UNIVERSITY OF EDUCATION, WINNEBA

EXPLORING THE INFLUENCE OF PERCEPTION AND INTEREST IN MATHEMATICS ON STUDENTS' MATHEMATICS ACHIEVEMENT IN BOLE SENIOR HIGH SCHOOL

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of the requirements for the award of the degree of Master of Philosophy (Mathematics Education) in the University of Education, Winneba.

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DECLARATION

STUDENT'S DECLARATION

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

SIGNATURE: .....

DATE: .....

SUPERVISOR'S DECLARATION

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

Supervisor: Prof. C. A. Okpoti

SIGNATURE: .....

DATE: .....

DEDICATION

I dedicate this humble piece to my brother (Mr Adamu Seidu) for his lifelong brotherly care and my lovely wife (Mrs Issifu Barichisu) for their support and prayers throughout the programme.

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LIST OF ACRONYMS

CAMFED: Campaign for Female Education

G. E. U: Girls Education Unit

G.E.S: Ghana Education Service

GMPs: Girls Mentorship Programmes

J.H.S: Junior High School

MoE: Ministry of Education

P.T.A: Parent Teacher Association

PBL: Problem-Based Learning

S.H.S: Senior High School

TLMs: Teaching and Learning Materials

UNESCO: United Nations Educational, Scientific and Cultural Organization

UNICEF: United Nations Children Educational Fund

WASSCE: West African Senior Secondary Certificate Examination

UNFPA: United Nations sexual and reproductive health agency.

WHO: **W**orld Health Organization

ABSTRACT

The main purpose of this study was to explore by means of quantitative, exploratory, descriptive and inferential methods of statistical analysis to investigate how students' achievement in mathematics is affected by students' perception and students' interest to learn mathematics. The study further investigated the effect of students' perception on students' interest to learn mathematics. The study adopted purposive sampling method in selecting the school and a simple random sampling technique to administer 270 questionnaires to Bole Senior High School students in the Savanna Region of Ghana. A total number of 270 Students were given questionnaires on students' interest in mathematics, students' perception of mathematics and students' achievement test to indicate their responses for the study. However, 232 questionnaires were properly responded, representing 85.9% response rate. The Results from 232 students who responded to the various questionnaire items revealed that students' interest in mathematics is dependent on the perception and the misconception held by students about mathematics as a subject. Students' achievement in mathematics was also found to be statistically significant on students' interest to learn mathematics and perception held by students about mathematics. The findings indicated that when Bole Senior High School students have good perception about mathematics as well as interest to learn mathematics, their achievement in mathematics would improve significantly. Nonetheless, the analysis also revealed that variables such as age, the type of school attended, students' access to textbooks was found to be independent on the student's achievement in mathematics. The researcher suggest that further work on the factors and their level of effect on the students' achievement in mathematics should be undertaken in other parts of the country.

CHAPTER ONE

INTRODUCTION

1.0 Overview

This chapter discussed the background of the study, statement of the problem, purpose of the study, research objectives, research questions, significance of the study, scope of the study, limitations of the study, delimitations, assumptions of the study and organisation of the study.

1.1 Background of the Study

Over the years, the nation needs a skilled, knowledgeable workforce and well equipped citizens to function in a complex world. This can only be achieved through a sound understanding of science and its related subjects. Science is a major tool for change in the modern world. Science is the hub of all technological advancement (Reeve, 2013), the scientific aspect of science and technology has turned the world into a global village in which we live. Science is a systematic process that builds and organizes knowledge in the form of testable explanations and predictions about the universe.

Besides, mathematics is the heart of science and its related courses, without mathematics there is no real development in science and technology (Hafiz & Hina, 2016). The competence gained in the study of mathematics is widely known and used in all spheres of human life (Asiedu-Addo & Yidana, 2004). Mathematics plays a very key role in shaping how individuals deal with the various spheres of private, social, and civil life (Anthony & Walshaw, 2009). Mathematics is seen by society as

the basis of scientific knowledge that is very important in socioeconomic development of a nation (Reeve, 2013).

According to Kalhotra (2013), mathematics is one of the most important subjects which act as a bridge to all source of knowledge. This was intensified by FRN 6th edition (2013) in which mathematics was clearly stated and noted as a necessary requirement for any science related fields of study such as the engineering, chemistry, health sciences (Medicine, nursing and optometry), and the social sciences (communication, economics and geography). However, mathematics is very useful in our day to day activities such as cooking, driving, savings and credit buying and selling (Laure, 2008). This idea was supported by Du Sautoy (2010), a famous mathematician and scientist, who once said, "The universe cannot be read until we have learned the language and become familiar with the characters in which it is written. It is written in mathematical language, and the letters are triangles, circles and other geometrical figures, without which means it is humanly impossible to comprehend a single word. Without these, one is wandering about in a dark labyrinth". Mathematics is the basic foundation of all scientific education. This idea was supported by Carl Friedrich Gauss (1777–1855) referred to mathematics as "the Queen of the Sciences".

Despite the importance of mathematics to students' careers and its relevance to everyday life, there are a number of observable problems associated with its teaching and learning, especially at the senior high school level. Researchers find it very important to investigate why students still fail in mathematics. Bol and Berry (2005) conducted an inquiry to determine the factors which are responsible for mathematically achievement gaps. The study revealed that students' characteristics such as differences in motivational levels, work ethic, family support and lack of

mathematics supervisors could be the causes of the achievement gaps at senior high level. Leonard (2016) found that, teacher factor, student factor, instructional strategy, mathematics anxiety and infrastructural problem could be the major causes of the low achievement in the Secondary Schools. Okigbo and Okeke (2011) identified a poor background in primary school, students' lack of interest, incompetent primary teachers, unawareness of the difficulty of mathematics, large-class syndrome, psychological fear for the subject, poor teaching methods, and lack of skilled mathematics teachers as causes of low achievement in mathematics at the Junior and Senior High Schools. Douglas (2017) on his studies highlights on lack of teachers-efficacy and unqualified mathematics teachers could be the main causes of poor performance in mathematics in senior high schools. Pallavi, (2016) pointed out that students perceived mathematics difficult due to its theories and concepts involved, during its delivering. It is claimed that academic success or failure is related to many factors. In general, various studies that attempt to explain academic success or failure do so by looking at three basic elements that interfere in education; parents (family causal factor), students (personal causal factor) and teachers (academic causal factors) Diaz (2003).

The cause of students' failure in mathematics is undeniably as a result of their own actions (Fatola, 2005). He added, it is due to the fact that students have expressed a very low interest in mathematics and turn to dislike mathematics. Even at Senior High School level in Nigeria, where Ghana is not an exception, students do not want to attend mathematics lessons (Fatola, 2005). Those who attend the mathematics lessons do not pay attention to the teacher. Most of the students do not practice mathematics on their own, neither do they solve mathematics problems on their own. According to Arthur, Asiedu-Addo and Assuah (2017), when the option is available, many students

would prefer not to have anything to do with learning mathematics and this attitude has led them to the low achievement in mathematics.

On the other hands, Kiplagat, Role and Makewa (2012) indicated that teachers are the major cause of poor performance of students in mathematics. Bol and Berry (2005) found that some teachers' low knowledge in mathematics could lead to poor performances of students in mathematics. Also Njoroge (2004) carried out a study on teaching methodology in secondary schools and explained that teachers' incompetency and poor teaching techniques used during lessons could be major causes of students' poor achievement in mathematics. It is reasonable enough to conclude that the teachers' attitude both during and after instructions may influence students' perception and interest in mathematics achievement. Etuk, Afangideh and Uya (2012) indicated that the relationship between how students perceive their teachers in respect of knowledge of mathematics content, communication ability, use of appropriate teaching strategies and teachers' classroom management skills determine the kind of attitude students attached to the subject at the Secondary level of education. According to other researchers, learning mathematics does not only involve thinking and reasoning, it is dependent on the attitudes of the learners towards learning mathematics (Anthony & Walshaw, 2007; Grootenboer, Lomas, & Ingram, 2008; Kele & Sharma, 2014). Han and Carpenter (2014) state that attitudes consist of cognitive, affective and behavioural reactions that individuals display towards an object or the surrounding based on their perception, feelings or interest. The cognitive component of attitude is what the individual perceives or believes about mathematics (Akinsola & Olowojaiye, 2008; Maio & Haddock, 2009; Mensah, Okyere, & Kuranchie, 2013). The affective component of attitude is the feeling or emotions of the individual associated with learning mathematics (Ingram, 2015). Thus, the

affective component is the source of driving the engagement of students towards mathematics.

Furthermore, the affective aspect is also influenced by the perception or belief formed from the cognitive component of attitude, which creates a mind-set that becomes constant over time and influences the feelings of the students towards learning mathematics (Ingram, 2015; Zan & Di Martino, 2007). As such, the cognitive and affective components of attitude are interrelated and deeply interact with each other (Di Martino & Zan, 2011).

Moreover, the behavioural aspect of attitude is the tendency to respond in a certain way towards learning Mathematics (Akinsola & Olowojaiye, 2008; Maio & Haddock, 2009; Mensah et al., 2013). Behavioural attitude is also influenced by affective attitude. Students feeling confident in doing mathematics is linked with being successful in mathematics, which is regarded as a positive behaviour. If students are not confident in doing mathematics, they may not experience success, and unsuccessful behaviour is regarded as negative feelings (Zan & Di Martino, 2007). Hence the behavioural component of attitude has an impact on the cognitive component of attitude as well. When students see the importance of mathematics in real lives, they feel engaged, confident and connected to their learning (Attard, 2012). As such, the three components of attitude, confidence, importance of mathematics and engagement are interrelated (Mensah et al., 2013).

However, according to Ampadu (2012) the interest of students cannot be undermined, since it is directly linked to performance. Students often perceive their mathematics teachers' teaching effectiveness before developing interest in the subject (Ivowi, 2001). These were supported by Leonard **(**2016) who said, the few students who had interest in mathematics, thus have a high positive perception about their mathematics

teacher efficacy in the subject. A positive or high perception from the students, shows the extent to which the student has interest in the mathematics teacher's instructional method as this was supported in the report of findings from teacher's evaluation research by Kunter, et.al (2008). Consequently, attitudes of mathematics teachers are what greatly determine the perceptions they get from their students (Olasehinde & Olatoye, 2014). Rebecca and Angela (2012) studies revealed that, particularly boys perceived teacher support as a necessary tool that plays a very significant role in facilitating their mathematics interest as well as their mathematics achievement. However, other researchers also found that Subject-specific interest is an important determinant for successful learning and advanced achievement of mathematics (Fisher, Dobbs-Oates, Doctoroff, & Arnold, 2012). However, according to Adodo (2007) argued that one major factor responsible for the success of students' academic achievement is the teacher-efficacy. Orleans (2007) also supported the idea that the key factor in what comes out at the end of schooling is what goes on in the classroom. (Mereku, 2004, 2015) studies supported assertion that, no matter how well-developed and comprehensive a curriculum is, its successfulness dependents on the quality of the teachers and how well it will be implemented.

In conclusion, the perception of students about mathematics remains crucial in educational stakeholders' quest for finding lasting solution to the problem of poor performance and lack of interest in mathematics. These perceptions of learners about mathematics may be as a result of experiences learners have gone through at their early stages in their educational life (Taylor, 2007, Waugh & Su-Searle 2014). The experiences learners go through in their academic life come together to form factors that contribute to disliking of mathematics as a subject (Ali, 2013). The general lack of interest in mathematics which in most cases leads to total avoidance of

mathematics in many African countries where Ghana is not an exception remain crucial (Kim & Schallert, 2014, Silvia 2008). The perceptions held by many students may be that mathematics is a subject which is more of ability than effort. This view can further be implied that efforts may not matter in performance in mathematics in acknowledging that lack of mathematics achievement is mainly beyond students' control. The perceptions held by students in mathematics have in many cases prevented learners from reaching their desired academic height (Winheller, Hattie & Brown 2013, Frenzel, Pekrun, & Goetz, 2007). The fears of poor performance in mathematics are among other negative perceptions students hold about mathematics and these negative perceptions resist learning and enquiries. Since learning and enquiries depended on perceptions and beliefs (Wang, Lukowski, Hart, Lyons, Thompson and Kovas et al, 2015). These negative perceptions held by students, if not reversed could impact negatively on their interest and subsequently performance. Students' negative attitude they demonstrate in their academic life has been linked to their lack of motivation and achievement (Mensah, Okyere, & Kuranchie, 2013; Singh, Granville, & Dika, 2002a). The study by Githua and Mwangi (2003), revealed that achievements and performance should be linked to interest constructs since performance and achievement are driven by interest. He added that, predictors of students' achievements and performance such as attitude, self-concept, self-efficacy among others have received some degree of attention it deserves but these same variables relations with the students interest and perception have received little attention. The perception of students about mathematics and their motivation to learn mathematics is of great importance to students' interest in mathematics (Arthur, Asiedu-Addo, & Assuah, 2017; Martin, 2006; Meece, Wigfield, & Eccles, 1990). Students' interest in mathematics is key in their performance and achievement.

Therefore, the roles of teachers in shaping the perceptions of students is an important component of eradicating negative perceptions about mathematics (Ampadu, 2012). The teachers' role of eradicating negative perception about mathematics is all about knowing the learners and their perceptions held in order to help tackle this perceptions and develop their interest in mathematics. The teachers' ability to acquire knowledge about their students' perception of mathematics may improve strategies that will contribute in developing instructional strategies in teaching and learning of mathematics thereby improving students' mathematics achievement.

1.2 Statement of the Problem

The researcher's interaction and observations of students' performance in Bole S.H.S. has come to the realisation that, a great number of students performed very poor in mathematics. During the interaction, he also realised that students had different opinions about Mathematics. This has motivated the researcher to explore the influence of perception and interest in mathematics on students' mathematics achievement in Bole SHS.

According to Ampadu (2012), students' performance in mathematics depends on their attitude and perception towards the subject. Positive perception towards the subjects will encourage students to learn the subject better.

As in Heinze, Reiss and Franziska (2005) support the assertion that, students' attitudes need to be fostered throughout the process of teaching and learning in order to have a good achievement. A positive attitude or perception can motivate students' critical thinking, being active in the classroom, working together in groups, improve interaction and communication skills. All these kind of attitudes will boost up the performance of mathematics.

Rebecca and Angela (2012) studies revealed that one of the reasons that influences students' perception of a particular subject is the educator or the teacher. The teacher as a medium in teaching and learning process lacks the pedagogical knowledge to vary the teaching and learning strategies that will boost students' interest and positive perception towards the subject.

According to Arthur, Asiedu-Addo and Assuah (2017), studies revealed that, the perceptions held by students in mathematics can be traced right from childhood, and blames it on the wrong notions imparted to children by their older siblings. Our old siblings made us believe mathematics is a difficult subject. So, that perception sticks in students' minds and they grow up believing that mathematics is difficult. This prevented learners from reaching their desired academic height.

In fact, low performance in this subject is one of the major factors contributing to a high drop-out rate at the Senior high school level as students who are unable to pass their mathematics tests drop out of school (Snyder & Dillow, 2010). This low achievement in mathematics has become a problem for educators and researchers. Therefore according to Chaudhry, Shafiq, and Berhanu, (2011) found that Students' poor study habit, low self-esteem, teacher factors, inadequate teaching facilities in Schools, home factors, school environmental factors could be the causes of the poor achievement and interest in mathematics. According to Khan (2011) and Andronache (2013), competence is not only about having knowledge and skills but also integrating attitudes which is rightly selected and properly used to allow successful achievement of tasks in professional and social context. Since Teachers formed the core part of teaching and learning process, we cannot achieve the expected goal without improving appropriately on their efficacy as it has direct linkage to the major causes of students' poor performance and effective teaching and learning (Jeon, 2017).

As indicated earlier, Students' perception and interest in mathematics have been a great concern for educators, parents and policy makers over the years. Many Senior High School students in Bole District as indicated in the background are showing less interest in studying mathematics. Research has revealed that a great number of students perceived mathematics as a "boring, irrelevant and very difficult subject" (Smith, 2004:p2). In line with this assertion, many learners in the District perceived mathematics as a subject meant for the talented and high achievers. In addition, some learners have viewed mathematics as some "abstract black box" that contains nothing but complex, strictly held concepts and procedural imaginative formulae for memorization (Allotey, 2012). This view of mathematics as a subject of study has contributed to the dwindling interest of learners towards its study in Bole SHS as shown in appendix c of this research work. Therefore, this study is designed to explore the influence of perception and interest in mathematics on students' mathematics achievement in Bole senior high school.

1.3 Purpose of the Study

The purpose of the study was to explore the influence of perception and interest in mathematics on students' mathematics achievement.

1.4 Objectives of the Study

The study was guided by the following specific objectives;

1. To explore students' perception about mathematics and its influence on their Mathematics achievement.
2. To explore the extent to which students' interest in mathematics influence their achievement in mathematics.

3. To examine the relationship between students' perception and interest against their achievement in mathematics.

1.5 Research Questions

This study seeks to find answers to the following questions:

1. To what extent does students' perception about mathematics affect their achievements in mathematics?
2. To what extent does students' interest in mathematics influence their achievement in mathematics?
3. What is the relationship between students' perception and interest against their mathematics achievement?

1.5.1 Research Hypotheses

To achieve the objective three of the study, the following hypothesis were tested:

H_0: Students' perception and their interest in mathematics do not have significant effect on their mathematics achievements.

H_1: Students' perception and their interest in mathematics have significant effect on their mathematics achievements.

1.6 Significance of the Study

This study findings will be of great benefit to Students, mathematics teachers, the school administrators, policy makers in education and government. Policy makers are expected through this study to realize the importance of students' interest in mathematics and its influence in their mathematics achievement. Therefore, the study will help improve educational policies that will boost student's interest in

mathematics. The study findings will contribute to the existing body of knowledge in the area of mathematics in the district as well as other areas. Findings from this study would be very useful to students, teachers and other stake holders in the Educational sector to identify teacher-efficacy as a positive contributor to students' interest and achievement in mathematics. It will also be of benefit to educationists as it will open more research gaps for future research in the field of mathematics education. The views from various mathematics students will enrich teaching approaches, identify and give a probable and workable solution to some of the problems facing them in teaching and learning of mathematics.

However, the research findings will be of benefit to mathematics teachers as it will guide them to improve on their method of delivering lessons as well as improving students' mathematics achievement. When teachers understand that learning is not a "one-size–fits-all" approach, it will make it easier for teachers to teach to the strength of their individual students and ensure that mathematics stays on the cutting edge tomorrow.

1.7 Scope of the Study

This study was carried out on only one senior high school students in Bole District, of the Savanna Region of Ghana. The study was limited to exploring the influence of perception and interest in mathematics on students' mathematics achievement.

1.8 Delimitation

The study limits itself to only one public Senior High school in the Bole district, in the Savanna Region of Ghana for a more conclusive report. Where forms 2 and 3 students were used for study, since they form the population of interest for the research and their easy accessibility.

1.9 Limitations of the Study

The study anticipated some challenges in the availability of finances and time in process of data collection. The target population was big making it necessary to have multiple sampling processes. This was overcome by conducting purposive sampling and random sampling which was time consuming and financially straining. However, the constraints were ably mitigated.

1.10 Assumptions of the Study

a) Students in all cases were of similar learning backgrounds and that any difference in learning was a direct result of the classroom experience with which students interact.

b) Every student has innate ability for high achievement.

c) Most of the mathematics teachers had been trained.

d) Students' perceptions, attitudes and interest affect their performance.

1.11 Organization of the study

This study was organized into five chapters. Chapter One, deals with the background of the study, statement of the problem, purpose of study, research objectives, research questions, significance of the study, scope of the study, delimitations of the study, limitations of the study, and assumptions of the study were presented. Chapter Two, looks at the review of relevant literature to the study. Chapter Three is about methodology of the study. In Chapter Four, the data analysis, the results and discussions of major findings of the study were found. Finally, Chapter Five covers the summary of the study, conclusions and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.0 Overview

This chapter of the study presents an overview of literature related to the topic of the study. The review is done under the following subsections; perception, concept of perception, students' perception towards learning mathematics, influence on students' interest and achievement in mathematics, students' perception towards mathematics and their academic achievement, the theoretical framework and the conceptual framework will be considered.

2.1 Perception

Perception is defined as the process through which we select, organise and interpret information gathered by our senses in order to understand the world around us (Greenberg and Baro, 1999:72). An important aspect of how we perceive objects or people has to do with what we think they are or should be (Morris, 2008). How mathematics is perceived depends on what students themselves think mathematics is all about. Because students are limited in what they can perceive, they are highly selective in whatever they choose to perceive and which is relevant to them. In this process of filtering, different people will react differently even when they are from the same physical environment. They would not always have the same experiences, hence the differences in people's perceptions. Perception is therefore what results in our attitudes, and our actions in turn depend on our attitudes. Individual differences in perceptions of students' have been linked in several studies to academic performance (Guay, Marsh & Boivin 2003; Spinath, Frank, Bright & Robert, 2006).

Self-concept is broadly defined as the image or perceptions that students hold about themselves (Ahmayaara & Houston, 2007). It includes attitudes, feelings, and knowledge about abilities, skills, appearance and social acceptability (Bouche & Harter, 2005). According to Bouche and Harter (2005), these perceptions of self are basically formed through experiences with and interpretations of one's environment. They also suggest that self-concept is a construct that becomes more multifaceted as the individual moves from infancy to adulthood. However, one aspect of self-concept that may be more pertinent to academic performance is culture or ethnicity. Research, mostly in Western and European cultures, has established that self-concept has a significant influence on students' outcomes (Bouche, & Harter, 2005; Cokely; 2002, Spinath 2006). Students' perceptions of their faith between their self -concept and academic demands are important for learning outcomes. Indeed, self- concept researchers have found a relationship between the way students describe themselves and their academic performance (Harlaar, Frank, Bright, & Robert 2006). Self-concept literature supports the notion that how individuals perceive themselves can impact all phases of their lives. Perceptions in mathematics and associated anxiety have been known to plague students from all socio-economic and diverse types of backgrounds (Woodand, 2004).

Unfortunately, many students are not confident about their ability to solve mathematical problems. A poor perception toward the discipline is thought to plague learners at every level of schooling (Tapia, 2004). A student's confidence about his or her ability is often seen as an important variable in teaching and learning processes. There is awareness in an education context that lack of confidence may lead to the learner being prevented from making the required effort to reach the goals of their educational processes.

Reid and Yang (2002) define confidence as one part of self-concept which has to do with how sure a student is of his or her ability to learn new mathematics and to do well on mathematics tasks. They argue that confidence affects a student's willingness to approach new topics and to persist when the material becomes more difficult. It is argued that confidence is an attitude or perception towards oneself and it depends heavily on experience (Oraif, 2007). Reid and Yang (2009) noted that confidence was lacking when secondary and basic school students faced a new and open-ended task but, with the completion of the first such task, confidence was observed to grow markedly when facing subsequent tasks even when the students were finding the tasks difficult. Yang (2009) also found that the growth of confidence did not necessarily seem to lead to better performance in the open-ended tasks, but it did mean that the students approached subsequent tasks more enthusiastically with more self-belief and assurance. The effects of confidence on mathematics achievement and participation have been explored in many studies (Planas & Civil, 2008; Evans, 2005) and there were significant correlations between confidence in mathematics ability and mathematics achievement. A study presented by Evans examined grade eight pupils' attitudinal and motivational variables related to mathematics achievement in Jordan. One of the most important results reported in this study is that confidence was more strongly correlated with mathematics achievement than any other variable. Individuals with poor perception toward mathematics are often reported to have a low self-concept and feelings of incompetence (Schoenfeld, 2002). These perceptions are manifested as self-deprecating remarks and a perpetual lack of success in mathematics. Self-concept is an important feature to be considered in the realm of achievement and self-evaluation of one's abilities. In fact, Pezdek, Berry and Renn (2002) found that elementary mathematics teachers' attitudes can be transmitted to

their students in that perception toward mathematics is highly related to students' statements about previous mathematics teachers. Therefore, if teachers' attitudes or perceptions towards mathematics are positive, then these beliefs may enhance their own global self-concept while affecting and benefitting their elementary students in the area of mathematics learning. Improving graduates and undergraduates students' perceptions toward mathematics is an important concern for university education courses. This will facilitate positive mathematics perceptions in future senior high Students.

2.2 The concept of perception

The term perception is said to have originated from a Latin word, “percipere” which means to perceive. Perception is defined as the process through which we select, organise and interpret information gathered by our senses in order to understand the world around us (Greenberg and Baro, 1999:72). Perception has to do with the individuals’ feelings about, or appraisal of, a given object, thing or a person based on the individuals’ past and present experiences. Fazio and Williams (1986) see perception as those subjective experiences of objects or events that results from a stimulation of the individuals’ receptor organ. There are two dimensions to perception. They are the conscious recognition dimension and the instinctive dimension. Conscious recognition dimension of perception concerns itself with the process by which an individual consciously recognizes and interprets issues in accordance with his/her understanding of the environment or the perceived object. Conscious recognition dimension is believed to be the basis for a particular action or reaction towards a perceived person, object, activity or event (Akurugu, 2010). Instinctive dimension on the other hand, deals with the response or reaction of an individual towards the perceived object based on the individuals existing knowledge,

sense, notion, impression and conception of the individual (Akurugu, 2010). It is in recognition of these dimensions that Fazio and Williams (1986) explained that perception about a given object, person, or event results from the stimulation of a person's receptor organ. According to them, this stimulation is encoded into a neural activity which in turn is relayed to the central nervous system for further processing. It is believed that the perceptual experience of an individual is a direct result of these neural processes. It must however be noted that perception may sometimes occur without necessarily being influenced by an external receptor stimulus, but rather, it may result from an evolutionary adaptation of an innate knowledge (Fazio and Williams, 1986 and Akurugu, 2010). From the above revelations, the perceptions of female learners on mathematics as a subject of study at the Senior High School may either be innately determined or may be based on their past and present experiences with regards to the subject.

Kreitner and Kinicki (2004), cited in Akurugu (2010) have explained that the formation of perception about an object is just similar to processing information. Just like information processing, perception begins from a selective attention stage through to encoding, storage and retention to a final stage of retrieval and response. With regards to the selective attention stage, Kreitner and Kinicki are of the view that people are not able to comprehend all the competing information that comes their way hence; they may tend to select such information that either suits their interests or those that are familiar with their previous knowledge. According to Akurugu (2010) however, the tendency of people to pay more attention to information that connotes negative is higher than that of positive information. In this regard, the tendency of students to pay more attention to the notion that mathematics is a difficult subject of study is higher than those who see mathematics as a very useful subject for all persons

and must be given the necessary attention. This is what he terms as a "negative bias" tendencies among people in general (Akurugu, 2010:19). In this light, he thinks that a person might consider and for that matter select information that connotes negativity if such information is regarded as what he terms a "salient stimuli".

The selected information is then encoded. Here, the individual begins to analyse and interpret the information based on what Akurugu refers to as the persons' "schemata". It must be noted that varying interpretations may arise on the same information by different people based on individuals' differences in schemata, moods and emotions, as well as cognitive abilities. For instance, Kreitner and Kinicki (2004), cited in Akurugu (2010) observed that individuals who are depressed in life are more likely to interpret information negatively than those who are happy in life. Following the encoding stage is the storage and retention stage. Here, the encoded information is stored in the long- term memory of the individual. The final stage of Kreitner and Kinicki's perception process, according to Akurugu (2010) is the retrieval of information from memory where it was stored. For people to make their judgements and decisions with regards to issues confronting them, they would have to retrieve the stored information from their memories. This retrieved information is believed to be responsible for the responses of the individual with regards to the given situation, person or object and subsequent formation of a perception towards that object, person or situation.

2.3 Students' Perception towards learning mathematics

Researchers (Attard, 2012; Grootenboer et al., 2008; Mata, Monteiro, & Peixoto, 2012) have identified important factors that contribute to students' negative perception towards learning of mathematics. These include the students themselves, the school, the teachers' beliefs and attitudes (Beswick, 2006) and their teaching

methods. The teachers' teaching methods have a major influence on students' perception (Akinsola & Olowojaiye, 2008; Mensah et al., 2013). Teachers can do many things to facilitate the classroom learning to alleviate students' interest, engagement level and confidence in learning mathematics (Attard, 2012; Kele & Sharma, 2014). According to Sullivan and McDonough (2007), teachers can find ways to encourage students' engagement and confidence in learning mathematics. This can be achieved by implementing meaningful activities embedded in real-life contexts (Kacerja, 2012)

2.4 Students' Perception towards mathematics

Arthur, Asiedu-Addo and Assuah (2017) conducted a study on Triangular law of students' mathematics Interest in Ghana: A Model with motivation and perception as predictor. The purpose of the study was to investigate the effect of students' perception and students motivation exert on students interest in mathematics. The study used sample survey method for data collection needed for investigating the problem under study. The study also used purely quantitative research paradigm to generate the needed statistics and results. The results from the study revealed that students' motivation and students' perception significantly predicted students' interest in mathematics.

Arthur, Asiedu-Addo and Assuah, (2017) carried out a research on students' perception and its impact on Ghanaian students' interest in mathematics. The study aimed at addressing the effect of students' perception and its impact on students' interest in mathematics using multivariate statistical techniques. Quantitative data was used during the study and the following findings were identified;

The study established that, 58.1% of the total respondents agreed cumulatively that, students' negative perception of mathematics from the basic school has strong influence on their interest in mathematics as they moved forward on their educational ladder. However 20.4% of the total participants cumulatively disagreed with the statement that negative perception of mathematics by students from basic schools affected their interest in mathematics.

The study also concluded that 58.4% of the total participants agreed with the statement misconception about mathematics affected student interest in mathematics but 14.4% of the total participants disagreed with 27.2% of the total participants neutralising the statement that misconception about mathematics affected students' interest in mathematics.

The study further found that 60% of the total participants were found to agree with the statement that, Students with bad perception about mathematics negatively affected students' interest in mathematics, conversely, 14.2% of the total participants were found to disagree with the statement that, Students with bad perception about mathematics negatively affected students' interest in mathematics.

Besides, the study also identified that, students felt they are not involved in the teaching and learning process. It was found that less than 25% of the participants agreed while 37.7% of the participants disagreed with the statement that students are not involved in the teaching and learning of mathematics. In effect, the participants were undecided on the statement and were indifferent and were more skewed to disagreement than they agreed.

The study also revealed that, 51.4% of the total participants agreed with the statement that, students' perception that only bright or good students can perform well in mathematics affected students' interest in mathematics while 24.4% of the total

participants disagreed. The study however found 24.2% of the total participants to neither agree nor disagree with the statement.

The study concluded that, negative perception of students about mathematics significantly influenced their interest in mathematics negatively, however, students' perception explains almost 85% of their interest in mathematics.

Kabeera, (2018) carried out a study to examine the influence of students' perception on mathematics: Case of three selected Rwandan senior high schools. The purpose of the study was to examine the factors that influenced students' perceptions towards mathematic achievement. The researcher made use of a descriptive survey designed to explore the perceptions of senior high school students towards mathematics achievement in three senior high schools in Rwanda. The study further analysed relationship between the teachers and the students and how this relationship can positively or negatively influence the students' perceptions towards the general mathematics performance. The research revealed that Language is one of the factors that has influenced the students' perceptions towards mathematics. It was equally exposed that age greatly influenced the way students viewed mathematics, it highlighted that students from the age of 14-18 usually viewed mathematics as a difficult subject. The study found out that there was a significant discrepancy in perceptions between the ways girls perceived mathematics to boys. The research's results showed that there is a grand relationship between teachers, learning materials, and school administrators' supports on the self-confidence of students of all ages, gender, beliefs, and attitudes, and thus influenced positive attitudes towards mathematics. The study also revealed that gender related factors influenced the students' perceptions towards mathematics, it noted that girls tend to develop a low self-esteem that they cannot boldly compete with boys in mathematics.

Paul, (2014) carried out a research on the Influence of Students' Perceptions on mathematics Performance: A Case of a selected senior high Schools in South Africa. The purpose of the study was to investigate the influence of students' perceptions on mathematics performance at some selected South African senior high schools. The study made use of quantitative data analyse. The findings from the study showed a strong positive relationships between performance and perception constructs, such as self-confidence, interests in mathematics, teaching and learning material as well as myths and beliefs. Students perceived difficulty in mathematics as an obstacle, and attributed failure to their own lack of inherited mathematical ability. These findings suggested that differences in (i) myths and beliefs about mathematics success, (ii) motivation given to students by mathematics teachers and parents, (iii) Mathematics teachers' teaching styles and learning materials and (iv) Self confidence in mathematics may lead to differences in perceptions about mathematics. These in turn may lead to differences in perceptions towards mathematics and learning mathematics which have a bearing on performance.

Ampadu, (2012) carried out a research on students' perceptions of their teachers' teaching of mathematics, in junior high schools in the Cape Coast Metropolis of Ghana. The purpose of the study was to find out (1) students' perceptions of their teachers' teaching methods in relation to teacher-centred and student-centred teaching methods, (2) Students' perceptions of their own learning in relation to passive and active learning experiences. The study employed a mini survey method in investigating into students' perceptions of their teachers teaching. The research revealed that students' perceptions of their teachers' teaching varied as the results established that both teacher-centred and student-centred teaching approaches were used by mathematics teachers. The study also established that teachers' actions and

inactions impacted positively or negatively on students learning experiences and the way they perceived the subject. The study concluded that, teachers' actions and inactions impacted positively or negatively on students perception as majority of the respondents reported that their learning experiences are to a larger extent controlled by that of the teacher.

Murugan, (2013) conducted a research on Students' perceptions of mathematics classroom environment and mathematics achievement. The goals of this research were to examine the level of mathematics classroom environments and performance, compare these two constructs based on gender and determine the relationships between the constructs. Quantitative descriptive research framework was adopted based on cross-sectional survey method. Findings from the studies indicated that, students had a moderate perception of their mathematics classroom environment. Mathematics achievement was low, with female students achieving better than males in their mathematics assessment. There were no significant difference in perception of mathematic learning environment based on gender. There were significantly weak correlations between mathematics classroom learning Environment and mathematics achievement. The research findings brought some meaningful implications to the teaching and learning of mathematics at secondary school as well as the training of mathematics teachers in Malaysia.

This study concluded that students' perception of mathematics classroom environment in Sipitang, Sabah was average and their mathematics achievement was poor. These findings implied that females were better achievers than males. This study extended learning environment theories as well as used instruments to a local context by putting emphasis on students' perception and teaching and learning

processes through a constructivist view in relation with learning environment in a mathematics classroom in Sipitang, Sabah, Malaysia.

Mariam, Mustapha, Farah, and Liziana, (2016), carried out research on students' perception toward mathematic performance. The study was conducted using a survey method and were mainly based on the quantitative data collection through simple random sampling. According to the study's findings, the manner in which the course (Mathematics) was being handled by tutors during the process of teaching and learning is the first source of the students' perception toward mathematics. The findings also pointed out that students perceived mathematics as not useful in their lives and hence no need to develop an interest for it.

A research was conducted by Wasike, Michael and Joseph (2013) on the impact of perception on performance in mathematics of female students in secondary schools in Teso District, Kenya. This study sought to determine the impact of perception of female students on performance of mathematics within senior high schools in Teso District. The main objectives were to establish the effects of perception of female students on performance in mathematics in senior high schools. The study adopted a descriptive survey design. Analysis of the data was done using descriptive statistics. Analysis of data from the questionnaire responses revealed a significant ($P < 0.05$) effect perception towards performance in mathematics among the students. The findings indicated that Female students had negative perception towards mathematics. Most of the female students with negative perception performed poorly in mathematics. However, it also revealed that female students in boarding schools were established to have more positive perceptions towards mathematics and therefore performed better in the subject than female students from day schools. This indicated

that performance of mathematics can be improved through enhancing positive perception towards mathematics.

Kamau (2018), conducted a study on factors influencing girls' perceptions and attitudes towards mathematics in secondary schools of Westlands District, Nairobi County, Kenya. The study aimed at considering the factors that influenced girls' perceptions and attitudes and their impact on their performance in mathematics in Westlands District of Nairobi County, Kenya. The main objectives of the study was to establish the extent to which perceptions and attitudes of students are influenced by mathematics assessed curriculum, the school factors, home environment and gender related factors. The researcher uses both qualitative and quantitative techniques during data analyses. The following findings were identified. From the regression test found curriculum produced an error of the attitude of girls on mathematics by 0.266 units. This showed that the current curriculum of mathematics being taught in secondary schools negatively affected the attitude of the female students towards mathematics. A further investigation showed that this was attributed to the perception of the students that the mathematics concepts being taught in schools were too complex for students to understand.

The regression test also showed that teaching methods had a Beta value of -0.059 units. This represented a negative effect of teaching methods on attitude of the girls towards mathematics. This indicated that teaching methodology and the personality of teachers were found to have a negative influence on the perceptions and attitudes of female students on mathematics.

However, the method the teachers used to teach affected how students understood mathematics in class. Most of the students with bad attitude on the subject attributed this to the teaching method. Secondly, the attitude of the teachers towards the subject

affected students' perception negatively. Lastly, according to the regression test results, the home environment increased the attitude of female students to mathematics by 0.187 units. According to the results a good home environment provided comfort and relaxed atmosphere for the students to learn. Provision of textbooks and revision materials by the parents encouraged students to have a positive approach to mathematics. Allowing adequate time for students to study at home and motivating them largely contributed to the attitude of students on the subject. The parental encouragement also changed the attitude of female students positively.

The study concluded that mathematics curriculum negatively affected the perceptions and attitudes of female students on mathematics. This could be attributed to the attitude that both students and teachers felt the content was wide and the time for revision was inadequate and thus teachers rushed to cover the syllabus within the time given in a term. The current teaching methodology and personality of the teachers of mathematics negatively affected the attitude of the students. Most students' perceived teaching method as being difficult for students to understand and the teachers' attitude being negative. Also teachers and students indicated that time was inadequate to revise and cover all the wide content. Thus a change in teaching related factors would affect the attitude of female students towards mathematics.

The home environment influenced how students perceived education and more particularly mathematics. A good home environment with parental encouragement, ample time for studies, with enough reading and revision materials and with motivation from parents positively affected the students' perception and attitude towards mathematics.

Bright and Douglas (2018), carried out a study on Senior high school students' attitudes towards the study of mathematics and their perceived teachers' teaching

practices. The purpose of the study was to investigate students' attitudes towards the study of mathematics and their perceived teachers' teaching practices. The study made use of descriptive research survey design. The data was analysed using descriptive statistics, correlation and regression analyses. The following findings were showed from the study;

High perceived attitudes as reported in the students' interest in doing mathematics, usefulness of mathematics, and confidence in doing mathematics; it was unclear whether students perceived mathematics as a male dominated subject or not. The study also indicated that, with regards to teachers' teaching practices, all the 3 subscales: use of student- centered approach, classroom management skills and communication skills studied, were reported to be important in influencing students' interest in learning of mathematics. However, communication skills adopted by teachers in teaching the subject was perceived as the strongest predictor of high school students' attitudes followed by teachers' classroom management skills. The study concluded that to ensure students positive attitudes towards the study of mathematics, effective communication and classroom management skills should be integral in mathematics teachers' instructional practices.

2.5 Students' Perception towards mathematics and their Academic Achievement

Perception of pupils can be influenced by the attitude of the teacher and his method of teaching. Studies carried out in Australia have shown that the teachers' method of mathematics teaching and his personality greatly influenced students' positive perception towards mathematics and that, without interest and personal effort in learning mathematics by the students, they can hardly perform well in the subject (Bolaji, 2005; Koul & Fisher, 2006). The results of a research conducted in some

schools in Nigeria showed that students' perceptions towards mathematics were positive and many of them believed that mathematics is a worthwhile and necessary subject which can help them in their future career (Olatoye, 2002). The research suggested that stakeholders should organize periodic seminars and workshops for students, parents and teachers designed to promote positive perceptions towards mathematics.

Perception towards mathematics denotes interest or feeling towards studying mathematics. It is the students' disposition towards 'liking' or 'disliking' mathematics while perception in mathematics means scientific approach assumed by an individual for solving problems, assessing ideas and making decisions. Review of relevant literature depicts varying opinions and findings on the students' perception towards mathematics and their performances. According to Koul and Fisher (2006), perceptions towards mathematics are, in general, highly favoured, indicating strong support for mathematics and the learning of mathematics.

Silver, Mesa, Morris, Star and Benken (2009), Muijs and Reynold (2002), and Ma and Xu (2004) in their findings on perceptions revealed that in countries like Rwanda and Australia where there were emergent thirst for students perception towards mathematics and academic achievement, there were very favourable attitudes or perception towards mathematics. However, in countries where a high level of technological and industrial development had been achieved, the findings showed that perception towards mathematics was more neutral.

Mensah, Okyere, & Kuranchie (2013) differed in his report to the study carried out by Gutstien (2006) when he linked higher achievement in mathematics to positive attitude on the part of the students. As mentioned earlier, Olatoye (2002) found that

students perception towards mathematics have direct significant effect on their achievement in the subject, and Ampadu(2012) in a study of finding the influence of students' perceptions towards mathematics found that the teacher's method of teaching mathematics and his personality greatly accounted for the students' positive or negative perception towards mathematics. Students' beliefs and perceptions have the potential to either facilitate or inhibit learning. Nardi and Steward (2003) opined that students' perceptions about the value of learning mathematics may be considered as both an input and outcome variable because their perceptions toward the subject can be related to educational achievement in ways that reinforce higher or lower achievement.

However, despite these diverse views and reports from various researchers' perception towards mathematics and students' achievement, attempts have been made to improve students' perception and achievements. Researchers, including, Kyriakou and Goulding (2006), Bouche and Harter (2005) developed and evaluated some of such strategies directed at improving students' perception of science subjects includes a strong relation between mathematics contents and students everyday experiences. Orton (1989), Sullivan, Clarke and Clarke (2009) also stressed that students needed to develop the attitudes and habits of mind that are considered for meaningful work in mathematics and technology.

A critical look into the above cited studies indicated that there are positive reports concerning the relationship between students' perception and academic achievement. It is against this background that the present study also investigated the influence of perception and interest in Mathematics on students' mathematics achievement in Bole S.H.S.

2.6 Perceptions and world views of Students about mathematics

Most students are characterised by high levels of negative attitudes and anxieties towards mathematics. As discussed earlier, socio-cultural stereotypes, gender-biased approaches to mathematics teaching and learning, low parental involvements among others have contributed significantly to making many students' to perceive themselves as failures when it comes to mathematics and Science education. The world view of many students, especially girls are assumed to be weak in mathematics and mathematical concepts, they are not gifted nor talented in mathematics and hence do not have what it takes to succeed in mathematics achievement (Cracker, 2006 and Gunderson et al, 2012). Also, some students especially our female learners view the subject as an abstract, conundrums and more challenging (McLeod, 1994, Smith, 2004, Asante, 2010, Mata, Monteiro and Peixoto, 2012, Kiptum et al, 2013 and Ajai and Imoko, 2015).

2.7 General Perceptions and Attitudes of Students towards the Study of mathematics

According to Zan and Martino (2007), attitude towards the study of mathematics is either a positive or negative emotional disposition towards mathematics as a subject. Attitude towards mathematics has also been defined as "a like or dislike" for mathematics which results in a tendency to either engage in or totally avoid mathematical activities. This concept of "like and dislike" accounts from a notion of seeing oneself as good or bad at mathematics as a subject, coupled with the individual's world view of mathematics with regards to its usefulness or otherwise (Reynolds and Walberg, 1992 and Franzier-Kouassi, 1999).

Introducing a multidimensional perspective (emotions, beliefs and behaviours) to the concept of perception towards the study of mathematics, Smith (2004) sees perception towards mathematics as the tendency to be fearful of and anxious about mathematics as a result of the beliefs of an individual about the subject, the emotions associated with the subject and subsequent behaviour towards the subject. As explained by Eagly & Chaiken, (1993), attitude towards mathematics is characterised by cognitive, affective and behavioural components which can be formed through experience, reinforcement and observation of the mathematics teachers' attitude and behaviour towards the subject. The perception of students about mathematics as a subject determines their approach to studying the subject. Studies showed that many students approached mathematics with disdain as a result of the perception that mathematics is a procedural and rule oriented subject (Mensah, Okyere and Kuranche, 2013).

According to Carroll and Gill (2011), negative attitudes towards the study of mathematics are quite prevalent among students. In an evaluation of the University of Limerick mathematics Learning Centre, Carroll and Gill revealed that, nearly "half of the adult population in England had negative attitudes toward mathematics" since the early 1980s (Carrol and Gill, 2011:16). Supporting this assertion, Haylock (2006) indicated that many adults in Britain are characterised by "feelings of anxiety, helplessness, fear, dislike, guilt and lack of confidence" when it comes to studying mathematics and its related tasks and activities. Citing his interaction with adult learners in a numeracy class of the London King's College, Haylock revealed that majority of these learners see themselves as failures, confused and frustrated and carried some form of negative disposition towards the subject. This accounts from the fact that mathematics is not only perceived as a difficult subject with rigid procedures

and formulae, but also, it is characterised by questions to which your answers are either right or wrong (Haylock, 2006:2).

In Ireland, Hourigan and O'Donoghue (2007) also added that many students are not only anxious, but also, underprepared for tertiary level mathematics mostly due to the influence of their experiences with the subject at the pre-tertiary level. Carroll and Gill (2011) however observed that, the level of negative perception among younger students (those between the ages 17 to 23) were not as high as that of the mature students of the university. Only 22.5% of students within this age brackets exhibited negative perception towards the study of mathematics as compared to about fifty present of the mature students of the university (Carroll and Gill, 2011:62).

A study into the factors contributing to Senior Secondary School learners' poor performance in Science subjects in South Africa also revealed that at the early stages of learning, students are mostly characterised by positive attitudes and perceptions towards the Sciences. As they climb the academic ladder however, these attitudes dwindled to a negative one which mostly resulted in poor performance (Dandala, 2013). Investigating the attitudes of Italian students through essays on the theme "Me and mathematics", Zan and Di Martino (2010) found that students with negative emotional disposition towards mathematics were more than those with positive attitudes towards the subject. This accounted from the perceptions students have about their own abilities or inabilities to succeed in mathematics.

Employing a Problem-Based Learning (PBL) method as a Case Study in gender differences in mathematics achievement and retention scores in Nigeria, Ajai & Imoko (2015) stated that many students in Nigeria have developed negative attitudes for mathematics due to the notion that mathematics is a rigid and do-it-right subject

which can only be studied effectively by exceptionally gifted students'. A research into students' experiences with mathematics teaching and learning, Mapolelo (2007) indicated that many students in Botswana disliked or have no interest in studying the subject due to their experiences in mathematics lessons. The perceptions of these students are that mathematics is a subject of strictly held and static procedures that places premium on the ability of a student to produce correctly held answers based on a high retentive memorization of concepts and formulae.

2.8 The effects of Students' negative Perceptions and Attitudes on their Performance in mathematics

The impact of negative perception and attitudes of students towards the study of Mathematics is a debatable topic for discussion among scholars. Whiles some scholars have identified negative perception and attitudes towards the study of mathematics as a serious setback to the academic performance of learners in mathematics (Smith, 2004, Sanchez, Zimmerman and Ye (2004, Asante, 2010, Forgasz, Becker, Lee and Steinthorsdottir, 2010, Gunderson, et al, 2012 and Kiptum et al, 2013), others have indicated a weak correlation between the two variables (Eshun, 2004, Carroll and Gill 2011).

According to Smith (2004:5), learner's anxiety towards the study of mathematics does affect the value they place on the subject and the confidence and seriousness attached to the study of the subject. A simple fear of mathematics has caused serious challenges for the achievements and performance of many students in the subject. Smith asserted that students who feared mathematics did not try as hard to understand and finish their homework as students who did not have the fear of the subject. He added that, this type of learners "set themselves up for failure before they even attempted to succeed". In a review of research and related literature on adult

numeracy in London, Coben (2003) also reported that students' perception and attitudes towards mathematics do affect their learning of the subject. Coben's study revealed that students with positive perception and attitudes towards the subject performed higher than those with negative perception and attitudes. In explaining the relationship between perception and attitudes on performance in mathematics, Aiken and Dreger (1961) however argued that, although there is a strong correlation between the two variables, it is rather achievements that affected students' attitude and not the vice versa. According to them, students who obtained higher grades in mathematics developed positive perception and attitude towards the subject whiles those who obtained weak grades developed negative perceptions and attitudes towards the subject.

Mata, M. L, Monteiro, V. & Peixoto, F. (2012) conducted a study in Portugal among Basic and Senior high School students confirmed this argument. The study revealed that students with high academic performance had more favourable perception and attitudes towards mathematics than those with low academic performance (Mata et al, 2012). As to whether attitudes and perception influence mathematics performance or the vice versa, Mapolelo (2007) postulates that, perceptions and negative attitudes towards the subject has a significant impact on students interests, enjoyments, achievements and performance in mathematics. The conception of students about mathematics as a subject of study determines how the subject is approached and studied. Learners who see mathematics as a difficult subject most often than not approach the subject with great anxiety and for that matter, a procedural and rule oriented subject. These types of learners have mostly been identified as those who perform poorly in mathematics (Mensah et al, 2013). Negative perception towards mathematics do affect students' performance in many ways. According to Smith

(2004:6), students with mathematics anxiety may not only dread attending mathematics lessons, but also it may hinder their working memory. He added that such students suffer a great deal of difficulty in studying and working mathematics tasks due to unconcentrated minds. Smith (2004) postulated that "students who are anxious about mathematics are less likely to continue working on mathematical problems if they fail to understand it the first time".

2.9 Students' Perception and Interest in mathematics Achievement

There have been claims by several researchers that students' beliefs about mathematics are formed from a history of experiences (Townsend & Wilton, 2003). However, changing such beliefs might be a herculean task for teachers, educational policy makers and even parents. But such changes in students' beliefs seems possible by consistent application of effective teaching activities as suggested in the equilibrium model which would definitely result in changes in the cognitive as well as the behavioural dimensions of mathematics attitude in future. However, modifying these negative beliefs requires more than just effective teaching. It has been suggested that activities with elements affecting cognition and emotions would yield more results with respect to modifying students' serious beliefs and perceptions towards the learning of Mathematics and success (Vandecandelaere, Speybroeck, Vanlaar, De Fraine, &Van Damme, 2012).

Students with higher cognitive abilities tend to have a higher mathematics academic self-confidence. Moreover, students in general and technical sections of education tend to have a lower mathematics academic self-confidence as compared to students in the classical study section. Different writers (Mohd, Mahmood & Ismail, 2011) have indicated that, there is positive correlation between students' perception and

interest towards mathematics and academic achievement of students. Specific attitudes such as problem solving in terms of patience, confidence and willingness have significant relation with students' mathematics achievement (Mohd, Mahmood & Ismail, 2011; Nicolaidou & Philippou, 2003). There have been a lot of misconceptions by students of the difficult nature of mathematics which have scared many students in the course of their educational career. These misconceptions being negative perception held by students have landed many students to have low self-concept in mathematics (Ali, 2013 & Martha, 2009). The students' misconception of mathematics seem to extend to the teachers of the subject, the time of day in which the subject is taught, the amount of formula in mathematics, the amount of time used during mathematics lessons, lack of students involvement during lessons as well as the perceptions that only good students can perform in mathematics (Ampadu, 2012; Vandecandelaere, Speybroeck, Vanlaar, De Fraine, &Van Damme, 2012; Etuk, Afangideh, & Uya, 2013).

There are several researches indicating that, the perceptions of students about mathematics do not only lie in the teachers and students attitude but also the environment in which studies take place play a very significant role (Winheller, Hattie & Brown, 2013; Siegle, Rubenstein & Mitchell, 2014; Vandecandelaere, Speybroeck, Vanlaar, De Fraine & Van Damme, 2012).

The negative perception of students and people who disliked mathematics has created quite unfortunate and bad public image of mathematics in Ghana, where Bole District is not an exception and other parts of the world describing mathematics as difficult, cold, abstract, theoretical and uninterested subject (Wang, Lukowski, Hart, Lyons, Thompson, Kovas, et al. 2015; Björklund, 2010 & Sam, 2002). This problem of misconception and negative perception needs to be eradicated from students' minds,

in order to improve students' interest in the learning of mathematics in all levels of our education curricular.

2.10 Interest

Some research has suggested that, compared to other subjects, there is a relatively strong

relationship between interest and achievement in mathematics (Schiefele, Krapp & Winteler: 1992). In this regard, Turner & Meyer (2009) stated that the following factors are of significance in the learners' interest in mathematics:

- Learners' feelings play an important role in mathematics interest.
- Learners' interest and ability are positively related. According to Maree (1994) the better a learner performs in mathematics, the more he/she will like the subject and vice versa.

2.10.1 Students Interest in Mathematics: Developmental Trends

Theoretical deliberations about interest development proposed by Schiefele (2001), Krapp (2000), Hidi (2000), Baumert and Koller (1998) concur in predicting interest declines from childhood through to adulthood. These theorists all seem to agree that interest develops from a universal curiosity and boundless energy to explore and learn new skills in childhood, to select preferences of certain fields. Interest losses have been explained by factors inherent in age-related changes, such as increased task complexity, demands for effort, and a resultant lack of the intrinsic attractiveness of academic contents (Hidi, 2000; Zimmerman & Kitsantas, 1999) as well as changes in social relationships during adolescence (Hidi, 2000) that bring about a decrease in academic interests as a response to increasing social interests. Some researchers suggested that interest losses can also be attributed to an institutionalized mismatch

between students' rising desire for self-determination and the increasingly restrictive learning environment as they progress through school, particularly at transitions to junior high and senior high schools (Eccles & Midgley, 1989). Regarding the empirical evidence for developmental trends in mathematics interest in particular, a number of studies have analysed the development of students' ability-related beliefs in mathematics, but relatively few studies have been conducted with a focus on mathematics interest. Koller et al. (2001) longitudinally analysed mathematics interest in students from German high-ability track schools (Gymnasium) at three time points (end of grade 7, end of grade 10, and middle of grade 12). Based on repeated measures using ANOVAs, the report revealed consistent downward trends of interest in mathematics during that period. Furthermore, Eccles, Wigfield, and colleagues conducted studies regarding the development of mathematics values during the 1980s and 1990s. They have consistently found a decline in intrinsic mathematics values across the transition to junior high school and into the Senior high school years. Finally, three recent large-scale American and Australian longitudinal studies have provided findings on the development of adolescents' mathematics related values (Fredricks & Eccles, 2002; Jacobs et al., 2002; Watt, 2004). Their results pertaining to the development of intrinsic values are of primary interest for our present investigation. Using latent growth curve modeling, these authors reported curvilinear declines of intrinsic mathematics values, which were more pronounced in earlier years and then plateaued in senior years. Nevertheless, Jacobs et al. (2002) attributed some of the declines of students' interest in mathematics to transition-related changes in school environments.

2.10.2 How interested are Students in mathematics

Arthur, Oduro and Boadi (2014), conducted a study on Statistical analysis of Ghanaian students' attitude and interest towards learning mathematics. The purpose of the study was to investigate the variables perceived to influence students' interest in learning mathematics and the extent to which these variables affected students' interest in learning mathematics. Nonetheless, it also investigated factors affecting Ghanaian students' interest in mathematics to enrich their mathematics potentials. The study made use of non-experimental, quantitative, exploratory, descriptive and non-parametric methods of statistical analysis to establish students' mathematics interest. The findings from the study revealed that student's interest in mathematics is dependent on whether students liked mathematics as a subject. The teachers' motivation and access to textbooks was also identified to have very positively impact on student interest in mathematics as well as the method and approach adopted by the teacher during teaching and learning of Mathematics. However, the age of students, the type of school attended by students was found to be independent on the students' interest in mathematics.

Mohammed and Charles (2017), carried out a research on Interest in mathematics and Academic Achievement of High School Students in Chennai District. The purpose of the study was to investigate students' interest in mathematics and their academic achievement. The study made use of a survey design and quantitative data which were used during the data collection. The study findings inferred on the difference between rural and urban area school students of high school level in respect of their interest in Mathematics. The study found that the calculated 't' value 0.680 was less than the table value 1.96 at 0.05 level of significant. And their achievement in mathematics, that the calculated 't' value 0.365 was less than the

table value 1.96 at 0.05 level of significant. They found that, there was no significant difference between rural and urban area school students of high school level in respect of their interest and their achievement in mathematics.

They also investigated difference between male and female students of high school level in respect of their interest in mathematics. They found that the calculated 't' value 1.373 was less than the table value 1.96 at 0.05 level of significant. And their achievement in mathematics calculated 't' value 1.632 was less than the table value 1.96 at 0.05 level of significant. Hence it is found that, there was no significant difference between male and female students of high school level in respect of their interest and their achievement in mathematics.

A study was conducted by Leonard, (2016) on Factors affecting students' interest in mathematics in Secondary Schools in Enugu state. The reason for the study was to find the possible factors that affected students' interest in mathematics. The study employed a survey research design and it also made use of quantitative data analysis techniques. The research findings revealed that, teacher factor, student factor, instructional strategy, mathematics anxiety and infrastructural problem correlated positively with students' interest and their mathematics achievements.

Rimma (2017) conducted a research on students' interest and engagement: Perspectives on mathematics in the Classroom. The main purpose of the study was to investigate how interested and engaging students are, in a mathematics class, and the perception they had about mathematics during the lesson. The researcher made use of mixed methods, using both quantitative and qualitative data together. The following results were identified;

Majority of the students showed less interest in mathematics due to inappropriate methodology used by teachers. Most students deliberately not engaging themselves in

mathematics lessons with the notion that mathematics is difficult. Whiles few testified that interest is manifested through their engagement in mathematics lessons with a positive perception. The findings also showed that students' interest and engagement was developed by teachers during classroom interaction as perceived by the students in mathematical tasks. The study concluded that students' interest and engagement had a very significant relation with mathematics classroom achievement.

2.10.3 Factors affecting students' interest in mathematics achievement

2.10.3.1 Use of Teaching and Learning Materials (TLMS) During Mathematics Lessons

Teaching and Learning Materials (TLMs) may be seen as any material that aids the teaching and learning process in classrooms. TLMs are mostly used by teachers to stimulate and engage the interest of learners during the learning processes (Mathematical Association of Ghana, 2013). Akuamoah, Ampadu, Asamoah, Baffoe Bonney and Pray (2004) see teaching and learning materials as instructional materials that aid students to comprehend a given lesson. They went further to add that teaching and learning materials, also known as instructional materials are any audio-visual or teaching aids which contributed to the learning process. According to them, TLMs are now referred to as instructional media or multimedia in these contemporary times. Some examples of TLMs mostly used by instructors are real objects such as photographs and sketches and drawings. The role of TLMs in promoting the understanding and raising positive attitudes of students towards studies cannot be overemphasized. According to Akuamoah et al (2004:148), the use of TLMs arouses the interests of learners and as well promote self-learning and transfer of knowledge. It also provides an opportunity for students to participate actively in class thereby

leading to a revamping of self-confidence among learners especially females. Finally, the use of TLMs bring mathematics closer to the student by making the subject very practical and real.

Despite the significance of teaching and learning materials in mathematics education, some teachers still teach the subject in abstraction without recourse to any teaching aid. Akuamoah et al (2004:148) postulated that such teachers ended up being frustrated and aggravated for the inability of their students to perform well in the subject. Research revealed that most schools in developing countries such as Ghana are not equipped with the required instructional materials. Teachers in such schools are left to their fate to either improvise these materials or to do without them (Legotlo and Maaga, 2002).

The impacts of this situation on the academic performance of learners in Africa are quite devastating. Inappropriate and or no use of teaching and learning materials during teaching and learning processes do not only reduce the morale, interests and enthusiasms of learners, but also, it leads to the development of apathy, rote learning, poor academic performance and unfavourable attitudes or perception towards studies among learners (Legotlo & Maaga, 2002, Allottey, 2012 and Akuamoah et al 2004).

2.10.3.2 Students Motivation towards Mathematics as a Subject

The question of how to motivate learners in the classroom has become a leading concern

for teachers in all disciplines, let alone in mathematics. Therefore the role of motivation in learning mathematics and it achievement cannot be overlooked. Motivational factors are very crucial in determining the kind of attitude students have towards mathematics as a subject and their efforts in studying it. Motivation towards

mathematics has to do with the factors that inform and influence people and or students to pursue the subject. Students are motivated towards mathematics as a school subject of study if their expectations are that it will lead them to a desired goal. According to Baba (2012), motivation is defined as the willingness of an individual to exert high levels of efforts towards the realization of organizational goals. Motivation is also defined as all the inner striving conditions such as wishes, desires and urges which lead to the stimulation of a person's interest in a particular activity (Ofoegbu, 2004). For Akuamoah et al (2004:214), "motivation is both the internal and external desires which pushes and sustains one's interest to achieve a goal". According to (Dörnyei, 2001), motivation is the motives behind the performance of a given activity. She added that, these motives actually determine the kind of efforts being put into the activity and the period in which the activity is performed. Motivation involves the attitudes and affective states of a person that determines the level of effort exerted towards the attainment of a desired goal (Saeman, 2009). Motivation for mathematics may therefore be seen as those internal drives, desires and expectations which urge students and people to pursue mathematics as a subject of study or interest in schools. There are three major components of motivation. They are; effort, desire and affect. Effort has to do with the energy exerted towards some activity. A student who is highly motivated will exert more effort such as attending extra classes and doing extra studies into his/her mathematics and other areas of learning interest. A desire for achievement will surely influence the seriousness or perception of a student towards his/her studies. The affect component of motivation deals with the enjoyment, excitement, interest and the fun associated with performing a task such as studying Mathematics. It must be noted that these three components of motivation are interrelated and interconnected. Any student who lacked any of these components

might not be fully motivated for the subject (Mathematics) and hence may find difficulties in studying and achieving in mathematics which may subsequently result in the development of negative attitude or perception towards mathematics (Saeman, 2009 and Baba, 2012). Motivation deals with the reasons why learners become interested and react to those events that catch their attention. According to Akurugu (2010), there are different kinds of motivation. They include intrinsic, extrinsic, instrumental and integrative motivations.

2.10.3.2.1 Intrinsic Motivation

Intrinsic motivation refers to the desire of an individual to do something for a self-conceived reward. With this kind of motivation, a student has the urge to learn due to personal interests, desire and excitements. This kind of motivation has been identified as a kind of motivation that makes learning an enjoyable process which results in long lasting positive effects among learners even after they have completed school (Akuamoah et al, 2004, Akurugu, 2010). Intrinsic motivation is very crucial for the sustained development of positive attitudes of students towards mathematics as a subject. Self-motivated factors such as a desire to be a renowned mathematician to be highly respected by peers and to obtain a very good grade in mathematics to qualify one for a university education are some examples of intrinsic motivation. Saemann (2009) has further categorized intrinsic motivation into intrinsic-knowledge, intrinsic-accomplishment and intrinsic-stimulation. According to him, intrinsic-knowledge has to do with the joy, interest and satisfaction derived from gathering knowledge about something such as mathematical concepts. For instance, a learner who is able to acquire thorough knowledge in a particular mathematical topic may feel satisfied and hence, will be motivated to acquire new knowledge in other areas or topics. The excitement associated with the process of achieving a desired goal is what Saemann

refers to as intrinsic-accomplishment. An example of an intrinsic-accomplishment is a student who is able to follow the right procedure as taught by the teacher to arrive at a correct result. With intrinsic-stimulation, is a situation where the learner feels some sense of consistency in understanding mathematical concepts and principles from the beginning of his/her encounter with the topic to the last lesson may be referred to as an intrinsic-stimulated student. In summary, intrinsic motivation is a psychological construct that reflects the "natural human propensity to learn and assimilate" (Richard and Edward, 2000:1).

2.10.3.2.2 Extrinsic Motivation

Looking at motivation at various work places, Armstrong (2007) sees extrinsic motivation as anything that is done to increase the interest of employees. For example, increased in salaries or wages, promotions, punishments and disciplinary actions are all factors that propel people to work hard. According to Akuamoah (2004:215), extrinsic motivation in education has to do with "learning that is related to outside influence or incentives such as rewards, praises, high grades and self-esteem". Extrinsic motivation is also seen as something that is done "because it leads to a separable outcome" (Richard and Edward, 2000:2). Extrinsic motivation has been identified as a very powerful tool for getting work done. Akuamoah and other researcher observed that, students who are provided with most of the following items such as mathematical sets, text books, graph books, calculators, Schoolbags and among others are more motivated to learn mathematics than those without those necessary items. However, it must be noted that the effects of extrinsic motivation is short lived. Through extrinsic motivation, people may engage themselves with some activities with resentments, compulsion and disinterests. For instance, a student may

pretend to show interest in a particular subject due to some kind of reward attached to subject by the teacher for performance in the subject. Such a student might not be able to keep this interest if the motivation factor is no longer in place (Armstrong, 2007). In this regard, although incentives may play a very important role in developing positive interests among learners in general, teachers of this subject and other stakeholders in schools must rather put more efforts towards the intrinsic kinds of motivation for mathematics education.

2.10.3.2.3 Integrative motivation

Integrative motivation in education deals with the role of the target group (classmates or peers) in stimulating the interests of the individual learner. Supportive and friendly classmates are a motivation factor for learners than unsupportive, unfriendly and bullying ones. Thus, students who study mathematics with supportive and encouraging classmates, peers and friends are more motivated to develop positive perception and attitudes for the subject and as well perform in it than those are studying with bullies (Saeman, 2009).

2.10.3.2.4 Instrumental Motivation

Students are motivated towards mathematics if they identify knowledge and skills in mathematics as a prerequisite for realizing a desired goal. For instance, most students at the Senior High level are motivated towards mathematics because it is not only a core subject, but also, it is considered as a prerequisite for securing admission into the tertiary level of education (Akuamoah et al, 2004, Saeman, 2009 and Akurugu, 2010).

In seeking to develop positive perception and attitudes among students of Junior High and Senior High Schools, it is imperative from these discussions on the various kinds of motivation for teachers of mathematics to identify the different learning needs of

students so as to determine the kind of motivation that will arouse the interests of learners in mathematics.

2.10.3.3 The Attitudes and Beliefs of the Mathematics Teacher (Teacher Factor)

The role of the teachers' attitude and beliefs towards mathematics cannot be overemphasized. Teachers with positive attitudes and strong knowledge of mathematical concepts and principles are more likely to positively influence the perception and interest of learners for the subject than those with negative perception or attitudes and lack of confidence. Humorous, motivated, gender sensitive, devoted, friendly, encouraging and supportive teachers are more likely to develop positive perception or attitudes among learners of the subject than those with rude, low self-concepts, gender bias, uncommitted, unsociable, less encouraging and unsupportive teachers (Li, 1999, Asante, 2010, Mata, Monteiro and Peixoto, 2012 and Mensah et al, 2013). Research on students attitude towards mathematics performance: does the teacher attitude matter conducted by Mensah et al (2013) in Ghana disclosed that teachers who devoted themselves in encouraging and supporting their students did not only help in shaping the perception or attitudes and behaviours of their students, but also, they provided opportunities for their learners to face realities associated with school life with ease and confidence. They added that "teachers are, invariably, role models whose behaviours are easily copied by students". With this, Mensah and his colleagues maintained that the "likes or dislikes" of a teacher does have "significant effects" on the academic and psycho-social lives of his/her student (Mensah et al, 2013:135). Yara (2009), however, asserts that, many teachers seldom realize this vital role played by teachers. A study carried out on learners' attitude towards mathematics and academic achievements in some selected schools in Nigeria revealed that learners

are mostly characterised by positive attitudes towards mathematics just like any other subject at the early stages of their academic persuasions. However, the demeanour, attitude, knowledge, skills and pedagogical techniques of the teacher are mostly responsible for the development of positive or negative attitudes or perception of the student towards mathematics (Yara, 2009). In this regard, Yara proposed the development of high levels of mathematical competence and skills through comprehensive training of teachers, coupled with the development of positive, gender - sensitive attitude and appropriate and child-centred methods of teaching mathematics.

2.10.3.4 Teaching Methodologies Employed During Mathematics Lessons

Douglas (2002) defines teaching methodologies as interventions adopted by a teacher to enable students arrive at a learning objective. He added that teaching and learning is a "dynamic interaction among four components: the teacher, the learner, the curriculum and the learned repertoire" (Douglas, 2002:4). Adding to this view, Ozkan (2011) emphatically stated that "teaching is not just a matter of telling stories, and learning is not just a matter of listening to stories". Ozkan defined teaching methods as "the types of principles and methods used for instruction" (Ozkan, 2011:1). Depending on the type of subject, content, environment, level of students and objectives of a particular lesson, a teacher may employ one or more of these identified teaching methodologies: activity or child-centred methodology, demonstration, lecture, question-and-answer as well as drama and role-play (Douglas, 2002, Smith, 2004, Mapolelo, 2009; Ozkan, 2011 and Mathematical Association of Ghana, 2013).

Researchers have stated that poor, gender-bias, teacher-centred, ineffective and inappropriate teaching methods employed by some mathematics and Science teachers

is responsible for the disillusionment, low self-concepts and efficacy as well as reduced interest of female learners for the study of the subjects (UNICEF, WHO, UNESCO & UNFPA, 1993). According to Yara (2009), inappropriate teaching methodology employed by teachers has contributed greatly to killing the innate curiosity and aspirations of learners. Writing on the topic "poor teaching", Smith (2004) said that poor teaching is the process by which teachers employ inappropriate strategies that is characterised by a mismatch between the study curriculum and the needs of the student. He added that poor teaching also involves the inability of the teacher to identify the different learning and special needs as well as the behavioural learning styles of students so as to adopt appropriate strategies and measures to addressing those differing needs. Smith went further to state that poor teaching methods have not only exacerbated the existing learning problems of students, but also, it has contributed adversely to the development of pupils with special needs in schools.

2.10.3.5 Attitudes of parents and their involvement in students Education.

The attitudes of parents towards their children directly influenced their involvement in the education and academic performance of these children. Parents are considered as the first teachers of children at our various homes. The type of attitudes, perceptions, beliefs and values held by children towards any subject (especially mathematics) is believed to be greatly influenced by his/her parents. This is because, as first teachers of the child, parents and the family normally inculcate their own attitudes, perceptions, values, interests, beliefs, customs and norms in the child, which in turn influence how he/she perceives things and behaves towards things and issues (Akuamoah et al 2004 and Mji and Makgato, 2006). Parents are valuable resources

because they invest a lot in their children's education. Parents provide the required needs such as school uniforms, school fees, books and other stationery for their children. The concept of parental involvement has been defined as the participation of parents in every facet of their children's education and development from birth through to adulthood. The term simply means that parents are actively involved in assisting their children to learn effectively in schools and out of school and as well partnering with schools in the decision-making and advisory process with regards to their children's education (National PTA, 2012). An "involved parent", according to LaBahn (1995:1) is one who is "sympathetic, understanding, reassuring and encouraging". LaBahn indicated that parents who showed interests, and effectively involved themselves in the education of their children have contributed significantly to the academic performance of their children as well as renewed interests and attitudes towards education.

Despite these seeming benefits of parental involvement, many parents in Africa are not effectively involved in their children's education especially girls. Among the reasons accounting for low involvement of parents in their children's education are illiteracy, family pressures, financial challenges and perceptions of parents towards the child and subjects of study (LaBahn, 1995 and Akuamoah et al 2004).

Dandala (2013) found that literate parents were more involved in their wards education and choice of courses than illiterate parents. This he said could account from the fact that illiterate parents might not be fully aware of the importance of education let alone to know the importance of parental involvement. Family pressure is also another stumbling block to parental involvement. Socio-cultural problems such as divorce and single parenting coupled with time constraints may also affect the ability of a parent to effectively involve themselves in their wards education.

Supporting this assertion, Asikhia (2010) postulated that polygamous parents were less likely to be involved in their children's education and academic performances than their counterparts in monogamous parents. This is so because, there is so much pressure in the polygamous or extended family as compared to the monogamous or nuclear family. Closely linked to this is financial pressure. The lack of or passive participation of some parents in their children's education is blamed on difficult economic situations facing those families. Lack of or passive involvement of some parents does not necessarily mean they are neglecting their parental duties, but rather, they are financially handicapped (LaBahn, 1995).

Finally, the perception of many parents towards their female children has influenced the level of participation of those parents in their children's education. The perceptions of many parents within the African sub region towards females are that, girls and women play subservient roles such as home making, cooking and nursing of children. Females are also perceived to lack the innate abilities to pursue mathematics, engineering and science related subjects. With this notion, ladies are only required to abreast themselves with some basic literacy and numeracy skills that would enable them to make a gentle pass in these subjects and to make use of these basic concepts later in managing their marital homes and families. Parents with these negative perceptions and dispositions will rather prefer to invest their little resources on their male children rather than the female. This will surely lead to a less or no involvement of parents in the education and academic achievements of female learners (Gallagher, 1998, Gallagher and Kaufman, 2006).

2.10.3.6 The School Environment

The school environment has also been identified as a major factor that influences gender differences in students' attitudes towards the study of mathematics. The nature and type of environment learners find themselves does affect the type of attitude being developed. Students who find themselves in a hostile environment are more likely to develop negative attitudes, hence no interest for the subject than those in a congenial environment (Gallagher & Kaufman, 2006).

In a study on students and teachers' perceptions of the causes of poor academic performance in Nigeria, Asikhia (2010) stated that in unconducive school environment such as large class size has not only contributed to the negative perception and attitudes of learners but also, it has contributed to the poor academic performance of students. Classroom size, social interaction within the school (between students and school authorities, or among students themselves), methods of assessment in the school and the content of the curriculum are some features of the school environment that influence learners' perception and interests in mathematics (Gallagher & Kaufman, 2006).

2.10.3.7 Students Affinity for Mathematics

According to Du Sautoy (2010), Students' affinity for mathematics and science related subjects are significantly low right from our junior and senior high schools. These low level of students' affinity for mathematics progress to the tertiary. He added that students affinity towards mathematics vary from one student to another. There is a positive correlation between students' affinity towards mathematics and their results (Bramlett and Herron 2009; Papanastasiou 2000; Ma and Kishor 1997). Teaching methodology (Papanastasiou 2008), teaching and learning processes as well

as high quality instructions (Jones and Byrnes 2006) also influence a student's mathematics result. According to Arthur, Asiedu-Addo and Assuah (2017), when the option is offered, many students would prefer not to have anything with relating to learning of mathematics. This perception and attitude held my students has led them to the low achievement in Mathematics.

2.10.3.8 Type of basic School Attended by Student

School inputs and school processes are important factors that have been examined in Educational Effectiveness Research (Rumberger & Palardy, 2004). He added that the type of basic school one attended significantly influenced students' interest in mathematics either positively or negatively based on the resources available. School resources, school size and students' socio-economic status are considered to be factors that affect mathematics achievement because parents with full-time jobs and steady income send their children to schools with more resources (Mohammadpour, 2012). Kyei and Nemaorani (2014) have found school location and type to affect secondary students' mathematics performance in South Africa, where schools closer to town perform worse, because students are distracted by entertainments, students running to town and students in private schools perform better than those in public schools. However, Yusuf and Adigun (2010) found no significant influence of school location and type on achievement.

The relationship of school size to educational outcomes remains controversial, as Slate and Jones (2005) concluded from their literature review that both very small and very large schools are negatively related to educational outcomes.

Rumberger and Palardy (2004) refer to school processes as the teaching practices and social and academic climate of schools among other features. Opdenakker and Van

Damme (2001) showed that school composition and school processes jointly explain a sizeable amount of student variance in mathematics Achievement at the end of Seventh Grade. However, there is a gap in the international literature about the effects of the school composition and processes within an educational system without tracking, such as that of Uganda.

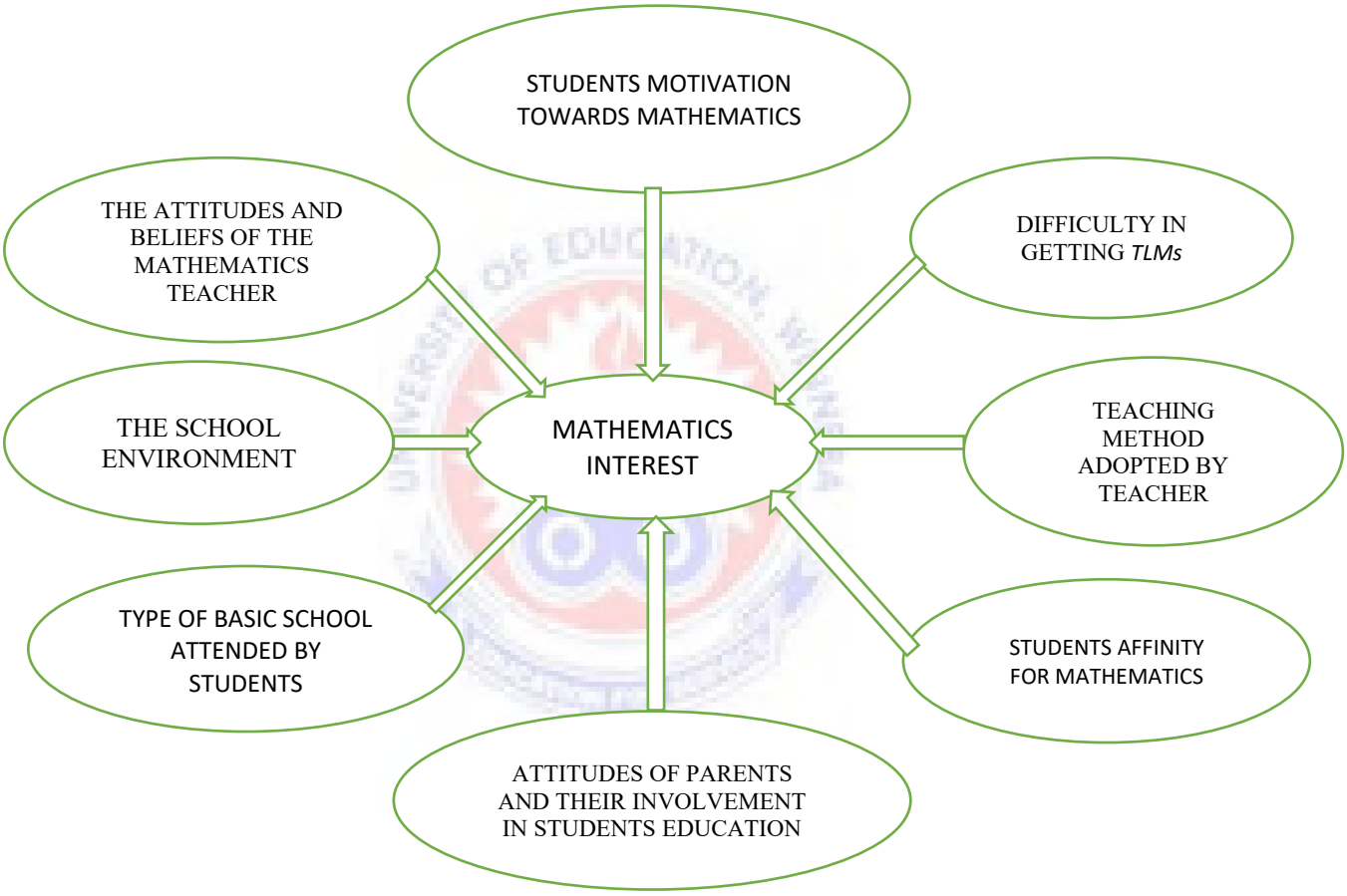


Figure 2.1: Determinants Model of Students Interest in Mathematics

2.11 Strategies for addressing negative Perception of Students towards Mathematics as a Subject

According to Kiptum et al (2013), negative perception and attitudes of students towards the study of mathematics can be addressed through the development of gender friendly mathematics curricula in schools. All mathematics study materials must address the concerns and needs of all students at all levels. Another mechanism for instilling positive perception among learners has to do with a transformed, gender sensitive and well trained teaching personnel at all levels of education. Teachers are seen as role models for their students. In this regard, a desire for positive perception and attitudes of students towards mathematics begins with the teacher. A teacher with positive attitudes towards mathematics will surely influence his/her students positively than the one with negative attitudes (UNICEF, WHO, UNESCO & UNFPA, 1993 and Smith, 2004). Again, teachers who are competent and have thorough knowledge in the subject matter do influence their students positively in their subjects than those with limited knowledge in their subject area. Teachers must therefore do well to master their subjects so as to build positive perception and attitudes among their students in their subjects of study. Teachers should also do well to be very supportive to their learners especially those with learning difficulties (Akuamoah et al, 2004). Akuamoah et al added that teachers should try as much as possible to plan their work in order to meet the different needs, abilities, aspirations and levels of learners. Asikhia (2010) also added that teachers must avoid making derogatory remarks about their students or else there is a risk of killing their spirits of learning. Regularity and punctuality to work has also been identified as measures to developing positive perception and attitudes among learners. Smith (2004) also called on teachers to eschew all forms of gender stereotypes and develop positive perception

and attitudes towards their female students, and offer them equal support and opportunities as boys. This will go a long way to boost the morale of the female student towards the study and success in mathematics.

Closely linked to this is the type of methodology employed by the teacher during mathematics lessons. Akuamoah et al (2004) and Asikhia (2010) have offered useful suggestions for teachers of mathematics and the Sciences. As a motivation for learners, mathematics teachers must adopt variety of child centred methods such as group works. In child centred methods of teaching, the teacher is expected to acknowledge and respect the individuality of the student and encourage him/her to develop his/her potentials. This situation according to Akuamoah et al makes learners to feel very important, dignified and a sense of satisfaction. In this regard, mathematics teachers must make good use of teaching aids so as to arouse the interests and natural curiosity of learners in the subject. Introducing students to concrete or basic mathematical principles and ideas through to the abstract and complex ones has also been identified as another measure for building strong mathematical foundation of students (Smith, 2004).

Again, the government through the Ministry of Education (MoE) and the Ghana Education Service (G.E.S) should do well to provide schools with adequate learning resources such as textbooks, markers, marker boards, classrooms and furniture. This would not only contribute to promoting self-learning and self-confidence among learners but it will also result in the development of positive attitudes and perception (Akuamoah et al, 2004 and mathematical Association of Ghana, 2013). Akuamoah et al went further to advocate for the need to make room for feedback so as to identify students' challenges in order to help them improve. Smith (2004) however advices that, teachers should desist from using mathematical problems as punishments for

students' misbehaviours in class or school since this situation has accounted for many students' negative predisposition towards the subject. The mathematics teacher must therefore be very creative and innovative if he/she is to develop positive perception and attitudes and interest among his/her students towards mathematics. Use of cooperative learning sharing of ideas among students has been identified by Smith (2004) as one of the mechanisms for addressing negative perception and attitudes towards mathematics among learners. Many educators have acknowledged the role of cooperative learning in not only mathematics education in schools but in all subject areas. Students sometimes learn faster and understand concepts better when it is being explained by their peers and friends (Douglas, 2002, Akuamoah et al, 2004 and Walshaw and Anthony, 2009).Furthermore, the influence of the attitudes of parents towards their children and their involvement in the education and academic performance of these children cannot be overemphasized. One of the measures to addressing the negative perception of students towards mathematics is a comprehensive involvement of parents in their wards' education.

Considering parents as the first teachers of the child, Akuamoah et al 2004 call for sensitization of parents to enable them take active interest in the education and achievements of their children.

Finally, another mechanism for addressing the negative perception of students towards the study of mathematics is the development of Girls Mentorship Programmes (GMPs) in schools. According to UNICEF, WHO, UNESCO & UNFPA (1993), using female mathematics and Science teachers in Senior High Schools over the years as mentors to girls has yielded tremendous results in many parts of Africa. Girls tend to see themselves as capable of achieving greater heights in these subjects when they have role models to look up to. Despite the difficulties associated with

learning mathematics, female students are encouraged and motivated to take up mathematics and Science courses if they are surrounded by role models in that field (CAMFED, 2012, GEU, and Allotey, 2012).

2.12. Implications of the theories and Concepts of Attitudes and Perceptions for this Study

The purpose of the analyses and exploration of the various theories and concepts of attitude and perception was to place the study within a theoretical framework that may serve as a springboard for a study into the factors contributing to the negative attitudes of students of Senior High Schools towards the study of mathematics. These theories and concepts have helped to unravel the factors responsible for the development of attitudes (either negative or positive) and perceptions for a particular subject.

Linking attitude change to a message of communication, Festinger (1957) believes that, persuasion is the effective tool for realizing attitude change among people. With this, it is very obvious that if the negative attitudes of students towards mathematics are to be addressed, then teachers, parents and educators in general must employ the persuasive model. Again, the three learning theories especially the observational learning theory, which claims that children mostly learn new ideas and form their attitudes and perceptions through observation, would serve as a springboard for parents, teachers and adults to conduct themselves in ways that would motivate children and students to inculcate positive attitudes and behaviours both in the classroom and at home. The functional theory of Daniel Katz which posits that individuals normally develop favourable attitudes towards things that are rewarding, and negative attitudes towards things that may incur punishments would also serve as an eye-opener for teachers and parents to devise strategies such as rewards for students to develop positive perception towards mathematics.

Closely linked to this is the Fishbein and Ajzen (1980) expectancy-value theory. The theory holds that the behaviour exhibited by an individual is determined by his/her expectations and values or beliefs. It went further to state that the achievement and performance of learners in any field of study is determined by two factors – expectancies for success and subjective task values (Kahle and ValetteFlorence, 2012). This theory therefore, among others is very useful for this study since it provides a springboard for teachers and curriculum developers to design child and gender friendly strategies that would promote the interest and performance of students in mathematics as a subject of study in schools.

Also, Kreitner and Kinicki (2004), cited in Akurugu (2010) theory of perception formation about an object which sees perception formation as more like information processing, posits that, individuals perception of issues accounts from the way in which a specific information is selected, encoded, stored in a retention memory and finally retrieved from the memory for a specific response. This implies that, information with regards to mathematics must appeal to the cognitive domain of students especially our female students to enable them effectively select, encode, store and retrieve the information for a positive or favourable response for mathematics as a subject of study in schools.

In effect, the various theories and ideas about attitude formation, perception and attitude change is a springboard for comprehending the mental and psychological disposition of the students who are the target population of this study. The knowledge and ideas gathered through the exploration of these theories and concepts is very instrumental for identifying the factors contributing to the negative attitudes of students of Senior High Schools towards the study of mathematics as well as

addressing these negative attitudes and perception towards the subject among students.

2.13 Relationship between Students' Perception and Interest in Mathematics Achievement

Mohamed and Charles (2017). Conducted a research on students' interest in mathematics and Academic Achievement of High School in Chennai District. The purpose of the study was to investigate students' interest in mathematics and Academic Achievement of High Schools in some selected schools. The investigator made use of normative survey method for conducting the study. The researcher also made use of stratified random sampling technique during the sampling process. The findings showed that there was a significant difference in interest in mathematics and academic achievement of high school level students in respect of their type of management. Moreover, the findings also indicated that students should be trained and exposed to various problem solving skills as a supportive technique to reinforce the learning of mathematics. So as to bring about a better teaching and learning process in the classroom.

A study conducted by Madeleine (2013) on the Relationship between Attitudes and Achievement in mathematics among Fifth Grade Students. The purpose of this study was to examine the correlation between fifth grade students' attitudes towards mathematics and their achievement in the subject. The researcher implemented a survey design and quantitative data deemed appropriate for the studies. The findings from a Pearson correlation that was conducted indicated that there was a positive relationship between students' attitude towards mathematics and their mathematics achievement.

Ahmad, Azizan, Rahim, Jaya, Shaipullah and Siaw (2017), conducted a study to investigate the relationship between students' perception toward the teaching and learning methods of mathematics' lecturers and their achievement in pre-university studies.

The purpose of this study was to determine the relationship between students' perceptions of the teaching and learning towards the lecturers with their achievements in mathematics at the Centre for Pre-University Studies. The study was a descriptive study in which a survey research design was adopted. The findings revealed that there was no significant correlation between the average scores of students' perceptions of teaching and learning towards the mathematics lecturers with the average scores of mathematics achievement of the students. The study also revealed that there were no significant differences between the average scores of male and female students' perceptions of the effectiveness of teaching and learning of the mathematics lecturers. The findings of this study showed that the lecturers could improve their teaching skills and techniques which were appropriate to the students' level.

2.14 Theoretical Framework

It is the 'blueprint' or guide for a research (Grant & Osanloo, 2014). It is a framework based on an existing theory in a field of inquiry that is related and/or reflects the hypothesis of a study. Therefore, the theory that underpins this study is the adaptation of Albert Bandura (1986) cognitive theory based on students' perception and their interest on mathematics achievement.

Perception is defined as the process through which we select, organise and interpret information gathered by our senses in order to understand the world around us (Greenberg and Baro, 1999:72). Perception has to do with the individuals' feelings about, or appraisal of, a given object, thing or a person based on the individuals' past

and present experiences. According to Bandura (1986) that nothing is more powerful than having a direct experience with something. Therefore students who have excelled in mathematics in the past will definitely have a good perception and interest in learning mathematics leading to high performance.

Nonetheless, Student interest allows learners to process understanding of concepts through different modalities based on their own experiences. Theoretical deliberations about interest development proposed by Schiefele (2001), Krapp (2000), Hidi (2000), Baumert and Koller (1998) concur in predicting interest declines from childhood through to adulthood. These theorists all seem to agree that interest develops based on observations. Therefore through Vicarious Experience student's obverse people around us, especially people students consider as their role models or seeing people similar to themselves who have excel in mathematics give students the good perception and interest in mathematics to persevere in learning mathematics leading to high mathematics achievement.

However, Verbal persuasion or motivation it is related to both interest and the desire to learn mathematics (Guy, Cornick, & Beckford, 2015). Students are intrinsically motivated to learn mathematics if they have the desire to do so after finding learning of mathematics interesting (OECD, 2013). It is believed that motivation is the driving force for learning (Yunus & Ali, 2009). Therefore when influential people such as teachers, lecturers, parents, etc. strengthen our interest by giving students a good perception about mathematics will lead to high mathematics performance.

Lastly, Physiological and emotional state: the state of a student influence his/her perception as well as interest in learning mathematics. For instance, depression can damp student's interest in leaning mathematics where as positive emotions will increase students interest in learning mathematics.

2.15 Conceptual Framework

The conceptual framework shows the hypothesized relationship between dependent, independent and the intervening variables. The perception and the interest which students develop towards mathematics in turn affect their performance on the subject.

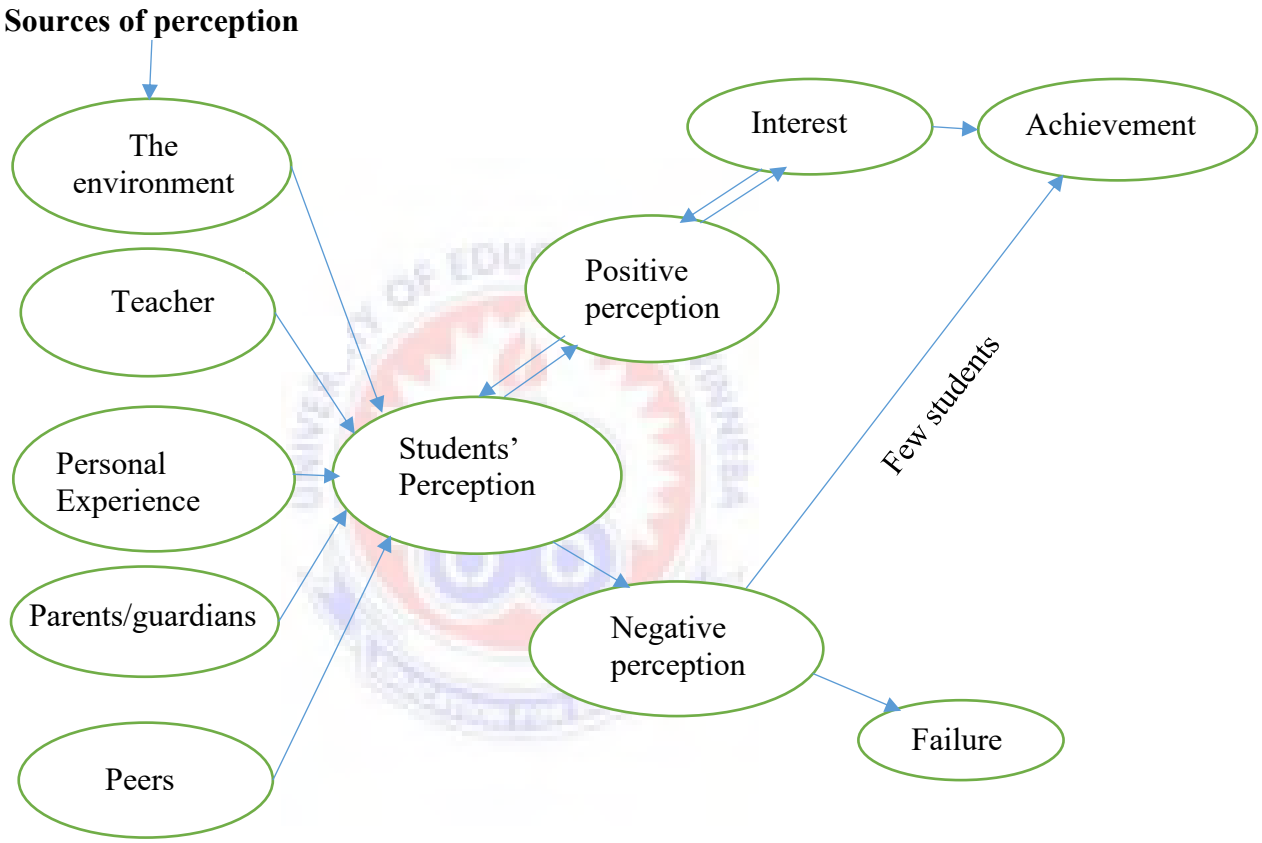


Figure 2.2: The relationship between independent and dependent variables

Source: Adapted from Ayot and Patel (1987).

CHAPTER THREE

METHODOLOGY

3.0 Overview

This chapter presents the research methodology used in the study. A methodology is the general research strategy that outlines the way in which research is to be undertaken and, among other things, identifies the methods to be used in it (Howell, 2013). The chapter therefore describes the procedures the study used in the collection and analysis of data. The section covers the research design, target population, study location, sample and sampling techniques, research instruments, data collection and analysis.

3.1 Research methods and procedures

This study seeks to expose the methods and tools employed in the study. The study adopted methodology relevant to modern research for the realization of underpinning research objectives questions and hypothesis.

3.2 Design of the Study

Kombo and Tromp (2006) suggested that design is used to structure the research, to show how all the major parts of the research project work together to address central research questions. Orodho (2002) defined it as a scheme, outline or plan that is used to generate answers to research problems. According to Kothari (2010), it constitutes the blue print for collection, measurement and analysis of data.

This study adopted exploratory and explanatory research design, since the study sought to explore the influence of students' perception and interest in mathematics on students' mathematics achievement. The exploratory and explanatory survey research

seeks to obtain information that describes existing phenomena by asking individual students about their perceptions and interest in mathematics with relation to their mathematics achievement. The exploratory and explanatory report the way things are and explain characteristics associated with target population, estimates of proportions of a population that have these characteristics and discovery of associations among different variables. The study however, included explanatory for the purpose of providing the current picture and explaining the extent of effect students' perception and students' interest exert on students' mathematics achievement. The study used purely quantitative research design to generate the needed statistics and results.

This research design was considered appropriate for the study because, Arthur, Asiedu-Addo and Assuah, (2017) and David (2017) used the design for similar studies. It is a research design which is purely quantitative and has the goal of identifying predictive relationships among occurring variables. According to Sukamolson (2005) "Quantitative research is the numerical representation and manipulation of observations for the purpose of describing and explaining the phenomena that those observations reflect". Therefore, this study seeks to examine the influence of perception and interest in mathematics on students' mathematics achievement.

3.3 Variables in the study

3.3.1 Independent variables

Students' perception and Interest in mathematics.

3.3.2 Dependent variables

Achievement in mathematics.

3.4 Population of the study

Mugenda and Mugenda (2003) described population as, the entire group of individuals or items under consideration in any field of inquiry and have a common attribute. The target population for this study was all second and third year students of Bole Senior High School.

3.5 Sample and Sampling Technique

Sampling procedure is a process of selecting a number of individuals or objects from a population such that the selected group contains elements representative of the characteristics found in the entire population (Orodho and Kombo, 2002).

The study used sample survey method for data collection needed for investigating the problem understudy. The research sampling was based on students because they are directly involved in the study and they know the extent to which their perception and interest towards learning of mathematics affect their low achievement in mathematics. The school was selected through the use of purposive sampling method while 116 students were selected from each form. Thus form 2 and 3 students, given a total participants of 232 by the use of simple random sampling, which comprised 99 females and 133 males of the participants. Simple random sampling was used because the study intended to select a representative without being bias from the accessible population. This ensured that each member of the target population had an equal and independent chance of being included in the sample.

3.6 Research Instruments

The researcher used the following instruments for collecting data.

Mathematics Achievement Test (MAT) (teacher made test)

Students perception and Interest in Mathematics Questionnaire (SPIMQ).

3.6.1 Mathematics Achievement Test (MAT)

This instrument was structured by the researcher and vetted by the supervisor, the instrument contains two sections, A and B. The section A contains demographic variables of the respondents such as name of school and class, whiles the section B contains mathematics questions made up of thirty (30) multiple choice items for students to answer. The mathematics achievement test aimed at information on demographic data and performance of mathematics. The collection procedure was highly monitored to ensure a high response rate.

3.6.2 Students' perception and Interest in Mathematics Questionnaire (SPIMQ)

This instrument was structured by the researcher and scrutinised by the supervisor. It was meant to measure the perception and interest of students in mathematics. It consisted of two sections; section A, which contained demographic variables of the respondents. Section B consisted of 20 items which reflected students' perception, interest and what they felt about mathematics. This instrument is an adaptation of the proposal of Jang, Guan and Hsieh (2009). This instrument was administered to the students, because the researcher thought they were the best people with regards to the research to provide a better information about Students' perception and interest in mathematics. The items were rated on 5 likert-scales, starting from Strongly Disagree (SD)=1, Disagree (D)=2, Undecided (UD)=3, Strongly Agree (SA)=4, Agree (A)=5, and for students to tick with respect to their opinion. The collection procedure was highly monitored to ensure a high response rate.

3.7 Pilot study

A pilot study was conducted using an achievement test and questionnaires which were administered to the respondents prior to the main study. The purpose of the pilot study was to ensure validity and reliability of the achievement test and the questionnaires. Mugenda and Mugenda (2003) asserted that, the accuracy of data to be collected largely depended on the data collection instruments in terms of validity and reliability. Data collected during the pilot study was not used in the final data analysis. A pilot study was conducted in Sankore Senior High School in Asunafo South District to save time resources, since the school was closer to the researcher. The school also have a similar characteristics as that of Bole S. H. S.

3.8 Validity and Reliability of Research Instrument

The study used validity and reliability test and questionnaires to ensure meaningfulness and consistency of the results.

3.8.1 Validity of Research Instruments

Validity refers to the accuracy and meaningfulness of inferences, which are based on the

research results. According to Mugenda and Mugenda (1999), the usual procedure in assessing the content validity of a measure is to use a professional or expert in a particular field which helps in discovering question content, correction in the wording and the sequencing problems before the actual study as well as exploring ways of improving overall quality of study. To ensure the quality of this study, the researcher sought opinions of experts in the field of study especially the supervisor, lecturers in the department of project management to make sure that the instrument measured

what it intended to measure in order to establish the validity of the research instrument. This facilitated the necessary revision and modification of the research instrument thereby enhancing validity.

3.8.2 Reliability of Research Instruments

Reliability of the data collection instrument is the internal consistency of measurement and frequently assessed using a test reliability method (Mugenda and Mugenda, 2003). Reliability enabled the researcher to identify the ambiguities and inadequate items in the research instrument; where the instrument reliability is the dependability, consistency or trustworthiness of the instrument.

Kuder-Richardson formula 20, were used to measure the reliability and the consistency of the test. Where an achievement test were given to students in a different school with similar characteristics as the actual sample to scored. The correct answers were scored 1 and the incorrect answers were scored 0 for the test. The scores obtained from the test were computed with coefficient of reliability of 0.86. This figure indicated that the test was good and have a very high reliability for the study.

Students' perceptions and interest variables were identified from literature and a 5-point likert scale was designed by the researcher. Responses to each of the items were rated with anchors labelled: 1 = strongly disagree, 2 = disagree, 3 = Undecided, 4 = agree, 5= strongly agree. The reliability of the questionnaires were tested using the Cronbach Alpha coefficient and a coefficient of 0.91 was achieved, hence the reliability of the instrument can be accepted based on Cooper and Schindlers' (2008) argument that any coefficient above 0.70 implies reliability of the instrument. Which indicated that the instrument was 90% reliable and therefore reliable and consistent to answer the research questions of the study.

3.9 Procedure for Data Collection

The researcher visited the selected school with the consent letter from the Department of Mathematics Education-Winneba to seek permission from the Headmaster and the consent and cooperation of the students in the school engaged in the study. The researcher after being given the approval to conduct the study addressed the students on the purpose and relevance of the study to be conducted. The researcher explained the contents of the test and questionnaires and how they would be answered. After which the researcher distributed copies of the test and questionnaire to the students participating in the study. The researcher waited for the completion of the test and the questionnaires and instant retrieval, to ensure that all questionnaires were collected. The retrieved questionnaires were then packaged and arranged for easy data analysis.

3.10 Data Analysis Techniques

The data gathered were organized and keyed into SPSS for analysis. Both descriptive and inferential statistics were employed. The descriptive statistics (i.e. frequency distribution, percentages, means and standard deviations) were used to address the research questions one, two and three and to display the demographic information of the respondents. Whiles the Inferential statistics (Pearson moment correlation) were used to analyse the research question four and the hypotheses.

3.11 Ethical Considerations

The goal of ethics is to ensure that no one is harmed or suffered adverse consequence from the research activities. Given the often sensitive relationships between researcher and respondents, reasonable safeguards were built in this study based on ethical considerations and requirements. Therefore, an official letter was written to the school requesting the head of the school to allow the researcher to collect data in their

institution. The information that the researcher received during the period of this study was treated confidentially and purely for academic purposes. Names of respondents were not used or mentioned in this study.

CHAPTER FOUR

FINDINGS AND DISCUSSION

4.0 Overview

This chapter presents the findings of the data from the field. The results are presented in sections. The first section is the demographic information of the respondents which include the level of education, the age and sex of students. The other sections discuss the findings on the relationship between students' perceptions and interest in mathematics achievement.

4.1 Response rate

Table 4.1 shows the response rate of the study. The table shows the number of questionnaires distributed and those properly filled and collected.

Table 4: 1 Response rate

Questionnaires	Number	Percentage (%)
Properly responded	232	85.9%
Not properly responded	38	14.1%
Total	270	100

Source: Field Work

The total number of questionnaires distributed was 270. However, 232 participants properly responded to the questionnaires instrument representing 85.9% response rate. This according to Mugenda and Mugenda (2003) is excellent for a study.

4.2 Demographic information

This section has subsections on the demographic information of the students who took part in this study.

4.2.1 Level of education of the students.

The students' level of education was determined by the class they were at the time of the study. The results are shown in Table 4.2

Table 4. 2: Level of education of the students

Form	Frequency	Percent	Mean	S.D
Form two	93	40.1		
Form three	139	59.9	2.60	0.491
Total	232	100.0		

Source: Field Work

With reference to the education of respondents, it was realized that, most of the respondents were from form three, representing 59.9% of students while students who were in form two represented only 40.1%. The number of students who took part in the study were in form three and two only. This is because the students had been in senior high school for a period of two years and above and could provide a good account of their perceptions and interest in mathematics.

Table 4.3: Age distribution of respondents

Age of respondents	**frequency**	**percentages**
13-16 Years	47	20.3%
17 Years and above	185	79.7%
Total	232	100

Source: Field Work

From Table 4.3, the data on the age distribution of respondents who participated in the project are presented. As observed in the Table 4.3, the respondents' age representing 20.3% were in the age bracket of 13–16 years. Majority of the respondents (185) which depicted 79.7% of the participants were in the range of 17 years and above.

The above data then depicts very active respondents due to their youthful age. This also

implies that, students at this age need to be guided and counselled by their mathematics tutors to eliminate the negative perception held by students and this will significantly improve students' interest and achievement in mathematics in the districts.

Table 4.4: Gender distribution of respondents

Gender	Frequency	Percent	Mean	S.D
Male	133	57.3		
Female	99	42.7	1.43	0.496
Total	232	100.0		

Source: Field Work

As revealed in the Table 4.4, 133 of the respondents who were males constituted 57.3% of the sample selected for this study. It was also observed that, 99 of the respondents expressed in percentage terms as 42.7% were females. The data therefore show that, despite the greater number of females in the country's population, males appear to be at the forefront of issues concerning education of the students in the district under study. However, there is the possibility that the population of the school is skewed towards males leaving females at the disadvantaged position. The study

further found the average mean to be 1.43 and standard deviation of 0.50 of the respondents.

4.3 Descriptive statistical analyses of students' perception construct

This section presents data analysis and reports on the results obtained by descriptive statistics approaches used in the data analysis to answer the research question "To what extent does students' perception about mathematics affect their achievements in mathematics?" The study began with descriptive statistical results from the measures of students perception construct. The paragraphs below present the results.

The researcher investigated students' perception about the statement: Mathematics is abstract and boring and how this perception affects the interest of students in mathematics class. The analysis indicated that 75.4% of the total respondents agreed with the views that, mathematics is abstract and boring and therefore affects students' interest in learning mathematics. However, 20.3% of the total respondents disagreed with this statement. The result further found 4.3% of the total respondents without any decision as to whether mathematics is abstract and boring and probably affect their interest in mathematics. And the average mean to be 2.1 and standard deviation of 1.3. See table 4.5.

The researcher investigated the statement that mathematics is very complex and the perceived complex nature of mathematics affects students' interest in mathematics. The study found the students' level of agreement and disagreement to the statement: Mathematics is very complex and how the complex nature of mathematics affects student interest in learning mathematics. The results revealed that, 56.4% of the total respondents agreed while 35.3% of the total respondents disagreed with the statement that, mathematics is very complex and the complex nature of mathematics affects students' interest in mathematics. The results further revealed 8.2% of the respondents

were neutral to the statement. The researcher found the statement under investigation to have a mean and standard deviation to be 3.1 and 1.4 respectively in table 4.5.

Table 4.5 Descriptive statistical analyses of students' perception construct

Factors	SD	D	U	A	SA	Mean	S.D
Mathematics is abstract and boring.	9.5%	10.8%	4.3%	31.0%	44.4%	2.10	1.330
Mathematics is very complex to my understanding	18.5%	16.8%	8.2%	33.6%	22.8%	3.07	1.408
Mathematics has nothing to improve in my life.	3.9%	6.0%	5.2%	21.1%	63.8%	1.65	1.079
Mathematics is full of rules and procedures.	6.9%	7.8%	3.0%	48.7%	33.6%	3.94	1.140
Mathematics is meant for students who are talented and higher achievers.	7.8%	7.8%	3.4%	28.4%	52.6%	1.90	1.251
Mathematics is not difficult as compared to other subjects.	24.6%	28.0%	3.4%	28.4%	15.5%	2.82	1.465
Negative perception of students from basic schools affects student interest in mathematics.	12.5%	22.0%	2.6%	33.2%	29.7%	2.51	1.453
There are so many formulas in mathematics therefore students cannot do well in mathematics.	9.1%	18.1%	6.5%	29.7%	36.6%	2.33	1.369
Students' misconception about mathematics affects their perception of mathematics.	11.2%	19.8%	9.9%	34.1%	35.0%	2.58	1.349
Students feel they are not involved in the teaching and learning process.	33.6%	34.5%	3.0%	11.2%	8.6%	3.92	1.300

Source: Field Work

The study investigated the students' perception that: Mathematics has nothing to improve in their lives and how this perception affects student interest in mathematics. The analysis revealed that 84.9% of the total respondents agreed with the perception that mathematics has nothing to improve in their lives and hence students' attached no interest in learning Mathematics while 9.9% of the total respondents disagreed with the statement that "Mathematics has nothing to improve in their lives". The study however found 5.2% of the total respondents neither agreed nor disagreed with the fact that mathematics has nothing to improve in their lives. The study also found the statement to have an average rating of 1.7 and a standard deviation of 1.08. See table 4.5.

The researcher also examined the students' perception that: Mathematics is full of rules and procedures and how this perception held by students affect their interest in mathematics. The analysis revealed that 82.3% of the total respondents agreed with the perception that mathematics is full of rules and procedures that must be followed accurately and how this perception could affect students' interest in the teaching and learning of mathematics while 14.7% of the total respondents disagreed with the statement. The results however found 3.0% of the total respondents neither agreed nor disagreed with the fact that mathematics is full of rules and procedures that must affect students' interest in mathematics. Nonetheless, the study also found the statement to have an average mean of 3.9 and a standard deviation of 1.14. See table 4.5.

The researcher however found that students' ability to attach a personal significance to the programme of study was also found to have some level of importance to the students' interest in mathematics. The researcher further investigated students' perception that, mathematics is meant for talented students or higher achiever

students. Most students perceived that students who excel in mathematics are talented. The results showed that 81.0% of the total respondents agreed with the statement that, students' perception that only brighter students can excel in mathematics affects students' interest in mathematics while 15.6% of the total respondents disagreed. The analysis however revealed 3.4% of the total respondents neither agreed nor disagreed with the statement and with a mean and standard deviation of 1.9 and 1.25 respectively in table 4.5.

The study also examined students' perception about mathematics difficulty as compared to other subjects and how it affects their interest in learning mathematics. It was found that 52.6% of the total respondents were found to disagree with the statement that, mathematics is not difficult as compared to other subject, which indicated clearly it affects students' interest in learning mathematics. Conversely, 43.9% of the total respondents were found to agree with the statement that, mathematics is not difficult as compared to other subjects and therefore see mathematics as their friend and an interesting subject. The result further found that, 3.4% of the respondents were without decision as to whether mathematics is difficult or not. The statement however had a mean rating of 2.8 and standard deviation of 1.47. See table 4.5.

The researcher found out the perception of students held about mathematics from their elementary schools and how it directly influenced their interest in mathematics. The results established that, 62.9% of the total respondents agreed cumulatively that, students' negative perception of mathematics from the early stages of education has strong influence on their interest in mathematics as they progressed in their educational ladder. However 34.5% of the total respondents cumulatively disagreed with the fact that negative perception of mathematics by students from their early

stages of education affects their interest in mathematics. The analysis further indicated that, 2.6% of them were undecided. The results found negative perception of students from basic schools to have an average rating of 2.51 and standard deviation of 1.45. See table 4.5

The students' perception that, there are so many formulas in mathematics was investigated with reference to the impact it has on the students' interest in mathematics. The study made respondents to rank the statement: There are so many formulas in mathematics and that affect student interest in learning mathematics. The study found that 66.3% of the total respondents agree with the statement while 27.2% and 6.5% of the total respondents disagreed and neutral to the statement respectively. The average ranking of the statement was 2.3 and standard deviation of 1.37 in table 4.5.

The researcher also investigated how certain negative misconceptions held by students about mathematics affects students perception of mathematics. The researcher used an item "students' misconception about how mathematics affects their perception of mathematics". The study concluded that 59.1% of the total respondents agreed with the statement: Misconception about mathematics affects students' perception of Mathematics since this misconception can be traced from the mental state right from childhood, and can be blamed on the wrong notions imparted to children by their older siblings. However, 31.0% of the total respondents disagreed with 9.9% of the total respondents being neutral to the statement that misconception about mathematics affects students' perception of mathematics. The study found the average response of the respondents to be 2.6 with standard deviation of 1.35. See table 4.5.

The researcher also examined students' perception that teachers do not involve them in the teaching and learning of mathematics. The researcher further investigated the statement that: students felt they are not involved in mathematics lessons during the teaching and learning process. It was found that 19.8% of the respondents agreed while 77.1% of the respondents disagreed with the statement that students are not involved in the teaching and learning process of mathematics. In effect, 3.1% of the respondents were undecided on the statement and were indifferent and were more skewed to disagreement than they agreed in table 4.5.

This suggests further that, when students display positive perceptions of mathematics, it will further improve their interest in mathematics. The more positive perception students' held about teaching and learning of mathematics it will significantly develop their interest in learning mathematics as well as their mathematics achievement (David 2017). When students are guided by mathematics teachers and given academic counselling to eradicate their negative perception about mathematics, they will improve their interest in mathematics and further impact on achievement and performance in mathematics. These results agree with the studies of (Mutodi & Ngirande, 2014; Arthur, Asiedu-Addo, & Assuah, 2017b).

4.4 Descriptive statistical analyses of students' interest construct

The descriptive statistical analyses below answer the research question "To what extent does students' interest in mathematics influence their achievement in mathematics?"

The study found out how students' interest in mathematics influence their achievement in mathematics.

The study used an item “mathematics is a very interesting subject” and how this interest affects student mathematics achievement. It was established that, 23.3% of the total respondents agreed cumulatively to that statement. Whiles 61.6% of the total respondents cumulatively disagreed with the fact that; Mathematics is a very interesting subject is not true as indicated by some of the respondents’ response. Which indicated clearly that students’ interest in mathematics has a strong influence on their achievement in mathematics as students’ move upward in their educational ladder. However, 0.9% of the respondents were undecided. The analysis found “mathematics is a very interesting subject” to have an average rating of 3.7 and standard deviation of 1.32. See table 4.6.

The researcher also investigated students’ interest on the item that, students like mathematics, because they don’t have to memorize it, it could all be figured out and how this interest influenced students’ achievement in mathematics. The analysis revealed that 39.3% of the total respondents agreed with the views that, “Students like mathematics because, they don’t have to memorize it, it could all be figured out”. However, this was disagreed by 54.7% of the total respondents that, Students like mathematics, because they don’t have to memorize it, it could all be figured out is really not true for most students’. This clearly showed that students’ interest in mathematics really affected their mathematics achievement. The result further found 6.0% of the total respondents were without any decision as to whether Students like mathematics, because they don’t have to memorize it, it could all be figured out. The study found out that, students like mathematics because they don’t have to memorize it, it could all be figured out as variable with a mean of 3.26 and standard deviation of 1.45. See table 4.6.

Table 4.6 Descriptive statistical analyses of students' interest construct

Factors	SD	D	U	A	SA	Mean	S.D
Mathematics is a very interesting subject.	32.3%	43.5%	9%	12.5%	10.8%	3.74	1.320
Students like mathematics because they don't have to memorize it, it could all be figured out.	21.6%	37.1%	6.9%	15.1%	19.4%	3.26	1.449
Students enjoy studying mathematics in S.H.S than any other subjects.	24.6%	40.5%	4.7%	18.5%	11.6%	3.48	1.348
Students will like to avoid mathematics if an option is given.	19.0%	16.8%	6.5%	25.9%	31.9%	2.69	1.526
Students lose interest in mathematics due to the negative misconception held by students.	13.8%	19.0%	9.5%	28.4%	29.3%	3.41	1.429
Students like solving new problems in mathematics on their own.	32.3%	24.6%	9.1%	17.7%	16.4%	2.61	1.490
Mathematics makes students feel uncomfortable.	11.2%	23.3%	3.9%	30.1%	30.6%	2.53	1.420
Students dislike mathematics due to its complex nature.	10.8%	24.6%	9.9%	27.2%	27.6%	3.36	1.389
When students hear the word "mathematics", they have the feeling of dislike.	13.4%	15.5%	4.7%	30.2%	36.2%	3.60	.444
Teachers do not involve students in the teaching and learning of mathematics.	13.4%	22.0%	5.6%	36.6%	22.4%	3.32	1.384

Source: Field Work

The study examined students' interest on whether Students enjoy studying mathematics in S.H.S than any other subject and how this influenced their mathematics achievement. The study found that 30.1% of the total respondents were found to agree with the statement that, students enjoy studying mathematics in S.H.S than any other subject. Conversely, 65.1% of the total respondents were found to disagree with the statement that, students enjoy studying mathematics in S.H.S than any other subject which testified that students' interest really affected their achievement in mathematics. The study also found 4.8% of the total respondents were without any decision. The statement however had a mean rating and standard deviation of 3.5 and 1.35 respectively. See table 4.6.

The researcher investigated students' interest on the statement that, Students will like to avoid mathematics if an option is given and how this affects student achievement in mathematics. The researcher further found the students' level of agreement or disagreement to the statement: Students will like to avoid mathematics if an option is given. The results found that, 57.8% of the total respondents agreed while 35.8% of the total respondents disagreed to the statement that, Students' will like to avoid mathematics if an option is given. This depicted clearly that students have low interest in mathematics and hence low achievement in mathematics will be exhibited. The result however found 6.5% of the respondents neutral to the statement. It was also found that, the statement under investigation had mean and standard deviation of 3.35 and 1.5 respectively in table 4.6.

The study also investigated students' interest on the statement that; Students' lose interest in mathematics due to the negative misconception held by students about mathematics and this could affect students' achievement in mathematics. The researcher used an item "Students lose interest in mathematics due to the negative

misconception held by students". The outcome concluded that 57.7% of the total respondents agreed with the statement, Students lose interest in mathematics due to the negative misconception held by them. However 32.8% of the total respondents disagreed with and 9.5% of the total respondents were neutral to the statement that Misconception about mathematics affected students' interest in mathematics. The study found the average response of the participant to be 3.4 with standard deviation of 1.43 in table 4.6.

The researcher however found that students' ability to attach a personal significance to the programme of study was also found to have some level of importance to the students' interest in mathematics. The study further investigated the interest that Students like solving new problems in mathematics on their own and found that 34.1% of the total respondents agreed to the statement that, Students like solving new problems in mathematics on their own. Which indicated clearly the level of interest students' attached to the learning of mathematics and how this low interest affected students' achievement in mathematics, while 56.9% of the total respondents disagreed. The result however found 9.1% of the total respondents neither agreed nor disagreed with the statement which has a mean and standard deviation of 2.61 and 1.49 respectively. However, nothing is more powerful in the teaching and learning of mathematics than having a direct interest and sustaining the interest in the subject. This raises our interest leading to high achievement in mathematics (Arthur, Oduro & Boadi 2014). See table 4.6.

The researcher also investigated students' interest on how uncomfortable students are in teaching and learning of mathematics and how this affects their mathematics achievement. The study used an item "mathematics make students' feel uncomfortable". The result concluded that 61.6% of the total respondents agreed with

the statement that mathematics make students' feel uncomfortable and this significantly affects students' achievement in mathematics but 44.5% of the total respondents disagreed with the statement whiles 3.9% of the total respondents were neutral of the statement that mathematics makes students feel uncomfortable. The result found the average response of the respondents to be 2.5 with standard deviation of 1.42 in table 4.6.

The statement that; "Students dislike mathematics due to its complex nature" was investigated with reference to students' interest and the impact it has on the students' achievement in mathematics. The study made respondents to rank the statement: Students' dislike mathematics due to its complex nature and how this affect students' achievement in mathematics. The study revealed that 54.8% of the total respondents agreed with the statement while 35.4% of the total respondents disagreed and 9.8% neutral to the statement. The average mean of the statement was 3.36 and standard deviation of 1.39. See table 4.6.

The study investigated the students' interest that; when students hear the word "mathematics", they have the feeling of dislike and how this interest affects students' achievement in mathematics. The outcome shown 66.4% of the total respondents agreed to the statement that, when students' hear the word mathematics, they have the feeling of dislike has revealed how it affected students' achievement in mathematics while 28.9% of the total respondents disagreed. The result however found 4.7% of the total respondents neither agreed nor disagreed with the statement that, when students' hear the word "mathematics", they have the feeling of dislike. The study also found the statement to have an average ranking of 3.4 and a standard deviation of 1.44. See table 4.6.

The study also examined the students' interest that teachers do not involve them in the teaching and learning of mathematics. The study investigated the statement that: "students felt they are not involved in the teaching and learning process of mathematics to develop their interest which affected their achievement in mathematics. It was found that 35.4% of the respondents agreed while 59.0% of the respondents disagreed with the statement that students are not involved in the teaching and learning of mathematics. In effect, the study found 5.6% of the respondents were undecided. The result found the mean and the standard deviation to be 3.32 and 1.38 respectively. See table 4.6.

This portion of the analysis of the study revealed that, when students have interest in the teaching and learning of mathematics, it will further improve their competency in mathematical concepts as well as their confidence level. The more interested students are in the teaching and learning of mathematics, the more it will significantly develop their confidence in studying mathematics as well as their mathematics achievement. However, observations from the study also indicated that when students are guided by mathematics teachers and given academic counselling to eradicate their negative perception about mathematics, it will improve their interest in mathematics and further impact on their achievement and performance in mathematics. This result agrees with the studies of Mutodi & Ngirande, 2014; Arthur, Oduro & Boadi 2014; Arthur, Asiedu-Addo, & Assuah, 2017b.

4.5 Results and findings

The study previously determined the reflective measurement model that needed to be dropped based on unidimensionality or multidimensionality procedure that aimed at removing an indicator or an item with Cronbach's alpha value less than 0.6. The

results indicated in Table 4.8, shows that after multidimensionality procedure, the construct indicators produced with reliability statistics (Cronbach's alpha) value > 0.7, indicating the extent of internal consistency as well as construct reliability (Hair, Sarstedt, & Ringle, 2012; Henseler, Ringle, & Sinkovics, 2009). The study performed correlational reliability and validity test to ascertain the conformity of the constructs indicators measuring what it is meant to measure and not necessarily reflecting other constructs than the construct it intends to measure. The study presented the correlational reliability statistics based on the t-statistics. The standardised t-statistics is useful in determining the hypothesis indicated in the research. When the values of standardised t-statistics are greater than 1.96, basically, it is assumed to be statistically significant otherwise, it is not statistically significant (Fornell & Larcker, 1981).

To answer the research question "What is the relationship between students' perception and interest against their mathematics achievement?" the empirical Triangular model of students' achievement in mathematics was used for further clarity and confirmation. The results from the study revealed that students' interest in mathematics and students' perception of mathematics significantly predicted students' achievement in mathematics and explains by 49.24% of variance in students' achievement in mathematics. The results further indicated that, students' interest in mathematics can explain 28.95% of variance in students perception of mathematics whiles students' achievement in mathematics also explain 40.10% of variance in students interest to learn mathematics as indicated in Figure 4.1. It therefore concluded that there is a significant positive relationship between students' perception about mathematics and their interest in mathematics achievements. The result is consistent with the studies in (Arthur, Asiedu-Addo and Assuah, 2017a; Arthur, Oduro, & Boadi, 2014).

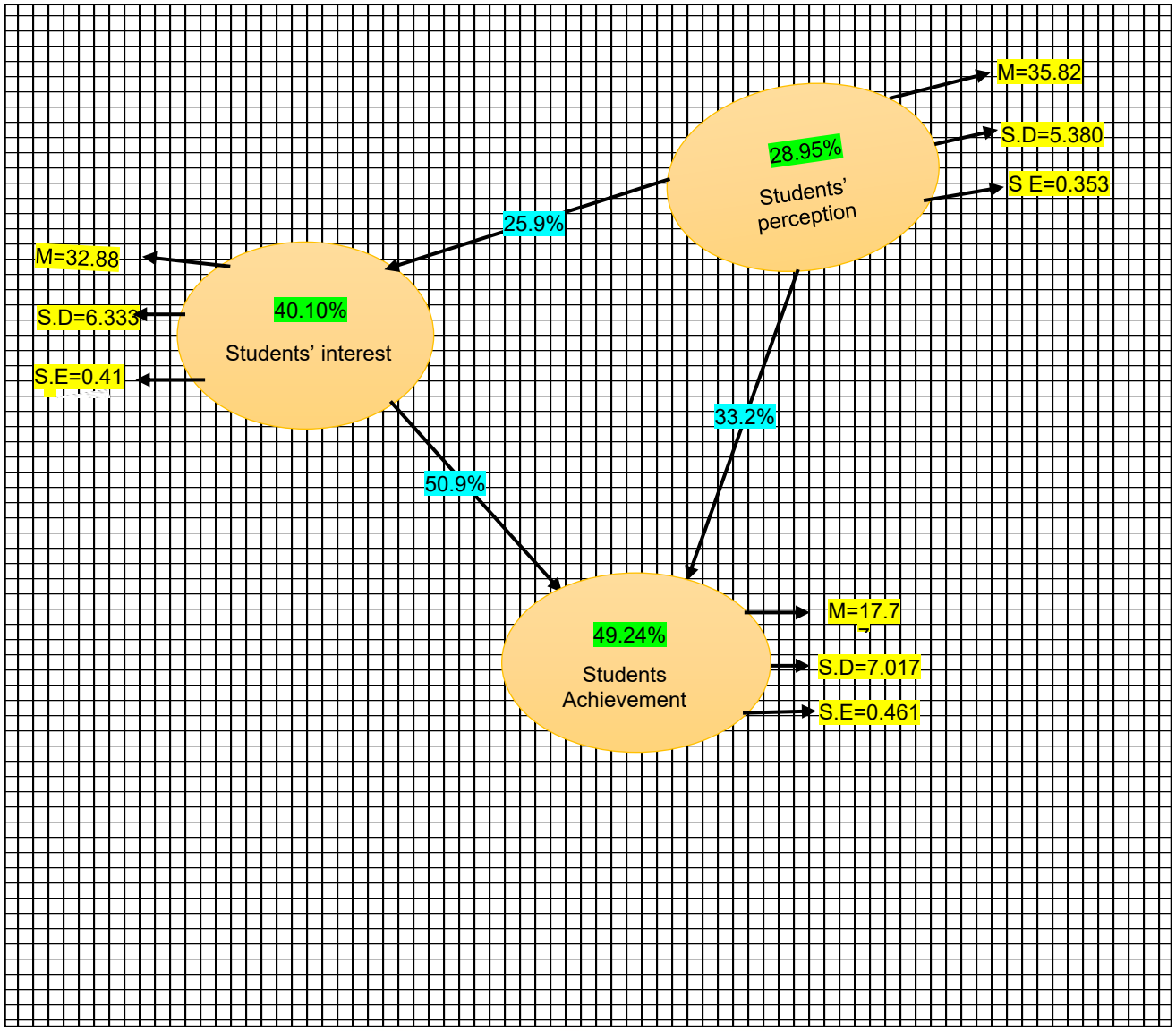


Figure 4.1. Empirical Triangular model of students' achievement in mathematics

Source: Field Work

To answer the hypothesis, the correlational reliability statistics Extracted were used for further clarity and confirmation. Students' perception against their mathematics achievement has a correlational value of 0.332 and that of students' interest against their achievement is 0.509 which indicated that, students' perception and their interest in mathematics have a significate positive effect on their mathematics achievement. The results from the data analyse revealed that, Students' perception and their interest

in mathematics have significant effect on their mathematics achievements. I therefore reject the null hypothesis and accept the alternative hypothesis that, "Students' perception and their interest in mathematics have significant effect on their mathematics achievements." The study therefore concluded that students' interest in mathematics and their perception of mathematics significantly predicted students' achievement in mathematics and explains by 49.24% of variance in students' achievement in mathematics. See table 4.7 and 4.1

Table 4.7: Correlation Reliability statistics Extracted

Constructs	Total sample	Sample Mean	Std. Dev.	T Statistics	Correlation	P - value
perception - interest	232	2.944	7.168	6.256	0.259	0.000
perception - Achievement	232	18.047	7.286	37.729	0.332	0.000
interest - Achievement	232	15.103	6.642	34.638	0.509	0.000

Correlation is significant at the 0.01 level

Source: Field Work

Table 4.8: Correlational reliability and validity of construct

Construct	Students' perception	Students' interest	Students' achievement	p-value	Cronbach's Alpha
Students' perception	1	0.259	0.332	0.000	
Students' interest	0.259	1	0.509	0.000	
Students' achievement	0.509	0.505	1	0.000	0.873

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

Source: Field Work

4.6 Discussion

4.6.1 Influence of students' perception on students' achievement in mathematics

The influence of students' perception on students' achievement in mathematics was tested at 0.01 level of significance. The results indicated a direct relationship between students' perception about mathematics and their achievement in mathematics ($r = 0.332$, $p < 0.01$) with coefficient of determination ($r^2 = 0.110$). That is students' achievement in mathematics accounted for 11.0% of students' perception. The result of the study suggested that as students positively perceive mathematics, the more likely students will exhibit in mathematics achievement. Thus as students positively perceive mathematics by erasing misconception about mathematics, the more interested students will be in the teaching and learning of mathematics and the more the achievement of mathematics will be improved. The results concur with the findings of (Arthur, Asiedu addo & asuah 2017a; Mutodi & Ngirande, 2014a)

4.6.2 Influence of students' interest on students' achievement in mathematics

The extent to which students' interest in mathematics influence their achievement in mathematics was tested using correlation. The study finding suggested that there exist a direct causation between students' achievement in mathematics and students' interest to learn mathematics ($r = 0.509$, $p < 0.01$) and had a coefficient of determination ($r^2 = 0.259$). That indicated that students' achievement in mathematics accounted for 25.9% of students' interest. The analysis of study indicated a positive and statistical significant relationship between students' achievement in mathematics and their interest to learn mathematics. The results further suggested that the more students are interested to learn mathematics, the more students demonstrate high achievement in mathematics. This contributes to the literature of mathematics

education and expand the scope of literature so that students' achievement in mathematics will be improved significantly if students are interested in learning mathematics. The educational leadership and stakeholders are required to institute measures that will promote students' interest since it has direct causation with students' mathematics achievement. Consistent with this study is the finding of (Mutodi & Ngirande, 2014; Arthur, Oduro and Boadi 2014 and Leonard, 2016).

4.6.3 Influence of students perception on students interest in mathematics Achievement

The hypothesis that students' perception and their interest in mathematics have significant effect on their mathematics achievements was found to be statistically significant. The findings suggested a direct relationship between students' interest in mathematics and students perception ($r = 0.259$, $p < 0.01$) with small coefficient of determination ($r^2 = 0.067$). That is students' interest in mathematics accounted for 6.7% of students' perception. This suggested further that students exhibiting positive perception of mathematics will further improve their interest in mathematics. The more positive perception students hold about teaching and learning of mathematics, it will significantly improve their interest in mathematics (Ampadu, 2012; Kabeera, 2018 and Mutodi & Ngirande, 2014). When students are given academic counselling to renew their perception about mathematics, they will improve their interest in mathematics and further impact on achievement in mathematics. The results agreed with the views of (Arthur, Asiedu-Addo and Assuah, 2017a and Arthur, Oduro, & Boadi, 2014).

It will be recalled that the purpose of this study was to investigate the causation between students' perceptions of mathematics, students' interest in mathematics and

their influence on students' mathematics achievement and it was hypothesized that there is a significant positive relationship between students' perceptions as well as students' interest contributing to students' achievement in mathematics. Since the p-values of all the relationships in Table 4.7 and 4.8 are less than 0.01, it therefore means that we fail to reject the null hypothesis and conclude that students' perception and their interest in mathematics have significant effects on their mathematics achievements. This portion of the study also agreed with the observations of Mohamed and Charles (2017).

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Overview

This chapter covers the last sections of the study. The chapter has a summary of findings of the study and the study conclusions. There is also a section on recommendations of the study and lastly a section on the suggested areas for further research.

5.1 Summary of the study

This study sought to establish the determinants, students' perception about mathematics, the extent to which students' interest influence students' achievements in mathematics and the relationship between students' perception and interest in mathematics and their influences on students' achievement in mathematics. To achieve this objective, the study investigated the effect of students' perception on mathematics, students' interest in mathematics and their influences on students' mathematics achievement. The data was collected from Bole Senior High School in the Savanna Region of Ghana. From the findings;

The empirical triangular model of students' achievement in mathematics showed that students' perception construct had a causational value of 33.2% with students' achievement in mathematics. This represents the extent of students' perception on their mathematics achievement. This agreed with the results from the descriptive statistics that students' perception in mathematics significantly had a positive influence on students' achievement in mathematics. This study agreed with the views

of (Arthur, Asiedu-Addo, & Assuah, 2017; Mutodi & Ngirande 2014) which showed that students' low achievement in mathematics was attributed to the way students' perceived the subject and how motivated they are during the teaching and learning of mathematics.

Similarly, according to the correlational test results, students' interest in mathematics had 25.9% attributable to students' perception. This indicated weak positive causation between students' perception in mathematics and students' interest ($r = 0.259$) with small coefficient of determination ($r^2 = 0.067$). That is, students' perception about mathematics accounted for 6.7% of students' interest in mathematics. This meant that students' perception on mathematics and students' interest to learn mathematics are positively correlated. This study concurs with the observations of Ampadu, (2012) and Leonard, (2016).

The empirical triangular model of students' achievement in mathematics indicated that students' interest in mathematics construct had a correlational value of 50.9% with students' achievement in mathematics. This represents the extent to which students' interest to learn mathematics had a positive causation with students' mathematics achievement. This agreed with the findings from the descriptive statistics that students' interest to learn mathematics is statistically significant and had a great influence on students' achievement in mathematics. However, the study also revealed that inappropriate teaching methods, instilling negative attitude in students towards mathematics, teachers' behaviour and negative utterances about mathematics and the personality of the teacher were found to have a negative influence on students' perceptions and interest on students' mathematics achievement. Firstly, the method the teacher uses to teach affects how students understand mathematics in class. Most students' with negative perception and low interest in mathematics is attributed to the

poor teaching methods and the negative utterances made by teachers. So mathematics as a subject if not well handled and students are motivated, students will certainly loose interest. Secondly, the attitude of the teachers towards students affect students' interest in the subject. This result tends to agree with the views of (Arthur, Asiedu-Addo, & Assuah, 2017; Arthur, Oduro, & Boadi, 2014 and Paul, 2014).

5.2 Conclusions of the study

The study modelled students' achievement in mathematics based on perception and interest of the students'. The study determined the influence of students' perception and students' interest on students' mathematics achievement. The study concluded that, students' achievement in mathematics is significantly and positively predicted by their perception and interest to learn mathematics. The study further concluded that students' perception about mathematics further predicted their interest to learn mathematics significantly. Nonetheless, the study concluded that students' achievement in mathematics could be improved by students' interest for studying mathematics and when their perception about mathematics is improved. The more students are highly interested to learn mathematics with renewed perception, the more the achievement students would demonstrate in mathematics.

5.3 Recommendations of the study

1. The study recommended for stakeholders and mathematics educators to invest in activities that will positively improve students' perception in mathematics and further motivate them both intrinsically and extrinsically to increase their interest to learn mathematics.

2. The study recommended for stakeholders and mathematics educators to engage students in activities that will influence their interest for learning mathematics.
3. The use of technology in teaching and learning of mathematics should be encouraged at the early stages of the children's education to help eradicate the negative perception students have for mathematics and stimulate their interest.
4. The study also revealed that the attitude of teachers and their negative utterances about mathematics also attributed to the negative perception and the low interest of students in mathematics.
5. It is recommended that teachers be sensitized on how best they could approach the subject, relate to students and change the attitude of students on mathematics.
6. The study noted that gender stereotypes and false beliefs were found to create fear and sense of inability among the female students on mathematics.
7. It is recommended that teachers, parents and other stakeholders be sensitized on how best to address those false stereotypes about female students on mathematics achievement in senior high school students.

5.4 Implications and suggestions of the further research study

The data collected showed that perceptions and interest of students towards mathematics is determined by various factors. The study has established that students' perception and their interest level influenced the confidence and commitment they had towards the subject which eventually influenced their mathematics achievement.

Although the findings are from the Savanna Region of Ghana, more precisely Bole district, where the study took place at the Bole senior high school which is quite a very large school, and all efforts were made to ensure that the data collected was

accurate and well processed, the findings are not generalizable because they represented only an urban area whose population was unique. It is recommended that a similar study should be done in other regions in Ghana so as to unearth more about the influences of students' perception and interest on students' achievement in mathematics.

REFERENCES

Adodo, S.O. (2007). Effect of diagnostic remediation instructional strategies and students learning outcomes in junior secondary school integrated science. *Unpublished Ph.D Thesis*, University of Ado-Ekiti, Ekiti State.

Ahmad, A. N., Azizan, F. L., Rahim, N. F., Jaya, N. H., Shaipullah, N. M. & Siaw, E. S. (2017). Relationship between Students' Perception toward the Teaching and Learning Methods of Mathematics' Lecturer and Their Achievement in Pre-University Studies. *International Education Studies; 1913-9020*

Ahmavaara, A., & Houston, D. (2007). The effects of selective school in grand self-concept on adolescents' academic aspiration: An examination of Dweck's self-theory. *British Journal of Psychology, 77,* 613-632.

Aiken, L. R. & Dreger, R. M. (1961). The Effects of Attitudes on Performance in Mathematics. *Journal of Educational Psychology***,** 52(1), 19-24.

Ajai, J. T. & Imoko, I. I. (2015). Gender Differences in Mathematics Achievement and Retention Scores: A Case of Problem-Based Learning Method. *International Journal of Research in Education and Science (IJRES***),** 1(1), 45-50.

Ajzen, I. & Fishbein, M. (1980). *Understanding Attitudes and Predicting Social Behaviour.* Englewood Cliffs, NJ: Prentice Hall.

Akinsola, M. K., & Olowojaiye, F. B. (2008). Teacher instructional methods and student attitudes towards mathematics. *International Electronic Journal of Mathematics Education, 3*(1), 60–73.

Akuamoah, J. O., Ampadu, C. O., Asamoah, D., Baffoe-Bonnie, B. D., & Prah, D. (2004). *Principles and Methods of Teaching in Basic Schools for UTTDBE Programme (By Distance).* Teacher Education Division, Ghana Education Service, Accra, Ghana

Akurugu, B. M. (2010). The Attitudes and Perceptions of Students about the Study of English Grammar: The Case of Selected Senior High School Students in Northern Region. *Unpublished PhD Thesis.* Kwame Nkrumah University of Science and Technology, Kumasi, Ghana.

Ali Ho (2013). Factors affecting students' Academic Performance in Mathematical Sciences Department in Tertiary Institutions in Nigeria. 3(12):905–13. *Arthur et al.; ARJOM, 4(2): 1-12,*

Allotey, G. A., (2012**).** *Mathematics for Junior High Schools: Student's Book Three*. Adaex Educational Publications & Pak Publishers, Accra, Ghana**.**

Ampadu, E. (2012) Students' Perceptions of their Teachers' Teaching of Mathematics: The Case of Ghana. *International Online Journal of Educational Sciences, 4 (2), 351-358.*

Andronache, D. (2013). Proiectarea curriculumului centrat pe competene la disciplinele pedagogice, în învăământul liceal. Teză de doctorat. Cluj-Napoca: Universitatea Babe-Bolyai. (Designing the Competence-Centred Curriculum for Pedagogical Subjects, in High School. Thesis. Cluj-Napoca: Babe-Bolyai University).

Angela, R. L (2003). Student ratings of women faculty: Data and Strategies. *Centre for Engineering learning and teaching, University of Washington*, Box 352180, seattle, WA98195, (206) 221-2633.

Anthony, G., & Walshaw, M. (2007). *Effective pedagogy in mathematics/pangarau: Best evidence synthesis iteration (BES)*. Wellington, New Zealand: Ministry of Education.

Anthony, G., & Walshaw, M. (2009). Characteristics of effective teaching of Mathematics: A view from the West. *Journal of Mathematics Education,* 2(2), 147-164.

Armstrong, M., (2007). *A Handbook of Human Resource Management Practice*. Cambridge University Press, United Kingdom

Arthur Y. D., Oduro F. T. & Boadi R. k. (2014). Statistical Analysis of Ghanaian Students Attitude and Interest Towards Learning Mathematics. *International Journal of Education and Research 2 661-670.*

Arthur, Y. D, Asiedu-Addo, S & Assuah, C. K. (2017a).Triangular law of students' Mathematics Interest in Ghana: A Model with motivation and perception as predictor. *International Electronic Journal of Mathematics Education* e-ISSN: 1306-3030. 2017, VOL. 12, NO. 3, 539-548

Arthur, Y. D, Asiedu-Addo, S & Assuah, C. K. (2017b). Students' Perception and Its Impact on Ghanaian Students' Interest in Mathematics: Multivariate Statistical Analytical Approach. *Asian Research Journal of Mathematics 4(2): 1-12,*

Asante, K.O. (2010). *Sex Differences in Mathematics Performance among Senior High Students in Ghana*. Retrieved from http://www.faqs.org/periodicals/201012/2187713381. [Accessed on 12 December 2019]

Asiedu-Addo, S.K & Yidana, I. (2004). *Mathematics teachers' knowledge of the subject content and methodology.*

Asikhia, O. A. (2010). Student's and Teacher's Perceptions of the Causes of Poor Academic Performance in Ogun State Secondary Schools in Nigerian: Implications for Counselling for National Development**.** Retrieved on *http://www.eurojournals.com/ejs13208.pdf* [Accessed 10 November 2019]

Attard, C. (2012). Engagement with mathematics: What does it mean and what does it look like? *Australian Primary Mathematics Classroom, 17*(1), 9–12.

Ayot, M. O & Patel, M. M. (1987). *Instructional Methods*. London: University of London.

Baba, W. M., (2012). Teacher Motivation and Quality of Education Delivery: A Study of Public Basic Schools in Tamale Metropolis in Ghana. *Unpublished Masters'*
Thesis, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioural change. *Psychological Review, 84,* 191–215.

Bandura, A. (1986). Social foundations of thought and action: A social cognitive theory.
Englewood Cliffs, NJ: Prentice Hall.

Baumert, J., & Koller, O. (1998). *Interest research in secondary level I: An overview*. In L. Hoffmann, A. Krapp, K. A. Renninger, & J. Baumert (Eds.), Interest and learning (pp. 241– 256). Kiel: IPN.

Beswick, K. (2006). The importance of mathematics teachers' beliefs. *Australian Mathematics Teacher, 62*(4), 17–22.

Björklund C (2010). *Broadening the horizon: Toddlers' strategies for learning mathematics.*

Bol, L. & Berry, R.Q III (2005). Secondary Mathematics' Teachers perceptions of the Achievement gap; *The High School Journal. Published by the University of North Carolina Press.*

Bong, M (2004) Academic Motivation in Self-Efficacy, Task Value, Achievement Goal Orientations, and Attributional Beliefs. *Journal of Educational research.* Vol. 97, 2004 - *6*

Bouche, H., & Harter, S. (2005). Reflected appraisals, academic self-perceptions, and math/science performance during early adolescent. *Journal of Educational Research, 97*(4), 673-686.

Bramlett, D. C. & Herron S. (2009). A Study of African-American College Students' Attitude towards Mathematics. *Journal of Mathematical Sciences and Mathematics Education, 4: 43-51.*

Bright D. A. & Douglas D. A. (2018). High school students' attitudes towards the study of mathematics and their perceived teachers' teaching practices. *European Journal of Educational and Development Psychology.* Com/cgi/content/abstract/26/12/1863

CAMFED (2012). *Insights: What Works in Girls' Education, Gender and Education in*
Ghana. Tamale**,** Ghana. Retrieved on *http://www.camfed.org* [Accessed 25 September 2019].

Carl Friedrich Gauss (1777–1855). About Mathematics. learningeasymath. wordpress.com.

Carrol. C. & Gill, O, (2011). Evaluation of the University of Limerick Maths Learning Centre. *Unpublished Undergraduate Dissertation*, University of Limerick, Ireland.

Chaudhry, Shafiq, & Berhanu, (2011). Perception of University Female Students on Factors Affecting Their Academic Performance and Competency: A Study from Dire Dawa University, Ethiopia. Science Journal of Education.

Coben, D. (2003). *Adult Numeracy: Review of Research and Related Literature.* London: National Research and Development Centre (NRDC).

Cokely, K. (2002). Ethnicity, gender and academic self-concept: A preliminary examination of academic misidentification and implication for psychologists. *Cultural Diversity Ethnic Minor Psychology, 8*(4), 378-388

Cooper, D. R. & Schindler, P. S. (2008). *Business research methods, 8th Ed*., New Delhi, Tata McGraw-Hill.

Cracker, D. E., (2006). Attitudes towards Science of Students Enrolled in Introductory *Level Science Courses at UW-La Cross***.** Retrieved on *http://www.uwlax.edu/urc***.** [Accessed 29 November 2019].

Craven, R. Marsh, H. W., & McInerney, D. (2009). *Self-processes, learning, and enabling human potential (pp. 223e247)*. Connecticut: Information Age Publishing.

Dandala, S. S. (2013). Factors Contributing to Senior Secondary School Learner's Poor Performance in Science Subjects in the Mount Frere Education District of the Eastern Cape Province, South Africa, *Unpublished Masters' Thesis*, Walter Sisulu University.

David, M. A (2017). Students' rating of mathematics teachers in senior secondary schools in ilorin, kwara state, Nigeria.

Di Martino, P., & Zan, R. (2011). Attitude towards mathematics: A bridge between beliefs and nemotions. *The International Journal on Mathematics Education, 43*(4), 471–482.

Diaz, A. L. (2003). Personal, family academic factors affecting low achievement in secondary school. *Electronic Journal of Research in Educational Psychology and Psychopedagogy, 1(1), 43-66.*

Dornyei, Z., (2001). *Teaching and Researching Motivation*. England, Essex: Pearson Education Limited.

Douglas, O. B. (2017). *Relationship between Teacher Effectiveness and Student Achievement: An Investigation of Teacher Quality*.

Douglas, R. G. (2002). *Design Teaching Strategies: Behaviour Analysis Systems Approach.* United States of America, Maple-Vall Book Manufacturing Group.

Du Sautoy, M., (2010). *Maths is the Language of the Universe.* New Statesman, 14 October 2010

Dweck, C. S., & Bush, E. S. (1976). Sex Differences in Learned Helplessness: In Differential Debilitation with Peer and Adult Evaluators**.** *Developmental Psychology***,** 12, 147-156.

Eagly, A. H., & Chaiken, S. (1993). *The Psychology of Attitudes***.** Orlando: Harcourt Brace Jovanovich College Publishers.

Eccles, J. S., & Midgley, C. (1989). Stage/environment fit: Developmentally appropriate classrooms for early adolescents. In R. A. C. Ames (Ed.), *Research on motivation in education* (Vol. 3, pp. 139–181). New York: Academic Press.

Eccles, J. S., Wigfield, A., Harold, R. D., & Blumenfeld, P. B. (1993). Age and gender differences in children's self- and task-perceptions during elementary school. *Child Development,* 64, 830–847.

Eshun, B., (2004). Sex-Differences in Attitude of Students towards Mathematics in Secondary Schools, *Mathematics Connection***,** 4: 1-13

Etuk E. N, Afangideh M. E, & Uya A. O (2013). Students' perception of teachers' characteristics and their attitude towards mathematics in Ooron education zone, Nigeria. *Int Educ Stud. 6(2):197–204.*

Etuk, N. E, Maria, E. A, & Asukwo, O. U. (2012.) Students' Perception of Teachers' Characteristics and Their Attitude towards Mathematics in Oron Education Zone, Nigeria. Published by Canadian Centre of Science and Education. *International Education Studies; 6(2)197-204.*

Evans, B. R. (2005). Student attitudes, conceptions, and achievement in introductory undergraduate college Statistics. *Unpublished Doctoral Dissertation.* Temple University, Temple.

Fatola, B. M. (2005). Improving attendance and behaviour in secondary schools; *Journal of Teacher Education*. 4(2).18-22.

Fazio, R. H., Powell, M. C. & Williams, C. (1989). The Role of Attitude in the Attitude-to-Behaviour Process. *Journal of Consumer Research, Vol. 16: 505–514.*

Federal Republic of Nigeria National Policy on Education 6th Edition (2013). Published by Nigerian Educational Research and Development Council (NERDC*), Yaba Lagos, Nigeria. ISBN-978-054-216-7.*

Festinger, L. (1957). *A Theory of Cognitive Dissonance***.** Evanston, Row, Peterson.

Fishbein, M., & Ajzen, I. (1980). *The Influence of Attitudes on Behavior*. Publication at: *https://www.researchgate.net/publication/264000974*

Fisher, P. H., Dobbs-Oates, J., Doctoroff, G. L., & Arnold, D. H. (2012). Early math interest and the development of math skills. *Journal of Educational Psychology*, *104*, 673-681.

Forgasz, H. J., Becker, J. R., Lee, K.-H., & Steinthorsdottir, O. B. (Eds.), (2010). *International perspectives on gender and mathematics education*. Charlotte, NC:
Information Age Publishing.

Frazier-Kouassi, S., (1999). A Psychological Study of Mathematics Attitudes and Achievement among Female Ivorian Students**,** *Institute for Social Research, University of Michigan, Working Paper #: 268, MSU Board of Trustees. Retrieved from http://gencen.isp.msu.edu/documents/Working_Papers/WP268.pdf* [Accessed 19 November 2019].

Fredricks, J. A., & Eccles, J. (2002). Children's competence and value beliefs from childhood through adolescence: Growth trajectories in two male-sex-typed domains. *Developmental Psychology, 38, 519–533*.

Frenzel A. C, Pekrun R, & Goetz T (2007). Perceived learning environment and students' emotional experiences: A multilevel analysis of mathematics classrooms. *Learn Instr. 17(5):478–93*.

Gallagher, A. M., & Kaufman, J. C. (2006). *Gender Differences in Mathematics: An Integrative Psychological Approach***.** Cambridge: Cambridge University Press.

Gallagher, A. M., (1998). Gender and Antecedents of Performance in Mathematics Testing. *Teachers College Records, 100, 297-314.*

Ghana Education Service (2001). Girls' Education Unit, Basic Education Division, A National Vision for Girls" Education in Ghana and Framework for Action*:* Charting the Way forward**,** *Technical Report*, Accra, Ghana.

Githua, B. N., & Mwangi, J. G. (2003). Students' mathematics self-concept and motivation to learn mathematics : relationship and gender differences among Kenya's secondary-school students in Nairobi and Rift Valley provinces. International Journal of Educational Development 23, 23, 487–499. http://doi.org/10.1016/S0738 0593(03)00025-7

Grant, C. & Osanloo, A. (2014). Understanding, selecting, and integrating a theoretical framework in dissertation research:

Greenberg, J. & Baron, A. R., (1999). *Behaviour in Organisations*. New York Mcgraw- Hill.

Grootenboer, P., Lomas, G., & Ingram, N. (2008). *The affective domain and mathematics education.*

Guay, F., Marsh, H. W., & Boivin, M. (2003). Academic self-concept and academic achievement: Development perspectives on their casual ordering. *Journal of Education Psychology, 95*, 124-136.

Gunderson E. A., Ramirez, G., Levine, S. C., & Beilock, S. L., (2012). The Role of Parents and Teachers in the Development of Gender-Related Math Attitudes, Springer Science Business Media, LLC, Chicago, USA Sex Roles 66:153–166 Retrieved http://psychology.uchicago.edu/people/faculty/Gunderson_et_al_2012_Sex_Roles. pdf [Accessed 19 November 2019]

Guy, G. M., Cornick, J., & Beckford, I. (2015). More than Math: On the Affective Domain in Developmental Mathematics**.** *International Journal for the Scholarship of Teaching and Learning, 9* **(2).** Retrieved from https://files.eric.ed.gov/fulltext/EJ1134636.pdf

Hafiz T. J & Hina H. A (2016). Causes of Poor Performance in Mathematics from Teachers, Parents and Student's Perspective. *American Scientific Research Journal for Engineering, Technology, and Sciences* ·

Hair, J., Sarstedt, M., & Ringle, C. (2012). An assessment of the use of partial least squares structural equation modeling in marketing research. *Journal of the Academy of Marketing Science*, *40*(3), 414–433.

Han, S. Y., & Carpenter, D. (2014). Construct validation of student attitude toward science, technology, engineering and mathematics project-based learning: The case of Korean middle grade students. *Middle Grades Research Journal, 9*(3), 27–41.

Harlaar, F., & Robert, J. (2006). Predicting school achievement from general cognitive ability, self-perceived ability and intrinsic value. *Intelligence, 34*, 363 – 374.

Haylock, D. & Manning, R. (2014). *Mathematics Explained for Primary Teachers, (5rd edition)***.** SAGE Publications, London. New Delhi.

Haylock, D. (2007). Key concepts in teaching primary mathematics London: *SAGE Publications Ltd doi: 10.4135/9781446214503.*

Heinze, A., K. Reiss & R. Franziska, (2005). *Mathematics Achievement and Interest in Mathematics from a Differential Perspective*. ZDM, 37 (3): 212-220.

Henseler, J., Ringle, C., & Sinkovics, R. (2009). The use of partial least squares path modeling in international marketing. *Advances in International Marketing*, *20*, 277–319.

Hidi, S. (2000). An interest researcher's perspective on the effects of extrinsic and intrinsic factors on motivation. In B. Sansone & J. M. Harackiewitz (Eds.*), Intrinsic and extrinsic motivation: The search for optimum motivation and performance (pp. 309–330).* New York: Academic Press.

Hourigan, M. & O'Donoghue, J. (2007). Mathematical Under-Preparedness: The Influence of the Pre-Tertiary Mathematics Experience on Students‟ Ability to Make a Successful Transition to Tertiary Level Mathematics Courses in Ireland, *International Journal of Mathematical Education In Science and Technology***,** 38(4), 461-476.

Howell, K. E. (2013) Introduction to the Philosophy of Methodology. London: Sage Publications.

Ingram, N. (2015). *Students' relationships with mathematics: Affect and identity*. In M. Marshman, Int J Early Years Educ [Internet]. 18(1):71–84.

Ivowi, U. (2001). Role of Teachers in motivating students' interest in science and mathematics. International Institute for Capacity Building in Africa. *Newsletter. 3(1).*

Jacobs et al. (2002). Declining trends in student performance in lower secondary education. *European Journal of Psychology of Education,* volume 31, pages595–612(2016).

Jang, S. J., Guan, S. Y & Hsieh, H. F (2009). Developing an instrument for assessing college students' perceptions of teachers' pedagogical content knowledge Procedia Social and Behavioural Sciences, pp. 596-606.

Jeon, H. (2017). Teacher Efficacy Research in a Global Context. *Routledge International Handbook of Teacher Quality and Policy, pp. 414-429*.

Jones, K. K. & Byrnes J. P., 2006. Characteristics of Students Who Benefit from High-Quality Mathematics Instructions. *Contemporary Educational Psychology, 31(3): 328-343.*

Kabeera, P. (2018). Examining the influence of student's perception on mathematics performance: Case of three selected Rwandan secondary schools. *International Journal of Research Studies in Education 1, 33-41.*

Kacerja, S. (2012). Real-life contexts in mathematics and students' interests: An Albanian study (*Doctoral dissertation*, University of Agder, Kristiansand, Norway). Retrieved from http://www.nb.no/idtjeneste/URN:NBN:no-bibsys_brage_37094

Kahle, L. R., & Valette-Florence, P., (2012). *Marketplace Lifestyles in an Age of Social Media.* New York: M.E. Sharpe, Inc.

Kalhotra, S. K. (2013). A study of causes of failure in mathematics at High school Stage. *Academic Research International. 4 (5), 588-599.*

Kamau, M. W. (2018). *Factors influencing girls' perceptions and attitudes towards mathematics in secondary schools of westlands district, nairobi county, Kenya*.

Kele, A., & Sharma, S. (2014). Students' beliefs about learning mathematics: Some findings from the Solomon Islands. *Teachers and Curriculum, 14*, 33–44.

Khan, A. (2011). Teacher efficacy a tool to enhance academic achievement of secondary schools. *Language in India*, *11*(6), 235-247.

Kim T, & Schallert D. L (2014). Mediating effects of teacher enthusiasm and peer enthusiasm on students' interest in the college classroom. *Contemp Educ Psychol. 39:2.*

Kiplagat, P., Role, E. & Makewa, L.N (2012). Teacher commitment and mathematics performance in primary schools: A meeting point; *International Journal of Development and Sustainability*. 1(2)286-304.

Kiptum, J. K., Rono, P. K., Too, J. K., Bii, B. K. & Too, J., (2013). Effects of Students Gender on Mathematics Performance in Primary Schools in Keiyo South
District, Kenya. *International Journal of Scientific and Technology Research*, Vol. 2 Issue, 6 pp. 247-252.

Koller, O., Baumert, J., & Schnabel, K. (2001). Does interest matter? The relationship between academic interest and achievement in mathematics. *Journal for Research in Mathematics Education, 32, 448–470.*

Kombo D. & Tromp K (2006). *Proposal and Thesis Writing*. Kenya. Pauline's Publications.

Kothari, C. R. (2010). *Research Methodology: Methods and Techniques (3rd Ed.):* New Age International Publishers, New Delhi, India:

Koul, R. B.and Fisher, D. L. (2006). Students' perceptions of teachers' interpersonal behaviour and identifying exemplary teachers. *Science and Mathematics Education Centre*

Krapp, A. (2000). Interest and human development during adolescence: An educational-psychological approach. In J. Heckhausen (Ed.), *Motivational psychology of human development (pp. 109–128). Oxford, UK: Elsevier.*

Kreitner, R., & Kinicki, A. (2004). Organizational behaviour. Boston, MA: McGraw *American Journal of Educational Research*. 2018; 6(6):845-857. doi: 10.12691/education-6-6-39.

Kunter, et.al (2008). *How different mentoring approaches affect beginning teachers' development in the first years of practice*. Volume 36.

Kyei K. A. & Nemaorani T. M. (2014). Establishing factors that affect performance of grade ten students in high school: A case study of Vhembe district in South Africa. *Journal of Emerging Trends in Educational Research and Policy Studies (JETERAPDS)*, 5(7):83 87. Available at http://jeteraps.scholarlinkresearch.com/articles/ES. Accessed 18 September 2019.

Kyriacou C. & Goulding M. (2006). A systematic review of strategies to raise pupils' motivational effort in Key Stage 4 Mathematics

LaBahn, J., (1995). Education and Parental Involvement in Secondary Schools: Problems, Solutions and Effects**.** Retrieved on: *//www.edpsycinteractive.org/files/parinvol.html*. [Accessed 5 September 2019]

Laure, G. (2008). The importance of mathematics in everyday life; *African Institute for Mathematical Sciences,* 6 Melrose Road, Muizenberg 7945, South Africa.

Legotlo, M. W. & Maaga, M. G., (2002). Perceptions of Stakeholders on Poor Performance in Grade 12 in a Province in South Africa. *South African Journal of Education* Vol. 22 (2) 113 – 118. Retrieved on http://www.sabinet.co.za/abstracts/educat. [Accessed 26 November 2019].

Leonard, C. A. (2016).Factors affecting students' interest in Mathematics in Secondary Schools in Enugu state. *International Journal of Education and Evaluation ISSN 2489-0073 Vol. 2 No.1.*

Li, Q. (1999). Teachers' Beliefs and Gender Differences in Mathematics: A Review, *Educational Research*, 41, 63–76.

Liu, O. L. (2011). Examining American Post-Secondary Education. *ETS Research Report Series*, *2011*(1), i-42.

Ma, X. & Kishor N., (1997). Accessing the Relationship between Attitude toward Mathematics and Achievement in Mathematics. *Journal of Research in Mathematics Education, 28: 27–47.*

Ma, X. & Xu, J. (2004). The causal ordering of mathematics anxiety and mathematics achievement: a longitudinal panel analysis. *Journal of Adolescence, 27(2), 165-179. Retrieved April 20, 2020, from Science Direct database.*

Madeleine. M. P., (2013). The Relationship between Attitudes and Achievement in Mathematics among Fifth Grade Students. *Honors Teses.* Paper 126.

Maio, G., & Haddock, G. G. (2009). *Psychology of attitudes and attitude change.* London, England: Sage.

Mapolelo, C. D., (2007). Students' experiences with mathematics teaching and learning: listening to unheard voices. *International Journal of Mathematical Education in Science and Technology. Volume 51, Issue 8 (2020)*

Mapolelo, C. D., (2009). Student's Experiences with Mathematics Teaching and Learning: Listening to Unheard Voices**.** *International Journal of Mathematics Education in Science and Technology***.** Vol. 40 (3).

Mariam, S., Mustapha, W. A. H. W, Farah, S. H. M K & Liziana K. Z. (2016). A Study of Students' Perception toward Mathematic. *Journal of Applied Environmental and Biological Sciences.* www.textroad.com.

Martha K (2009). Factors affecting academic performance of undergraduate students at Uganda Christian University. *Educ Manag. 1–92.*

Martin, A. J. (2006). The relationship between teachers' perceptions of student motivation and engagement and teachers' enjoyment of and confidence in teaching. *Asia-Pacific Journal of Teacher Education, 34(1), 73–93. http://doi.org/10.1080/13598660500480100.*

Mata, M. de Lourdes, Monteiro, V. & Peixoto, F. (2012). Attitudes towards Mathematics: Effects of Individual, Motivational, and Social Support Factors, *Child Development Research*, vol. 2012, Article ID 876028, 10 pages, retrieved on *http://www.hindawi.com/journals/cdr/2012/876028/* [Accessed on 18-December 2019].

Mathematical Association of Ghana (2013). New Mathematics Books for Junior High Schools: *Teacher's Guide 1*, Pearson Education Limited, Harlow, England

McLeod, D. B. (1994). Research on Affect and Mathematics Learning in the JRME: 1970 to the Present. *Journal for Research in Mathematics Education*, 25(6), 637-647.

Meece, J. L., Wigfield, A., & Eccles, J. S. (1990). Predictors of math anxiety and its influence on young adolescents' course enrollment intentions and performance in mathematics. *Journal of Educational Psychology, 82(1), 60–70.*

Mensah, J. K, Okyere, M., & Kuranchie, A., (2013). Student Attitude towards Mathematics and Performance: Does the Teacher Attitude Matter? *Journal of Education and Practice*, Vol. 4(3) 132– 139.

Mereku D. K (2004). Mathematics Curriculum Implementation in Ghana: Winneba: University of Education.

Mereku D. K (2015).Congruence between the intended, implemented, and attained ICT curricula in Sub-Saharan Africa. *Canadian Journal of Science, Mathematics and Technology Education 15 (1), 1-14*

Mji, A. & Makgato, M., (2006). Factors Associated with High School Learner's Poor Performance: A Spotlight on Mathematics and Physical Science. *South African Journal of Education*, Vol. 26 (2) 253 – 266. Retrieved on *http://www.ajol.info/index.php* [Accessed 22 November 2019]

Mohamed, I. B & Charles, M. A. A., (2017). Interest in Mathematics and Academic Achievement of High School Students in Chennai District. *International Journal of Innovative Science and Research Technology 2456 – 2165.*

Mohammad, E (2012). Factors accounting for Mathematics achievement of Singaporean eighth graders. *The Asia-Pacific Education Researcher*, 21(3):507-518. Available at http://www.researchgate.net/publication/235679797 Accessed 18 September 2019.

Mohd, N., Mahmood, T. F. & Ismail, M. N. (2011). Factors that influence students in mathematics achievement. *International Journal of Academic Research.*

Morris, H. (2008). Issues raised by testing trainee primary teacher's mathematical knowledge. *Mathematics Teacher Education and Development, 3*, 37-47.

Mugenda, O. M., & Mugenda, A. G. (1999). *Research methods: Quantitative and Qualitative Approaches*. Nairobi: *Acts Press*.

Mugenda, O. M., & Mugenda, A. G. (2003). *Research methods: Qualitative and Quantitative Approaches.* Nairobi*:* Acts Press.

Muijs, D., & Reynolds, D. (2002). Teachers' beliefs and behaviors: What really matters? *Journal of classroom interaction, 2*, 3-15.

Murugan, A. (2013). Students' perceptions of mathematics classroom environment and mathematics achievement: *Journal of social science research (2289-4977)*

Mutodi, P., & Ngirande, H. (2014). The Influence of Students ` Perceptions on Mathematics. *Advertisement Mediterranean Journal of Social Sciences E-ISSN 2039-2117 ISSN 2039-9340.* MCSER Publishing, Rome-Italy Vol 5

Nardi, E & Steward, S (2003*)* Is Mathematics T.I.R.E.D? A Profile of Quiet Disaffection in the Secondary Mathematics Classroom. *British Educational Research Journal, 29 (3). pp. 345-366. ISSN 0141-1926*

National P.T.A (2012). Every Child: One Voice Programme in Pennsylvania**,** Parent Teacher Conference Tip Sheets, Schoolwires, Blackboard Solutions, Retrieved on http://www.papta.org/domain/73 [Accessed 24 November 2019].

Nicolaidou M, & Philippou G (2016). Attitudes towards mathematics, self-efficacy and achievement in problem solving. *Educ III*. Pisa Univ Pisa

Njoroge, K. N. (2004). Maths Still A Hard Nut To Crack. In *East Africa Standard* p.6.

OECD. (2013). *StudentS' drive and MotivatioN. Results: Ready to Learn-Students' Engagement, Drive and Self-Beliefs.* Volume III**.** OECD. Retrieved from https://www.oecd.org/pisa/keyfindings/pisa-2012- results-volume-III.pdf

Ofoegbu, F. I., (2004). Teacher Motivation: A Factor for Classroom Effectiveness and School Improvement in Nigeria, *College Student Journal*. Retrieved on Find Articles.com. [Accessed 12 November, 2019].

Okigbo, E. C & Okeke, S. O. C (2011) Effect of Games and analogies on students' interest in mathematics. *Journals of the Science Teacher Association of Nigeria volume 46(1)101-112.*

Olasehinde, K. J & Olatoye, R. A (2014). Scientific Attitude, Attitude to Science and Science Achievement of Senior Secondary School Students in Katsina State, Nigeria. *Journal of Educational and Social Research MCSER Publishing, Rome-Italy*. 4(1), 445-452

Olatoye (2002). Comparison of Male and Female Senior Secondary School Students' Learning Outcomes in Science in Katsina State, Nigeria. *Mediterranean Journal of Social Sciences 5(2):517-52*

Opdenakker M .C & Van Damme J (2001). Relationship between school composition and characteristics of school process and their effect on mathematics achievement. *British Educational Research Journal*, 27(4):407-432

Oraif, F. A. (2007). *An exploration of confidence related to formal learning in Saudi Arabia*. Glasgow: Glasgow University.

Orleans, A. V. (2007). The condition of secondary school physics education in the Philippines: Recent developments and remaining challenges for substantive improvements. *The Australian educational researcher, 34(1), 33-54. http://dx.doi.org/10.1007/BF03216849*

Orodho, A. J. & Kombo, D. K. (2002). *Research methods*. Nairobi: Kenyatta University, institute of open learning.

Orton, A. (1989). *Learning mathematics issues, theory and classroom practice*. Cassel Educational Ltd, London.

Ozkan, F. (2011). *Evaluating the Effects of Teaching Strategies and Learning Styles to Student's Success.* Retrieved on http://www.firat.edu.tr/icits2019/papers/27652.pdf. [Accessed 11 November 2019].

Pallavi, A. B. (2016). A systematic review of factors linked to poor academic performance of disadvantaged students in science and maths in schools.

Pandey, B. D**.** (2017). A study of mathematical achievement of secondary school students. *International journal of advanced research 5(12), 1951-1954*

Papanastasiou, C., (2000). Effects of Attitudes and Beliefs on Mathematics Achievement. *Studies in Educational Evaluation*, *26: 27-42*.

Papanastasiou, C., (2008). A Residual Analysis on Effective Schools and Effective Teaching in Mathematics. *Studies in Educational Evaluation, 34: 24-30.*

Paul, M. (2014). The Influence of Students` Perceptions on Mathematics Performance. A Case of a Selected High School in South Africa. *Mediterranean Journal of Social Sciences MCSER Publishing, Rome-Italy.*

Pezdek, K., Berry, T., & Renno, R.A. (2002). Children mathematics achievement: The role of parents' perceptions and their involvement in homework. *Journal of Educational Psychology, 94*(77), 177-183.

Planas, N., & Civil, M. (2008). Voices of non-immigrant students in the multiethnic mathematics classroom. Morelia: PME.

Professional Competence of Teachers: Effects on Instructional Quality and Student Development. *Journal of Educational Psychology© 2013 American Psychological Association2013, Vol. 105, No. 3, 805–820.*

Rebecca, L. & Angela, I. (2012)**.**Mathematics Interest and Achievement: What Role Do Perceived Parent and Teacher Support Play? A Longitudinal Analysis. *International Journal of Gender, Science and Technology, Vol.5, No.3.*

Reeve, E. M. (2013). Implementing Science, Technology, Mathematics, and Engineering
(STEM) Education in Thailand and in ASEAN A Report Prepared for : Prepared by :,1–22.

Reid, N., & Yang, M. J. (2002). Open-ended problem solving in school mathematics: A preliminary Investigation. *Internal Journal of Science Education, 24*(12), 1313-1322.

Reynolds, A. J. & Walberg, H. J. (1992). A Process Model of Mathematics Achievement and Attitude, *Journal for Research in Mathematics Education***,** 23(4), 306-328

Richard, M. R. & Edward, L. (2000), Intrinsic and Extrinsic Motivation: Classic Definition and New Directions. Retrieved on http://www.mmrg.pbworks.com. [Accessed 23 September 2019].

Rimma, N. (2017). *Interest and Engagement: Perspectives on Mathematics in the Classroom*. http://hdl.handle.net/2077/51917.

Rumberger RW & Palardy GJ 2004. Multilevel models for school effectiveness research. In D Kaplan (ed). *The SAGE handbook of quantitative methodology for the social sciences*. Thousand Oaks, CA: Sage Publications, Inc.

Saeman, B. (2009). *Motivation in Second Language Acquisition*. Allyn and Bacon Inc. Germany.

Sam L. C (2002). Public images of mathematics. *Philos Math Educ J. ;15:15*.

Sanchez, K., Zimmerman, L., and Ye, R., (2004). Secondary Students‟ Attitudes toward Mathematics**,** *Academic Exchange Quarterly***,** Vol. 8, No. 2, Pp. 56–60.

Schiefele, U. (2001). The role of interest in motivation and learning. In J. M. Collis & S. Messick (Eds*.), Intelligence and personality: Bridging the gap in theory and measurement* (pp. 163–194). Mahwah, NJ: Erlbaum

Schoenfeld, A. H. (2002). Making mathematics work for all children: Issues of standards, testing, and equity. *Educational Researcher, 31*(1), 13-25.

Siegle, D., Rubenstein, L. D. & Mitchell, M. S. (2014). Honours Students' perceptions of their high school experiences: The influence of teachers on student motivation. *Gift Child Q [Internet]. 58(1):35.*

Silver, E. A., Mesa, V. M., Morris, K. A., Star, J. R., & Benken, B. M, (2009).“Teaching mathematics for understanding: An analysis of lessons submitted by teachers seeking NBPTS certification”, *American Educational Research Journal, 46,* 501-531.

Singh, K., Granville, M., & Dika, S. (2002a). Mathematics and science achievement: effects of motivation, interest, and academic engagement. *The Journal of Educational Research, 95(6),*

Skaalvik, E. M., & Skaalvik, S. (2008). *Teacher self-efficacy: conceptual analysis and relations with teacher burnout and perceived school context*.

Slate, J. R & Jones, C. H (2005). Effects of school size: A review of the literature with recommendations.

Smith M. R., (2004). Mathematics Anxiety: Causes, Effects, and Preventative Measures, Unpublished Master’s Thesis. Retrieved on http://digitalcommons.liberty.edu/cgi/viewcontent.cgi?article=1263&context=honors [Accessed 12 july, 2019].

Smith, A. (2004). *Making Mathematics Count: The Report of Professor Adrian Smith’s Inquiry into Post-14 Mathematics Education.* Retrieved on *http://www.mathsinquiry.org.uk/report/MathsInquiryFinalReport.pdf* [Accessed 02 December 2019].

Snyder, T. D., & Dillow, S. A. (2010). *Digest of Education Statistics 2009 (NCES 2010-013).* National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC. Social Sciences, 5(3), 431–445. http://doi.org/10.5901/mjss.2014.v5n3p431.

Spinath, K. (2006). *Predicting school achievement from general cognitive ability, self-perceived ability and intrinsic value.* New York: McGraw Hill.

Sukamolson, S. (2012). *Fundamentals of quantitative research*. Retrieved from http://www.culi.chula.ac.th/e-Journal/bod/Suphat%20Sukamolson.pdf

Sullivan, P., & McDonough, A. (2007). *Eliciting positive student motivation for learning mathematics.*

Sullivan, P., Clarke, D. & Clarke, B (2009). Teaching with Tasks for Effective Mathematics Learning.

Tapia, M. (2004). The relationship of mathematics anxiety and gender. *Academic Exchange Quarter, 8*(2), 13-17.

Taylor, A. Z., & Graham S. (2007). An examination of the relationship between achievement values and perceptions of barriers among low-SES African American and Latino students. J Educ Psychol. 99(1):52–64. *Teacher Education,* 34(1), 73–93 http://doi.org/10.1080/13598660500480100

Townsend, M. & Wilton, K. (2003). Evaluating change in attitude towards mathematics using the "then-now" procedure in a cooperative learning programme. *Br J Educ Psychol. 73:473–487.*

Turner, J. & Meyer, D. (2009).Understanding motivations in mathematics: what is happening in classrooms. A handbook of motivation at school. Routledge/ Francis & Taylor group New York USA.

UNESCO/UNICEF (2003). Gender and Education for All: The Leap for Equality. *Global Monitoring Report for 2003***.** *R*etrieved on http:// www.unesco/ oc. unesco.org/ education/ eta-report/2003pdf/ chapter3.pdf. [Accessed july 10, 2019].

UNICEF, WHO, UNESCO & UNFPA (1993). Second edition published.

Uya, A. O. (2011). Teacher's characteristics and students' attitude towards mathematics in senior secondary of Oron Federal constituency of Akwa-Ibom State. Unpublished M.Ed Dissertation, University of Uyo. Akwa-Ibom State.

Vandecandelaere, M., Speybroeck, S., Vanlaar G. B., De Fraine B, & Van Damme J (2012). Learning environment and students' mathematics attitude. *Stud Educ Eval [Internet].38(3–4):107–20.* Available:http://dx.doi.org/10.1016/j.stueduc.2012.09.001

Walshaw, M. & Anthony, G., (2009). Characteristics of Effective Teaching of Mathematics: A View from the West**.** *Journal of Mathematics Education***, 2(2),** 147- 164.

Wang Z, Lukowski S. L, Hart S. A, Lyons I. M, Thompson L. A, & Kovas Y, et al (2015). Is Math Anxiety Always Bad for Math Learning? The Role of Math Motivation. *Psychol Sci[Internet]. 26(12):186376*. Available: http://pss.sagepub.com/cgi/content/abstract/26/12/1863

Wasike, A., Michael, N. & Joseph, K. K. (2013). The Impact of Perception on Performance in Mathematics of Female Students in Secondary Schools in Teso District, Kenya. *Journal of Education and Practice.* 2222-1735

Watt, H. M. G. (2004). Development of adolescents' self-perceptions, values, and task perceptions according to gender and domain in 7th through 11th grade Australian students. *Child Development*, 75, 1556–1574.

Waugh M, & Su-Searle J (2014). Student persistence and attrition in an online M.S. program: Implications for program design. *Int J e-Learning. 13(1):101–21.*

Winheller S, Hattie J. A, & Brown G. T. L (2013). Factors influencing early adolescents' mathematics achievement: High-quality teaching rather than relationships. *Learn Environ Res. 16(1):49–69.*

Woodwand, T. (2004). The effect of math anxiety on post-secondary developments as related to achievement. *Gender and age*.

Yang, M. J. (2009). *Problem solving in chemistry at secondary school: Science education*. Glasgow: University of Glasgow.

Yara, P. O., (2009). *Student's Attitudes towards Mathematics and Academic Achievement in Some Selected Secondary Schools in South Western Nigeria*. Retrieved on http://www.eurojournal.com ISSN 1450-216X Vol. 36 No.3 336-393 [Accessed 11 December 2019].

Yunus, A. S., & Ali, W. Z. (2009). Motivation in the Learning of Mathematics. *European Journal of Social Sciences, 7*(4), 93-101. Retrieved from https://core.ac.uk/download/pdf/42993965.pdf

Yusuf M. A & Adigun J. T (2010). The influence of school sex, location and type on students' academic performance. *International Journal of Educational Sciences*, 2(2):81-85. Available at http://krepublishers.com

Zan, R. & Di Martino, P. (2007). Attitude toward Mathematics: Overcoming the Positive/Negative Dichotomy, *The Montana Mathematics Enthusiast.* Pisa, Italy.
Monograph 3, pp. 157-168.

Zan, R. & Di Martino, P., (2010). 'Me and maths': Toward a Definition of Attitude Grounded on Students' Narratives. *Journal of Mathematics Teacher Education*,
Vol.13, No.1, Pp. 27-48.

Zimmerman, B. J., & Kitsantas, A. (1999). Acquiring writing revision skill: Shifting from process to outcome self-regulatory goals. *Journal of Educational Psychology, 91, 1–10.*

APPENDICES

Appendix A: Questionnaire for perception and interest.

QUESTIONNAIRE FOR PERCEPTION AND INTEREST

Students' perception and interest attached to the learning of mathematics:

Name of school……..……..…

Form:…… Age…….. sex:……

Directions: This inventory consists of statements on the following two categories: Students perception about mathematics and their interest attached to the learning of mathematics. These two categories can reflect on your attitudes towards learning mathematics. There are **no correct or incorrect responses**. Read each statement carefully. Please think about how you feel about each statement. Tick the column that corresponds closely to how each statement best describes your feelings.

Please answer every question.

PLEASE USE THESE RESPONSE CODES:

SD – Strongly Disagree

D – Disagree

U – Undecided

A – Agree

SA – Strongly Agree

	PERCEPTION	SD	D	U	A	SA
1	Negative perception of students from basic schools affects students' interest in Mathematics.					
2	Mathematics is abstract and boring.					
3	Mathematics is not difficult as compared to other subjects.					
4	Mathematics is very complex to my understanding					
5	Mathematics has nothing to improve in my life.					
6	Mathematics is full of rules and procedures.					
7	Mathematics is meant for students who are talented and higher achievers.					
8	There are so many formulas in Mathematics therefore students cannot do well in Mathematics.					
9	Students' misconception about Mathematics affects their interest in Mathematics.					
10	Students feel they are not involved in the teaching and learning process.					
	INTEREST	**SD**	**D**	**U**	**A**	**SA**
11	Mathematics is a very interesting subject.					
12	Mathematics makes students feel uncomfortable.					
13	Students like Mathematics because they don't have to memorize it, it could all be figured out.					
14	Students enjoy studying Mathematics in S.H.S than any other subjects.					
15	Students dislike Mathematics due to its complex nature.					
16	Students will like to avoid Mathematics if an option is given.					
17	When students hear the word "Mathematics", they have the feeling of dislike.					
18	Teachers do not involve students in the teaching and learning of Mathematics.					
19	Students lose interest in Mathematics due to the negative misconception held by students.					
20	Students like solving new problems in Mathematics on their own.					

Appendix B: Students Achievement Test

STUDENTS ACHIEVEMENT TEST. *TIME: 1hr: 15min* **Age**……

Name of school …… **Sex…..…** **Form……**

1. Determine the least value of y such that 7 + y = 3 (mod 8)

   a. 4 b. 3 c. 6 d. 5

2. Solve the equation $4x - x^2 - 3 = 1 - x$

   a. 0 and 1 b. 1 and 4 c. -3 and 4 d. 1 and 3

3. $\overrightarrow{OA} = \begin{pmatrix} 3 \\ 5 \end{pmatrix}$ and $\overrightarrow{AB} = \begin{pmatrix} 1 \\ 4 \end{pmatrix}$. If O is the origin, find $\overrightarrow{OB}$

   a. $\begin{pmatrix} 4 \\ 9 \end{pmatrix}$ b. $\begin{pmatrix} -2 \\ -1 \end{pmatrix}$ c. $\begin{pmatrix} 2 \\ 1 \end{pmatrix}$ d. $\begin{pmatrix} -4 \\ -9 \end{pmatrix}$

4. A student spends ⅓ of her loan on books, ¼ on entertainment and $^{11}/_{36}$ on provisions. What fraction of her loan is left?

   a. $^{7}/_{18}$ b. $^{11}/_{18}$ c. $^{1}/_{9}$ d. $^{5}/_{36}$

5. Find x if $\log_9 27 = x$.

   a. ⅔ b. 1 c. $^{3}/_{2}$ d. 3

6. A box contains 40 pencils of equal size, 10 of them are green and 18 red. If a pencil is chosen at random from the box, what is the probability that is neither green nor red?

   a. ¼ b. $^{3}/_{10}$ c. $^{9}/_{20}$ d. $^{7}/_{10}$

7. A quantity z varies directly as the square root of x and inversely as the cube of y, if z = 8 when x=4 and y= ½, find the relation for **z** in terms of **x** and **y**.

a. $\frac{2\sqrt{x}}{y^3}$ b. $\frac{\sqrt{x}}{2y^3}$ c. $\frac{2y^3}{\sqrt{x}}$ d. $\frac{8\sqrt{x}}{y^3}$

8. Make m the subject of the relation $\frac{km^2l}{g^2} = h$

a. $\sqrt{\frac{kl}{g^2h}}$ b. $\sqrt{\frac{g^2h}{kl}}$ c. $\frac{gh}{kl}$ d. klh

9. Find the gradient of the line joining the points p(-2,6) and Q(3,-2)

a. $\frac{8}{5}$ b. $\frac{1}{4}$ c. $\frac{-5}{8}$ d. $\frac{-8}{5}$

10. The bearing of a point Q from another 5point p is 110^0. Find the bearing of p from Q.

a. 010^0 b. 070^0 c. 290^0 d. 250^0

11. The mean of the number 3, 5, $3x$ and 2 is 4. Find x

a. 2 b. 3 c. 4 d. 6

12. If $\log_{10} 3$ = a and $\log_{10} 7$ = b, find the value of $\log_{10} 63$

a. 2ab b. a+2b c. 2a+b d. 2(a+b)

13. Express log 3 + 3 log 2 – 3 log 4 as a single logarithmic

a. log $\frac{3}{2}$ b. log $\frac{3}{16}$ c. log $\frac{3}{8}$ d. log $\frac{8}{3}$

14. Evaluate $ut + \frac{1}{2}at^2$ given that $u = 2, t = 3 \; and \; a = -9.8$.

a. -38.1 b. -82.2 c. 50.1 d. 94.2

15. Express the vector $\begin{pmatrix} 3 \\ -4 \end{pmatrix}$ in the form of (r, θ), where r is in km and θ is in degrees.

a. (5km, 143^0) b. (5km, 53^0) c. (5km, 127^0) d. (5km, 233^0)

16. The simple interest on Gh₵360,000.00 for 2 years is Gh₵90,000.00. find the rate

Percent per annum.

a. 12.5% b. 2% c. 25% d. 50%

17. If x is an acute angle such that $\cos x = \frac{5}{13}$. Find $\sin x$.

a. $^{12}/_{13}$ b. $^{8}/_{13}$ c. $^{5}/_{8}$ d. $^{5}/_{12}$

18. The interior angle of a regular polygon is 108^0. How many sides has the polygon.

a. 5 b. 6 c. 7 d. 8

20. If $5^n = k$, find 5^{n+1}.

a. $\frac{k}{5}$ b. $\frac{5}{k}$ c. $\frac{2}{5}k$ d. $5k$

21. If $9^{2x} = \frac{1}{3}(27^x)$, find the value of x.

a. 2 b. 4 c. -1 d. ½

22. A rectangular plot of land of width 5km requires a wire mesh of length 36km to fence it. What is the length of the plot?

a. 7.0km b. 10.0km c. 13.0km d. 25.0km

23. Find the values of x for which $\frac{1}{4}x - \frac{1}{3}(x-1) \leq \frac{7}{12}$

a. x≤-3 b. x≥-3 c. x≤3 d. x≥3

24. The area of a square field is $9y^2$. What is the perimeter of the field?

a. 8y b. 10y c. 12y d. 13y

25. Arrange the following numbers in ascending order of magnitude: 21_{eight}, 25_{seven}, 30_{six} .

a. 21_{eight} , 25_{seven}, 30_{six} b. 21_{eight}, 30_{six}, 25_{seven},

c. 30_{six} , 25_{seven}, 21_{eight}, d. 30_{six} ,21_{eight}, 25_{seven},

26. Solve the following equation simultaneously

$\frac{x}{4} + \frac{y}{3} = 2$, $\frac{x}{2} + y = 5$

a. x = 4, y = 3 b. x = -3, y = 3 c. x = 4, y = -3 d. cannot be solved

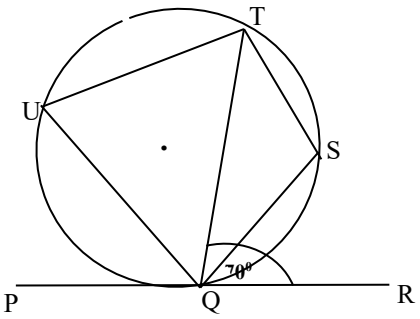
27. A chord of a circle is 10cm long. If the chord is 5cm away from the centre of the circle. Find the radius of the circle.

a. $5\sqrt{6}cm$ b. $5\sqrt{3}cm$ c. $5\sqrt{2}cm$ d. 5cm

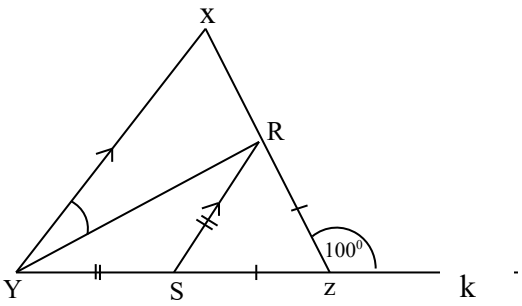
28. The roots of a quadratic equation are -1 and $\frac{-3}{2}$. Find the equation

a. $2x^2 + 5x - 3 = 0$ b. $2x^2 - 5x + 3 = 0$

c. $2x^2 - 5x - 3 = 0$ d. $2x^2 + 5x + 3 = 0$



29. In the diagram above, <PQR is a tangent at Q and <TQR = 70^0. Find <QST.
    a. 140^0 b. 110^0
    c. 70^0 d. 40^0



30. In the diagram above, XY//RS, |SY| = |SR|, |ZS| = |ZR| and <RZK = 100^0. Calculate <XYR.
    a. 20^0 b. 22^0
    c. 25^0 d. 50^0

Thanks for your time!!!

Appendix C:

The table below shows the summary of the performance of student in Bole S.H.S.

Table 1.1

2018 WASSCE PASS RATE OF BOLE S.H.S			
Subject	**No. of Candidates**	**No. Passed (A1 - C6)**	**% Passed (A1 - C6)**
	586	19	**3.2%**
	PASS RATE FOR GIRLS		
Core Mathematics	273	2	**0.7%**
	PASS RATE FOR BOYS		
	313	17	**5.4%**
	2016-2018 WASSCE PASS RATE (A1 – E8)		
SUBJECT	**2016**	**2017**	**2018**
Core Mathematics	549 25.5%	624 42.3%	586 15.7%

Source: Bole District Education office.