shows that the attitude of students towards mathematics is somehow affected by their sex. According to a study by Stanic (1995), he identified that sex-difference in achievement in mathematics was related to a sex-difference favouring males in terms of confidence in doing mathematics. Sarouhim, and Chartouny (2017), also confirmed in his studies that there is a significant gender differences in either achievement or attitudes toward mathematics, thus affirming the common belief that female students in traditional cultures do not perform well in mathematics and dislike the field.

In general, most of the studies reported that, compared with boys, girls lacked confidence, had debilitating causal attribution patterns, perceived mathematics as a male domain, and were anxious about mathematics (Casey et al, 2001).

4.3 Research Question 1: What attitude do student form towards study of mathematics?

Research question 1 sought to identify the senior high school students' attitude towards mathematics. This helped in exploring the kind of attitudes they formed towards the subject. The responses were put under five categories of a five-point Likert-scale which included strongly agree (SA), agree (A), not sure (NS), disagree (D), and strongly disagree (SD), as presented in Table 4.1.

Table 4.1: Students' attitudes towards the study of mathematics

Students' opinion	SA (%)	A (%)	NS (%)	D (%)	SD (%)
I enjoy learning mathematics	56	35	4	2	3
I would like to continue doing mathematics after secondary school	49	28	13	4	6
To understand mathematics is difficult	7	11	8	36	38
Mathematics is very useful in life	70	23	3	2	2
Among the subjects taught mathematics is my favorite	35	38	6	15	6
I feel extremely anxious and fearful when math exams are mentioned or brought	19	26	10	29	16
Mathematics should not be a compulsory subject	6	5	3	24	62
Mathematics is impossible to learn	5	4	5	28	58
The best way to learn math is to discover a concept by yourself	36	29	13	14	8
My grades are always low in mathematics	17	32	7	32	12
I do mathematics for the sake of it	4	4	4	23	65
Learning mathematics is remembering what the teacher says and does	23	26	10	20	21

Findings indicated that 56% of the respondents strongly agreed that they enjoyed learning mathematics as a subject. Forty-nine percent (49%) of the respondents strongly agreed that they would like to continue doing mathematics after senior high school citing reasons such as Mathematics was easy to study and that it was a logical subject (and that it needed no cramming). Further to this only 38% of the respondents strongly disagreed that understanding mathematics was difficult while 70% of the respondents strongly agreed that Mathematics was a very useful subject in life. Only 35% of the respondents strongly agreed that among the subjects taught, mathematics was their favourite. This is indicative of favourable attitudes towards learning mathematics and consequently better performance in the subject. Worth noting was that there were a few students who did not like the subject by stating that mathematics was difficult (18% who strongly agreed or just agreed) and that some topics were not applicable to daily life problems.

In addition, up to 58% of the respondents strongly disagreed that Mathematics was impossible to learn. Those who agreed that the subject was impossible to learn said that Mathematics was for intelligent students since it was a tough subject and that few students managed to study the subject to higher levels. They added that the subject needed sharp and fast thinking students.

The study also revealed that 26% of the respondents agreed that they felt extremely anxious and fearful when math exams were mentioned or brought while 21% strongly disagreed. High level anxiety in students had negative influence on their learning and consequently affecting the performance of the subject. Forty-five percent (45%) of the respondents either strongly agreed or agreed with the statement that they feel extremely anxious and fearful when math exams are mentioned. This has been

associated with increasing test stress, low self-confidence, fear of failure, and negative attitudes towards learning mathematics (Besant, 1995).

When asked whether Mathematics should be a compulsory subject up to 86% of the respondents disagreed/strongly disagree. Thirty-six percent (36%) thought that the best way to learn mathematics was to discover a concept by oneself. A high percentage (65%) however strongly disagreed that they did mathematics for the sake of it. Interestingly 49% were on the view that learning mathematics is all about remembering what the teacher says and does and some 41% of the respondents disagreed/strongly disagree with that view.

4.4 Research Question 2: What problems are associated with attitude affecting study and performance in mathematics?

The research question 2 sought to investigate the problems that are associated with students' attitude affecting the study of mathematics. The respondents were asked to identify some of the problems they experienced that affected their learning of mathematics and eventually affecting their performance in the subject. Their views are summarized in the Figure 4.2.

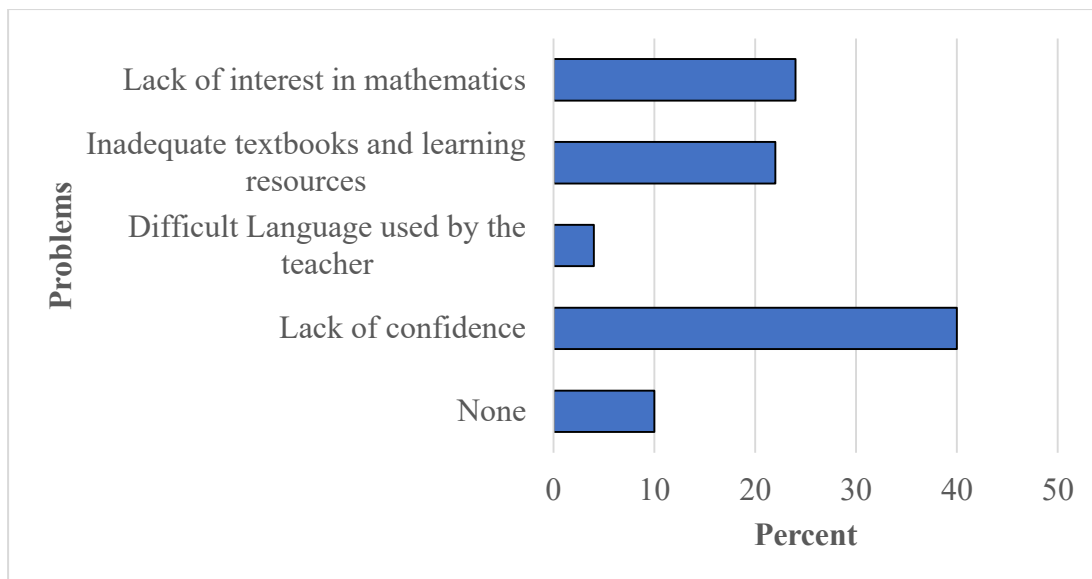


Figure 4.2: Problems associated with attitudes affecting learning of mathematics

The major problems in the learning and performance in mathematics in the senior high schools included lack of confidence in the ability to learn and perform well in mathematics as reported by 40% of the respondents. Lack of interest in mathematics was mentioned by 24% of the respondents while lack of teaching facilities such as textbooks and learning resources was mentioned by 21% of the respondents. Difficult language used by the teacher was cited by only 4% of the respondents while 10% of the respondents reported that they experienced no problems learning mathematics.

Generally, confidence in learning mathematics has been associated with mathematics achievement with correlation coefficients ranging from 0.3 to 0.4 (Newman, 1990). (Ryan et al, 1997) showed that students who perceived themselves as cognitively competent were less likely to avoid seeking help, whereas, students who were unsure of themselves were more likely to feel threatened when asking their peers for help and more likely to avoid seeking help. Students with high confidence in mathematics do not attribute their need for help to lack of ability and thus are more likely to seek help when they need it.

4.5 Research Question 3: What Factors influencing attitude formation towards the study of mathematics

The research question 3 attempted to explore the relevant reinforcing elements that impact students' attitudes toward study and performance in mathematics. The results are shown in Table 4.2.

Table 4.2: Factors influencing attitude towards study of mathematics

Students' opinion	SA (%)	A (%)	NS (%)	D (%)	SD (%)
Mathematics classes/lessons are not interesting	2	8	5	29	56
I am given a lot of unnecessary mathematics assignments	3	4	5	29	59
Am well provided with mathematics textbooks and other learning materials	35	33	5	17	10
Being a girl or a boy interferes with my learning and my performance of mathematics	5	8	8	18	61
I think it is the teacher who can make mathematics learning easier	31	38	13	11	7
My parents and siblings encourage me to learn Mathematics and to perform well in the subject	60	28	4	4	4
My friends don't like learning mathematics	60	29	5	2	4
I like my mathematics teacher	60	29	5	2	4
I learn mathematics well regardless of the gender of my teacher	38	30	8	10	14
I do a lot of mathematics exercises on my own or with a friend	38	42	4	12	4

From table 4.2 above, it could be noted that 61% of the respondents strongly disagreed that being a girl or a boy interfered with their learning and performing well in mathematics. (Lafortune, 1989) observed that girls and boys performed equally well despite the fact that girls had still some more negative attitude towards mathematics due to their greater anxiety when learning the subject. With regards to attitudes related to mathematics teachers, 69% of the respondents either agreed or strongly agreed that it was the teacher who could make mathematics learning easier for them. In addition, about 56% of the respondents strongly disagreed that Mathematics classes/lessons were not interesting. Fifty-nine percent (59%) of the respondents strongly disagreed that they were given a lot of unnecessary mathematics assignments while only 35% of the respondents were of the opinion that they were well provided with mathematics textbooks and other learning materials. This lack of adequate textbooks and learning materials was one of the contributing factors to negative attitudes towards learning and performance in mathematics among the students. For 23% of the respondents, learning mathematics was remembering what the teacher said and did while 38% strongly agreed that they understood Mathematics regardless of the gender of their teacher.

There was also an indication from Table 4.2 that, the sex of the teacher was an influencing factor in learning of mathematics where for example an assessment of boys by a female teacher could produce a generous mark or marking of girls' work by a male teacher (Goddard-Spear, 1989).

Some students' dissatisfaction on how some mathematics teachers taught the subject was related to the fact that 68% of the respondents felt there were not enough reference books and textbooks, making students perform poorly in mathematics and

loose interest in the subject. Sixty percent (60%) of the respondents reported that their friends did not like learning mathematics with them which meant that, that percentage of respondents were intrinsically motivated to learn and perform in mathematics. This further meant these students had formed favourable attitudes towards learning and performance of mathematics. Equally so, 60% stated that their parents and siblings encouraged them to learn Mathematics. Parents and siblings' level of education also influences how students perceive learning and performance in mathematics (Costello, 1991). Thirty eight percent (38%) of the respondents reported that they did a lot of mathematics exercises on their own or with a friend hence enhancing their learning and performance in mathematics.

4.5.1 Number of lessons taught by mathematics teachers

Fifty four percent (54%) of respondents (teachers) had a teaching load of up to 16 - 20 lessons per week while others had 10 or less lessons per week and the rest had lessons ranging above 20 lessons per week as indicated in Figure 4.3.

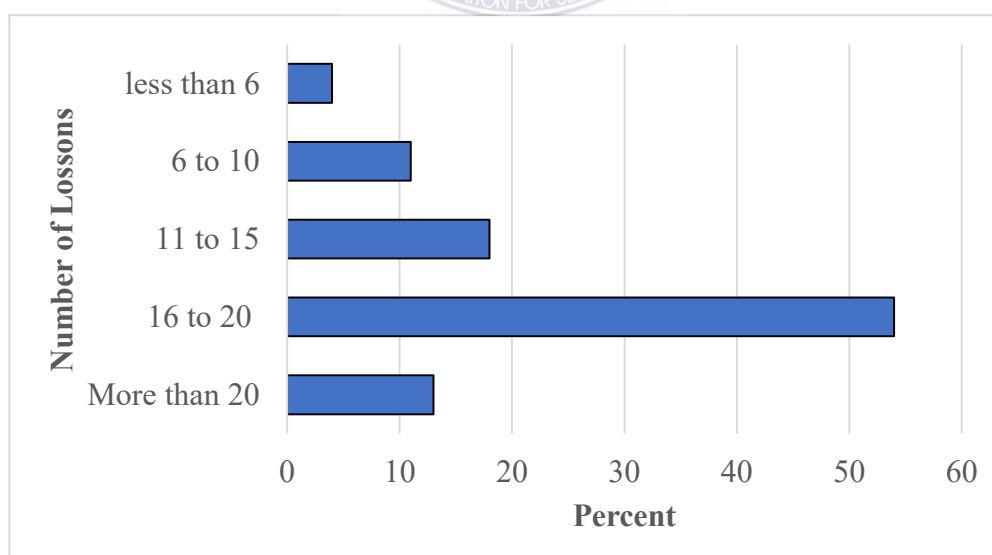


Figure 4.3: Number of lessons taught by mathematics teacher

Teachers with 11 to 15 lessons constituted 18% of the total respondent teachers while those with above 20 lessons constituted 13%. Teachers with lighter teaching load such as less than eleven lessons per week, are likely to have adequate time to plan for lessons, prepare tutorials and exercises as well as mark students work than those with more lessons per week. Overworked teachers claimed they had no time to plan for their lessons leading to poor teaching approach and thus development of negative attitude towards learning and performance in mathematics among the senior high school students.

4.5.2 Years of experience in teaching mathematics

The researcher carried out an investigation on the number of years of experience the mathematics teachers had in teaching the subject and the findings are presented in Figure 4.4.

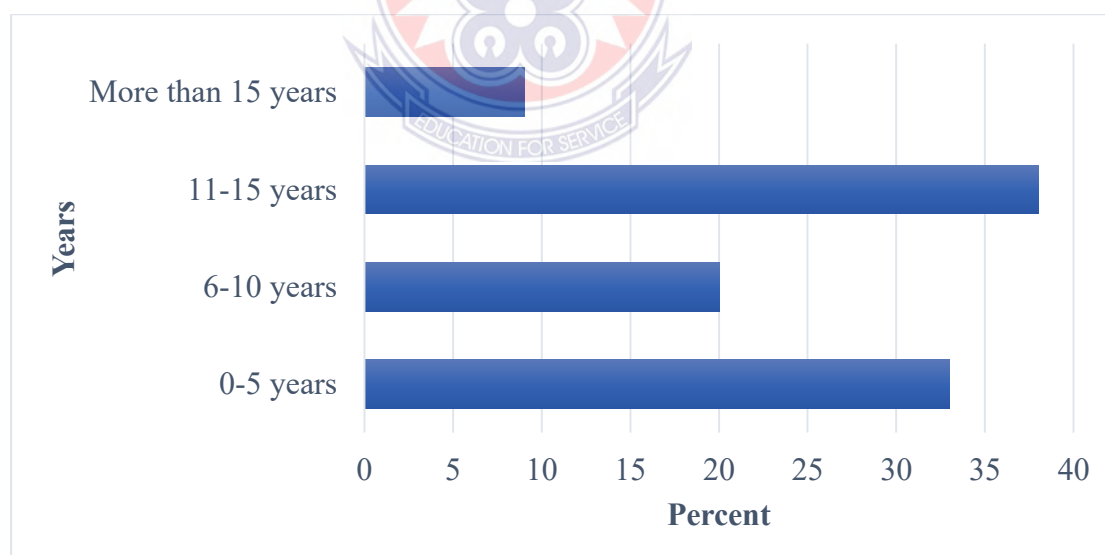


Figure 4.4: Years of experience in teaching mathematics

Thirty-eight (38%) percent of the teachers reported that they had been teaching mathematics for 11 to 15 years, while 33% said that they had taught mathematics for less than 5 years. Up to 20 % of the respondents reported that they had been teaching

mathematics for 6 to 10 years, while the remaining 9% had been teaching for more than 15 years. Teachers with many years of experience in teaching understood the subject matter as well as teaching methodologies that may positively influence students' attitudes towards learning and performance of mathematics (Mondoh, 2005).

4.5.3 Extent to which teachers liked teaching mathematics

With regard to how much the teachers liked teaching mathematics; majority (51%) stated that they liked teaching the subject very much while the remaining 49% reported that they liked teaching the subject moderately as indicated in Figure 4.5.

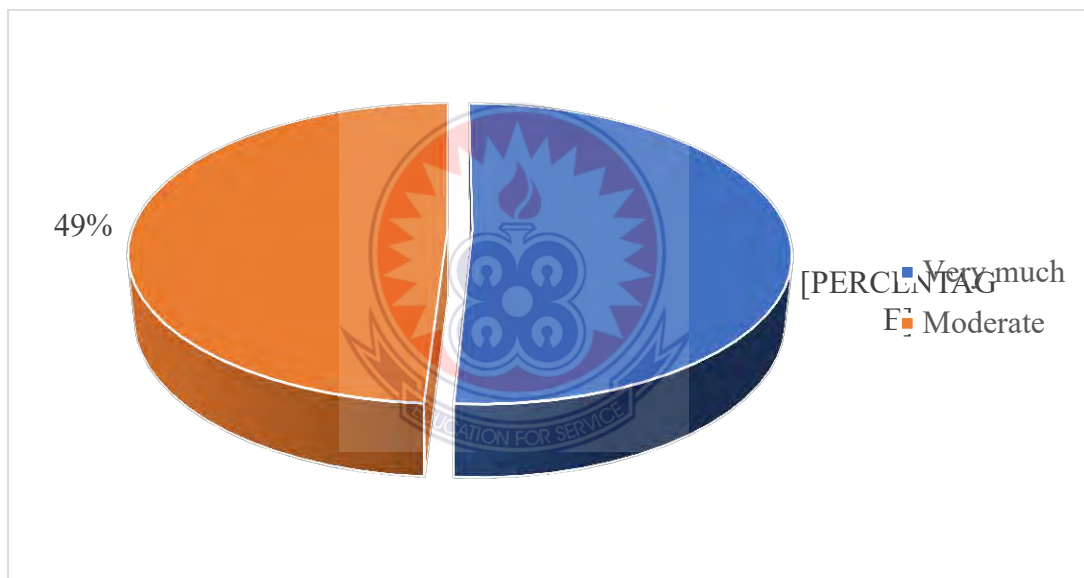


Figure 4.5: Extent to which teachers liked teaching mathematics.

For teachers to positively influence students' attitudes towards learning and performing of mathematics, they need to like the subject themselves and be motivated in their teaching.

4.5.4 Teachers' opinions on mathematics as a subject

The study also sought to investigate the teacher's attitudes towards mathematics as a subject. Up to 70% of the respondents reported that the subject was interesting while 17% thought that it was very interesting as indicated in Figure 4.6.

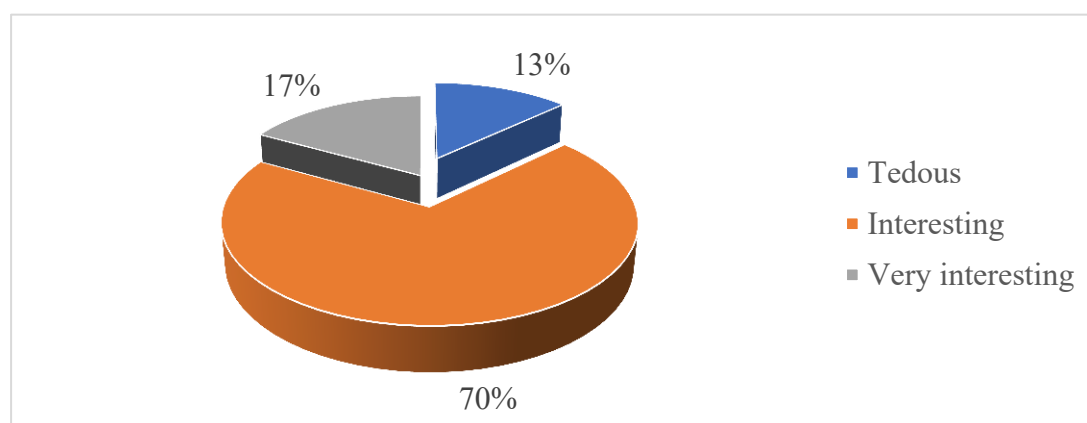


Figure 4.6: Teachers' opinions on mathematics as a subject

Only 13% thought that the subject was tedious. The teachers' positive attitudes towards the subjects as expressed in their interest tended to create positive attitude among the students towards the subject. Hence leading to more interest in the subject. It must be noted that students' attitudes towards mathematics tend to be more positive in classrooms where students perceive greater interest in the subject by their teachers who in turn give leadership and friendly helping hand in pursuing the subject. If the teachers find the subject less interesting, it becomes hard to motivate the students and to create positive attitudes among them towards the subject (Scope, 1973).

4.5.5 Teachers' opinions on what students like about mathematics

According to 75% of the respondent teachers, the students liked the subject content in mathematics while 13% thought that the students liked the teaching method as indicated in Figure 4.7.

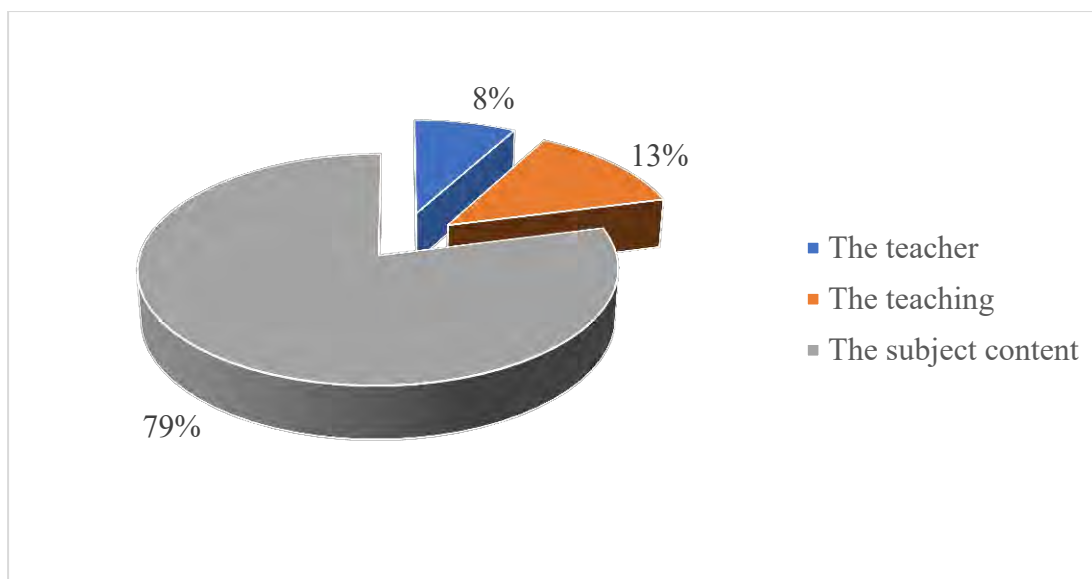


Figure 4.7: Teachers' opinions on what students like about mathematics

Only 8% thought that the students liked the teacher. Lack of time to cover thoroughly the mathematics content due to heavy teaching load was reported to be negatively affecting students' performance and while students seemed to like the content taught, they were not confident with the material covered as some of it could not be related to their future career needs.

4.5.6 Strategies to create interest in mathematics among students

The most commonly used method of creating interest in mathematics according to 75% of the respondents was to organize internal symposia as shown in Figure 4.8

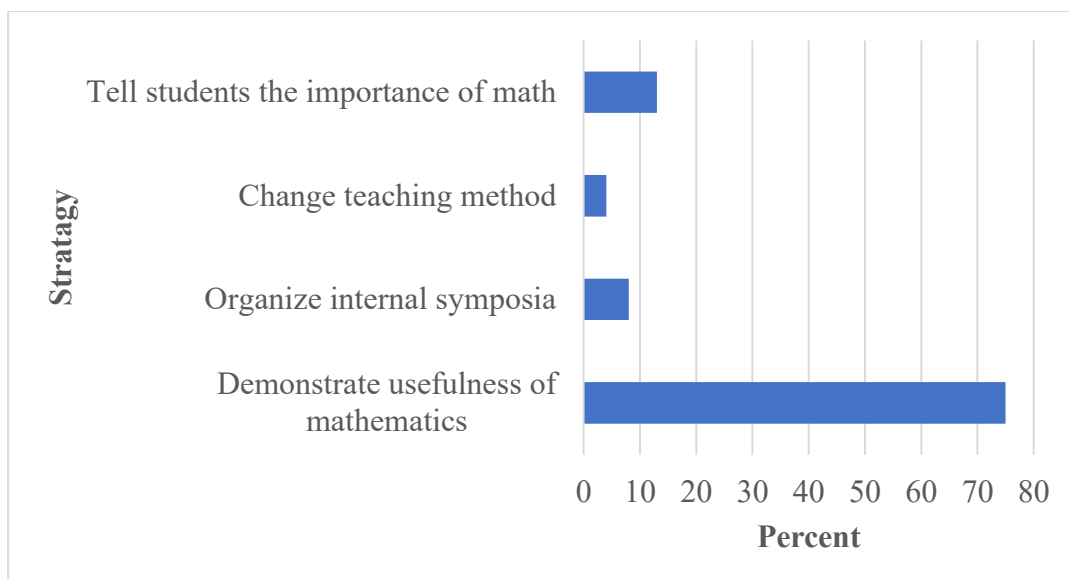


Figure 4.8: Strategies to create interest in mathematics among students

Other strategies included demonstrating usefulness of mathematics according to 8% of the respondents by telling the students about the importance of mathematics and assisting them to put the learnt content in a societal context while encouraging them to draw conclusions from the lessons learnt. Only 13% of the respondents told the students the importance of mathematics especially in relation to other subjects and day to day life. A small percentage (4%) of the teachers made the effort of changing the teaching method by checking the accuracy, correctness, and depth of content as well as summarizing the content and giving follow up activities. Many students seemed to like mathematics more when they worked in groups as well as when given individual attention by their teachers to enable them to clearly understand the concepts being taught. Teachers also gave the students chance to ask questions on aspects they did not seem to understand as well as demonstrating the application of the subject in everyday life especially when the teachers were teaching what was seen as challenging content. Teachers made deliberate efforts to motivate students by asking those questions that required reasoning and encouraging them to learn more on their own through assignments.

4.5.7 Methods used in teaching to enhance learning of mathematics

According to 42% of the respondents, lecture method was never used to enhance learning of mathematics but was sometimes used by 46% of the respondents as indicated in Figure 4.9.

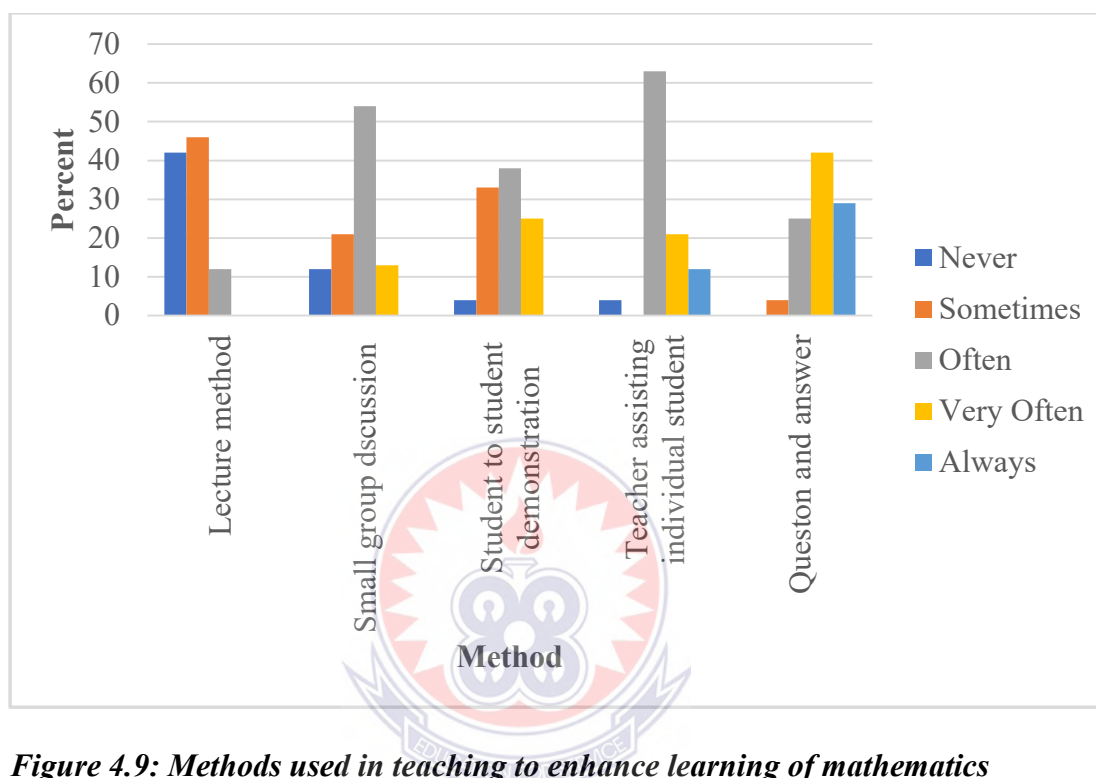


Figure 4.9: Methods used in teaching to enhance learning of mathematics

Small group discussion was often used according to 54% of the respondents while student to student demonstration was often used by 38% of the teachers. Teacher assisting individual student was adopted by 63% of the respondents while question and answer method was very often used by 42% of the respondents.

Students seemed to like the subjects more when they worked in small group discussion as well as when given individual attention by their teachers to enable them to clearly understand the concepts as stated earlier. According to approximately 40% of teachers under the study, the students did not like the lecture method which was not participatory by nature. Increased co-operation of the students in class was attributed

to the teacher's friendly attitude where teachers gave the students chance to ask questions on aspects they did not seem to understand and demonstrating the application of the subject in everyday life especially when the teachers asked them more challenging questions in questions and answers sessions.

4.5.8 Methods used by mathematics teachers to motivate students

Mathematics teachers in the study area used several methods to motivate students in learning of mathematics as indicated in Figure 4.10

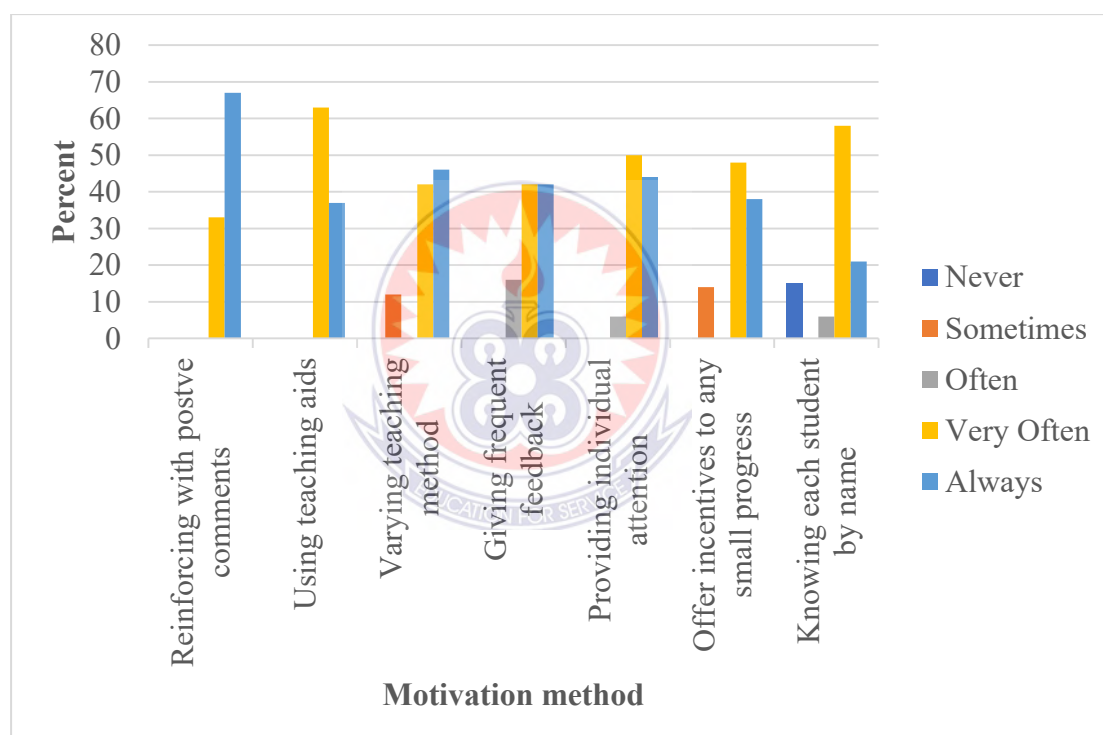


Figure 4.10: Methods used by mathematics teachers to motivate student.

Sixty-seven percent (67%) of the teacher respondents *always* reinforced students with positive comments to help them improve their attitude towards learning and performance in mathematics. Sixty-three percent (63%) used teaching aids very often to enhance students understanding of the topics being taught. In addition, varying teaching methods was always adopted by 46% of the respondents. 42% always gave frequent feedback to students on questions and exercises done to help them know

answers and enhance their understanding of the content. Providing individual attention was often adopted by 50% of the respondents and was aimed at addressing students' specific weaknesses in learning the subject.

Offering incentives to any small progress was very often practiced by 48% of the respondents helped in creating positive attitude among students especially the poor performers. Knowing each student by name was adopted by 58% of the respondents and was intended to give a sense of individual attention and enhance close relationship between the teacher and the students. The teachers tried to master the art of making the lessons quite interesting making the students to enjoyed the mathematics lessons. They specifically tended to use teaching aids. This way, they reported that students ended up understanding the content easily and discover new knowledge. The teachers indicated that students' participation was wanting in classes and there was need for improvement through evaluating, identifying and rewarding the best performers, offering incentives and reinforcing any small achievements with positive comments.

4.6 Discussions of the findings

4.6.1 Students' attitudes towards study of mathematics among senior high school students

As identified from the research question 1 analysis, the main feelings or opinions towards learning of mathematics was a general feeling of extreme anxiety and fear. This was evident when (45%) of student respondents affirmed of such feelings when a new mathematical concept was introduced or exams were mentioned or brought. This in turn prompted lack of confidence among the students as confirmed by approximately (40%) of teacher respondents. It was noted that a noticeable 18% of the

student respondents still believed that understanding mathematics was difficult. However, majority (93%) of student respondents strongly agreed or agreed that mathematics was a useful subject in life. Among them, some (73%) agreed that of the subjects taught, mathematics was their favourite. The students' poor performance in the subject was attributed to the fact that some topics were perceived not to be applicable to daily life problems and learning of such topics were greatly hampered resulting in another vicious cycle of poor performance in the subject. A considerable (61%) of the student respondents strongly disagreed that being a girl or a boy interfered with their learning and understanding of mathematics. It was clear that influence of the teachers, parents, siblings and peers on the students was not confined to imparting of subject knowledge alone, but goes further to play a part in the total development of the students' attitude towards learning and performance in mathematics.

Education is a process of human enlightenment and empowerment for the achievement of a better quality of life. The need to improve quality in mathematics education is a great necessity bearing in mind the dismal performance in this subject in the KEEA municipality and Ghana as a whole. Achieving this goal, positive attitudes towards mathematics should be enhanced and students motivated to like mathematics as a subject. Mathematics education is crucial to the entire developmental process of the country since teachers as well as students agree that the subject is multi-disciplinary and can be applied everywhere else. The negative attitude of students towards learning and poor performance in mathematics was due to existing learning methods that discouraged participation, as well as unfounded believes that mathematics was a difficult subject. Teachers, fellow students, siblings and parents also contributed to formation of attitude. If the afore mentioned had

negative attitude themselves, the study found out that they in turn enforce the same on the learners. This led to poor performance in the subject which degenerated even into more desperation. Due to its role in the life hood of the nation, there is a need for teachers and all education stakeholders to enhance positive attitudes towards mathematics as a subject as well as enhancement of quality teaching of the subject.

The findings should enlighten teachers, parents, students and all education stakeholders to ensure they enhance positive attitude towards learning and better performance of mathematics among students. This is so because a connection between attitudes, learning and performance in mathematics was identified in the study. Also learning experiences provided in the classrooms should include such activities which provide opportunities for students to participate, bring out analogy, to draw inferences, arrive at generalizations and so on. Schools' management should as a matter of priority take steps to develop positive attitude of students. In a nut shell it is important that school management, government, parents and well-wishers take active interest in the development of positive attitude towards learning of mathematics among students in senior high schools.

This is consistence with the findings in literature reviewed that, negative images and myths of mathematics are widespread among the students. Many students view mathematics as a difficult, cold and abstract subject. These are perceived by many students as an exclusive discipline (Buhagiar, 2013). It was also found out from epistemological and pedagogical perspectives, that students perceived mathematics as a subject that involves a lot of work. This gives room for many to believe that mathematical activity includes procedures that are divorced from real life, from discovery and from problem solving.

Also, in the literature reviewed there is a claim that mathematics is only for the clever ones, or only for those who have inherited mathematical ability (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.

It is generally believed that, people who have negative attitudes towards mathematics tend to avoid the subject and can be easily frustrated when working mathematics. On the other hand, people with positive attitudes towards mathematics are most likely to be motivated and enjoy working mathematics more than people with highly negative attitudes towards the subject.

4.6.2 Factors influencing attitudes towards learning of mathematics

According to the research, heavy teaching workload had a potential to compromise the quality of teaching since overworked teachers may not have time plan for their lessons, fail to attend classes, attend classes late or fail to mark students work. The resultant poor teaching methods and strategies enhance negative attitude towards learning and poor performance in the subject making the students to termed it as difficult. Slightly more than half (51%) of the teachers also reported that they liked teaching the subject moderately meaning that it was hard for them to adequately influence students positively towards learning and better performance in mathematics. Only a limited number of teachers (8%) demonstrated usefulness of mathematics by telling the students about the importance of the subject or even told the students the

importance of mathematics especially in relation to other subjects and day to day life, meaning that students learnt the lesson as routine to pass examinations.

A number of teaching methods had been employed by teachers to enhance learning and better performance in mathematics without much success. They attributed this to desperation of some students, especially in cases where poor results in mathematics examinations were repeatedly attained by the students. Students worked in groups as well as being given individual attention by their teachers to enable them to clearly understand the concepts.

However, it was not surprising to see that students were still anxious about their learning of mathematics and examination. In one aspect, one can view students relatively high level of anxiety as a positive sign indicating that students were serious about the subject. However, a high level of anxiety in students can also have negative influence on their learning. These research findings were in concurrence with other researches associated mathematics anxiety with low self-confidence, fear of failure, and negative attitudes towards learning and performance of mathematics. Ma's (1999) analysis of 26 studies on the relationship between anxiety toward mathematics and achievement in mathematics at the basic and senior high school levels revealed that there was a significant relationship between the two variables whereby lower mathematics anxiety gave the potential for higher mathematics achievement.

As some students said that they were encouraged by friends and relatives to study mathematics, the encouragement trend would definitely influence students' performance in the subject. Students' little interest in mathematics, that the subject had little application to real life situations (30% thought so) especially to their future careers and that there were no mathematics reference books and textbooks, were

major reasons which made students loose interest in the subject. Some students' dissatisfaction on how some mathematics teachers taught the subject was related to the fact that some difficult topics were not thoroughly covered to involve applications which were to be acquired by students for future use either in daily activities or in their careers.

The importance of mathematics is for students to regard mathematics as a subject not only crucial to passing the examination but a practical tool for day-to-day use. The data on whether students will use mathematics a lot in life, to some extent, indicates that some students cannot see the functional aspect of mathematics in their later life despite students viewing mathematics as a subject being abstract and not applicable to real-life situation. There is a need to change students' attitudes from learning mathematics just as a compulsory requirement in schooling and for passing to realizing the functional value of mathematics by letting students see the vital connection between attitudes learning, passing well in mathematics examinations and application of mathematics to real life situation. This will need rewriting mathematics syllabus to include attitude change, precise reason for learning then go ahead and let students learn and expect to perform well in the study so that students could realize mathematics applications in their future careers. Though it could be difficult to relate some areas of Mathematics to real life situations, many topics in the subject could be taught by identifying certain areas which could be illustrated involving application aspects.

All this can also be affirmed from the literature reviewed per a study conducted by Kwesiga (2002) showing that performance of students is also influenced by the school in which they studied. It was also indicated that the number of facilities a school

offers usually determine the quality of the school, which in turn affect the performance and accomplishment of its students. Students from a well-structured school with good monitoring, supervision, good teaching and learning materials and competent teachers are expected to perform better. This is because they attend these schools and the main reason behind is that these schools are usually well resourced with facilities.



CHAPTER 5

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Overview

This chapter gives a summary of the study, conclusions and recommendations, which can be made to help in improving students' attitude towards learning and performance in mathematics and therefore mitigate the negative impacts of such attitudes on learning of mathematics among students in senior high schools in KEEA municipality in particular and Ghana in general.

5.2 Summary of the Study

The purpose of this study was to investigate the attitudes that senior high school students form towards study of mathematics and the factors influencing the attitude of students towards the study of mathematics in the public senior high schools in Komenda Edina Eguafo Abrem (K.EEA) Municipality. The study adopted a descriptive survey design and data collected was largely descriptive by nature.

The target population for this study was final year senior high school students in the KEEA Municipality of the Central Region of Ghana. The sample size for the study consisted of 340 students' participants and 13 teachers from three public senior high schools. A Mathematics Student Questionnaire (MSQ) and Mathematics Teachers Questionnaire (MTQ) were the instruments for data collection. Analysis of data was based on descriptive (percentages means and frequencies) and was presented with the aid of tables and graphs.

5.2.1 Summary of Key Findings

The study's findings led to several developments. The findings are summarized below along with the associated research questions.

Research question 1: What attitudes do senior high school students form toward the study of mathematics?

The research question 1 was to find out the attitudes of the senior high school students towards mathematics. A Mathematics Student Questionnaire (MSQ) was used to obtain the data. The study found that the seniors in high school showed a favorable attitude toward mathematics. This could be inferred from the fact that up to 56% of the students said they enjoyed studying mathematics. Additionally, the same percentage (56%) thought that mathematics classes and lessons were interesting. Since the majority of students (70%) say mathematics is extremely useful in life, about 49% of respondents say they would like to continue studying it after high school.

Research question 2: What problems are associated with attitude affecting study and performance in mathematics?

The second research question sought to investigate the problems that are associated with students' attitude affecting the study of mathematics

Lack of confidence, the absence of teaching tools like textbooks and learning resources, the teacher's use of difficult language, and a lack of interest in mathematics are just a few of the issues associated with students' attitudes that have an impact on their study of mathematics. All things considered, as reported by 40% of the respondents, the main problem in the study is a lack of confidence in the ability to learn and perform well in mathematics.

Research question 3: What factors influence or reinforcing the students' attitude toward the study of mathematics.

The research question three sought to investigate the factors that reinforces or influence students' attitude toward the study of mathematics.

It was revealed in the research that, the student's attitude towards mathematics is influenced either positively or negatively by the teachers' method of teaching, the number of lessons taught by the teacher, years of experience in teaching mathematics, method used by teachers to motivate the students and the teachers own attitude toward the subject

In addition, it was found out in the research that, the parents and siblings also play part in influencing students' attitude towards the study of mathematics as some 60% confirmed from the research that their parents and siblings encourage to learn and permform well in the subject. The attitude of student towards mathematics is also influenced by their friends. The study reveals that most of the students follow friends who share the same view with them in mathematics

5.3 Conclusions

This study tried to investigate the attitude of senior high student in KEEA municipality towards the study of mathematics and also the factors that influence students' attitude towards mathematics. after the analysis and interpretation of the data from primary sources, the study, revealed that, the senior high school students' attitude towards mathematics was found to be positive. However, common sense reveals that one is likely to achieve higher in something one enjoys doing, has confidence in learning or finds useful. Thus, a favourable attitude towards various aspects of mathematics is desirable. Attitude towards mathematics may influence the

readiness and willingness with which an individual would learn and benefit from mathematics instruction.

It was also found out that student confidence level, their anxiety towards mathematics, lack of teaching resources are problems associated with students' attitude towards the subject. In addition, it came out from the research that, the teachers' method of teaching, the number of lessons taught by the teacher, years of experience in teaching mathematics, method used by teachers to motivate the students, the teachers own attitude toward the subject, the parents and siblings of the students and the friends or peers of the students appeared as main factors that influence or reinforce student attitude towards the study of mathematics.

5.4 Recommendations

The following recommendations are made from the study.

1. Since students in senior high school had a positive attitude towards mathematics according to the findings of the research, mathematics educators or teachers should materialize on some of this positive attitude within senior high schools in the KEEA municipality to encourage students to appreciate the process of learning mathematics.
2. It is recommended that the greatest emphasis be placed on improving the teacher's competencies by having mathematics teachers participate in a series of professional development activities designed to keep them up to date on the latest and most innovative teaching techniques. This is because the method of teaching and the method used by teachers to motivate students could have a significant impact on the students' attitudes as indicated in findings of the research.

3. It is recommended that findings from this research and other related one should be shared with teachers for them to be aware of students' attitudes towards mathematics because they influence how the subject is taught and learned. This would make it possible for teachers to create effective methodologies and plans to improve mathematics teaching and learning.
4. Because the attitudes of students are also influenced by their parents and siblings, it is necessary to encourage parents and other stakeholders through Parent Teacher Association (PTA) meetings to encourage their children to develop a positive attitude towards mathematics.

5.5 Suggestions for Further Research

Further research is suggested in the following areas.

1. Due to proximity, the amount of time needed to complete the study, and funding, the study only included three senior high schools in the KEEA Municipality in Central Region of Ghana. The research design could be modified to include more senior high schools in order to provide a more comprehensive understanding of senior high school students' attitudes towards mathematics and the factors that reinforce those attitudes.

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APPENDICES

APPENDIX A

Mathematics Teachers' Questionnaire (MTQ)

Dear Respondent,

I'm conducting a study on the students' attitudes towards learning of mathematics. Please read the questions below and kindly give the appropriate response by either ticking in the bracket [] or by giving further information in the spaces provided. This study is purely for academic purposes and all information given shall be treated confidentially.

Section A: Personal background information:

(1) Gender: Male [] Female: []

(2) What is your professional qualification?

Graduate teacher [] Diplomat [] Untrained teacher []

Others (specify) -----

Section B: Teaching information:

(1) How many mathematics lessons do you teach per week? -----

(2) How many years have you been teaching?

- (a) 1 – 5 years []
- (b) 6 – 10 years []
- (c) 11 – 15 years []
- (d) more than 15 years []

(3) Do you like teaching mathematics?

- (a) Very much []
- (b) Moderately []
- (c) Very little []
- (d) Not at all []

Section C: Information on mathematics:

1. Do your students attach a lot of value to mathematics as a subject?

(a) Yes [] (b) No []

Why? -----

2. What is your opinion on mathematics as a subject?

- (a) Dull [] (b) Tedious [] (c) Interesting [] (d) Very Interesting []
- (e) Other

(Specify).....

3. What are the general attitudes of your students towards learning of mathematics?
(a) Very positive [] (b) Positive []
(c) Negative [] (d) Very negative []
4. Is the content of the current mathematics syllabus relevant to the needs of the society?
(a) Not relevant [] (b) Somehow relevant []
(c) Relevant [] (d) Very relevant []
5. Do you have any problem with the syllabus of mathematics?
(a) Yes [] (b) No []

Specify them: -----

6. What do you think your students like about mathematics?
(a) The teaching [] (b) The teacher [] (c) The subject content []
(d) any other (specify) []

7. What do students like in mathematics as a subject? -----

8. What reason(s) could you attribute to your answer in question 7 above?

9. How can the students be encouraged to like mathematics?

10. Suppose you realize that your students are not interested or do not like learning Mathematics, what do you do?

- (a) Tell them the importance of mathematics []
- (b) Change teaching method []
- (c) Organize internal (or external) symposia []
- (d) Take them outside classroom and demonstrate usefulness of mathematics []
- (e) Punish them []
- (f) Nothing []
- (g) Other (specify)

Section D: Methods of teaching mathematics:

The following are different methods used to teach mathematics that may enhance learning of mathematics. Show by indicating against each method how frequent you use it. Rating of the method preferred is as follows:

1 – Never (N.) 2 – Sometimes (S) 3 – Often (O) 4 – very often (VO) and 5 – Always (A).

Teaching methods	N	S	O	VO	A
Lecture method					
Small group discussion					
Student demonstrating to one another (or to others)					
Teacher assisting individual					
Question & and Answer					

Any other, specify how frequent: -----

Which of the above methods do you think enhance learning of mathematics and why?

Section E: Methods used by Mathematics Teachers to Motivate Students

1. The following are motivation techniques that enhance learning of mathematics among students. Show by indicating against each method how frequent you use it. Rating of the method preferred is as follows:

1 – Never (N.) 2 – Sometimes (S) 3 – Often (O) 4 – very often (VO) and 5 – Always (A).

Techniques of motivation	N	S	O	VO	A
Reinforcing with positive comments					
Using teaching aids					
Varying teaching methods					
Giving frequent feedback					
Providing individual attention					
Offer incentives to any small progress					
Knowing each student by name					

Any other, specify how frequent -----

2. Give suggestions that you think would improve learning of mathematics among Students -----

Thank you

APPENDIX B

Mathematics Students' Questionnaire (MSQ)

Dear Student,

The purpose of this questionnaire is to find out students' attitudes towards learning of mathematics.

Instructions

1. You may not write your name anywhere in this questionnaire.
2. The information you give concerning your feelings towards learning of mathematics will be handled confidentially. Please respond to the items below as honestly as is possible.
3. Put a [\surd] in the brackets corresponding to your answer.

Section A: General information about the student and school

1. Type of school: Boys [] Girls [] Mixed []
2. Gender: Male [] Female []
3. Which of the following problems do you think affect you most when learning Mathematics?
 - (i) Lack of interest in mathematics []
 - (ii) Inadequate mathematics textbooks and learning resources []
 - (iii) Language used by the teacher is difficult to understand []
 - (iv) Lack of confidence []

Any other, specify -----

Suggest possible solutions to your problem: -----

Section B: Your feelings towards learning and performance in mathematics

(1) **Instructions:** This section has statements that you are to decide carefully whether you strongly agree (SA), Agree (A), Not Sure (NS), Disagree (D), or Strongly Disagree (SD). Put a tick [\surd] against each statement depending on your feelings. If you make a mistake, cross by putting (X) through the tick [\surd] and then tick in the appropriate box in the table below

Part A

Students' opinion	S	A	NS	D	SD
I enjoy learning mathematics					
I would like to continue doing mathematics after secondary school					
To understand mathematics is difficult					
Mathematics is very useful in life					
Among the subjects taught mathematics is my favorite					
I feel extremely anxious and fearful when math exams are mentioned or brought					
Mathematics should not be a compulsory subject					
Mathematics is impossible to learn					
The best way to learn math is to discover a concept by yourself					
My grades are always low in mathematics					
I do mathematics for the sake of it					
Learning mathematics is remembering what the teacher says and does					

Part B

Students' opinion	S	A	NS	D	SD
Mathematics classes/lessons are not interesting					
I am given a lot of unnecessary mathematics assignments					
Am well provided with mathematics textbooks and other learning materials					
Being a girl or a boy interferes with my learning and my performance of mathematics					
I think it is the teacher who can make mathematics learning easier					
My parents and siblings encourage me to learn Mathematics and to perform well in the subject					
My friends don't like learning mathematics					
I like my mathematics teacher					
I learn mathematics well regardless of the gender of my teacher					
I do a lot of mathematics exercises on my own or with a friend					

Thank you

APPENDIX C

Senior High Schools in KEEA Municipality

- | | |
|---|---------|
| 1. Edinaman Senior High School – (Mixed) | Public |
| 2. Eguafo-Abrem Senior High School – (Mixed) | Public |
| 3. Komenda Senior High Technical – (Mixed) | Public |
| 4. Peter Holdbrook Smith Senior High School – (Mixed) | Private |

