UNIVERSITY OF EDUCATION, WINNEBA

ASSESSING FACTORS THAT INFLUENCE STUDENTS' INTEREST IN MATHEMATICS IN SENIOR HIGH SCHOOLS IN ASHANTI REGION, GHANA

YARHANDS DISSOU ARTHUR

2018

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9150110006

A THESIS IN THE DEPARTMENT OF MATHEMATICS EDUCATION, FACULTY OF SCIENCE EDUCATION, SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES, UNIVERSITY OF EDUCATION, WINNEBA IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR AWARD OF THE DOCTOR OF PHILOSOPHY (MATHEMATICS EDUCATION) DEGREE

NOVEMBER, 2018

DECLARATION

STUDENT'S DECLARATION

I, YARHANDS DISSOU ARTHUR**,** declare that this thesis, with the exception of quotations and references contained in the 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. 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.

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ACKNOWLEDGEMENT

I acknowledge how great is the faithfulness of my Lord and Savior JESUS CHRIST who has guided me through this journey of academic success. It is my greatest pleasure to acknowledge the assistance and support of some personalities for their numerous help in diverse ways in making me what I am today.

My appreciation and gratitude go to my supervisors Prof. Samuel Kwesi Asiedu-Addo and Dr. Charles Assuah for their immense contributions, corrections and suggestions, which made this, work a success. I thank my lovely wife Perpetual Adwoa Antobam for her support and care for my life. I acknowledge the support of Dr. Alexander Senkyire Kwarteng, Dr. Simon Kojo Appiah and Mr. Francis Donkor for their editorial assistance, support and suggestions. Thank you Prof. Samuel Kwasi Asiedu-Addo and Eunice Ama Asiedu-Banning for assisting me purchase the smart PLS software used for the data analysis. Thank you Mr. Solomon Naabaseru Yuonakuu and Mr. Samuel Terkper for helping in data entry Mendeley installation, respectively. I wish to acknowledge the support of all participating schools, students and teachers.

DEDICATION

This work is dedicated to Mr. and Mrs. Odei-Asiedu, my children Samuel-Odei Asiedu Arthur and Ethel Adom Eduaba Arthur.

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ABSTRACT

The students' performance in Mathematics has been of great concern among parents, educators and general society. Students' performance in Mathematics may be affected by students' interest towards Mathematics. The study modeled the Ghanaian Senior High School students' interest in Mathematics by using quantitative research approach. The study used stratified simple random sampling technique to select ten schools and 1263 respondents in the Ashanti region. The structured questionnaire used for data collection was self-designed to suit the study objectives. The study presented three structure equation models: students-oriented model, teacher-oriented model and combined student and teacher factors-oriented model. The student-oriented model predicted 28.9% of students' interest in Mathematics, the teacher-oriented model predicted 71.8% of students' interest in Mathematics and the combined model predicted 71.1%. A logistics regression model predicted 45% of students' interest while multiple linear regression model predicted 65% of the total variability in students' interest in Mathematics. The study revealed that students' interest in Mathematics is independent on the type of basic school attended, age, class level of student as well as parental motivation, however, the study found that students' interest depend on gender, compulsion in studying Mathematics, future career influenced by Mathematics, parents interest, parents level of education, the programme of study and the agents of students' motivation. The study concluded that teacher-oriented factors are dominant factors needed for predicting students' interest in Mathematics. The study concluded further that teachers' ability to connect Mathematics to real life problems remain the most important predictor of students' interest in Mathematics. A recommendation of this study is for policy makers to consider early inclusion of guidance and counseling courses into the senior high school curricula to educate students on the importance of courses in their career.

CHAPTER ONE

INTRODUCTION

1.0 Overview

This introductory chapter describes the background of the study, statement of the problem, purpose of the study, objectives of the study, research questions, research hypotheses, and significance of the study, delimitation of the study, limitations and a chapter summary.

1.1 Background

The bedrock for countries to industrialize is technology. However, technology derives its strength from the study of mathematics and science. The realization of this fact should encourage developing countries to invest in science, mathematics and their related subjects. Mathematics remains the backbone of all sciences because it pervades almost every field of human endeavor (Githua & Mwangi, 2003; Schoenfeld, 1992). Without any fear of doubt, mathematics plays a fundamental role in the economic development of both developed and developing countries. In many countries, research has taken a centre stage from mathematical modelling to mathematics education curriculum. The inception of modelling in mathematics curricula at the various stages of education has helped build mathematics interest at the various stages. This gives an indication that there are manifold benefits of integrating mathematics application and modelling in Senior Secondary Schools mathematics (Harwell et al., 2007; Mousoulides et al., 2006). The integration of modelling into the mathematics curricula aids students' motivation as well as creating the necessary platform for the application of mathematical theories. Further to these applications is the support it gives to students to learn new mathematical content, which suggests that Mathematics could be fruitfully applied in solving real-life problems (Hansson, 2012; Keong, Horani, & Daniel, 2005).

Besides the above-mentioned advantages, such applications have the needed potentialities in focusing on the significance of mathematics as a discipline. More so, including mathematical modelling as part of the content taught in early stages, the mathematics curricular may add to the sustainability of students' interest in mathematics as a subject (Blomhøj, 2008; Senn, 2000). Mathematics education and its related applications have brought about a number of mathematics educational perspectives, which are useful in the teaching and learning of mathematical modeling known to improve students' interest (Kaiser & Sriraman, 2006). The historical development of different research perspectives has been emphasized further to identify certain perspectives known to describe the current trend of research in the field. Integrating modeling into the learning and teaching process of mathematics could improve students' interest (Blomhøj, 2008). The interest could be achieved by bridging the gap between students' real-life experiences and learning of mathematics. There are many factors that influence students' interest and performance in mathematics and for many countries the search for these factors still continues.

1.2 Statement of the problem

The search for solution to poor performance in mathematics among high school students has not been exhausted, especially, in Ghana and Africa at large (Bong, 2004; Gray, 2014; Marchis, 2011) . Research remains a very key important element in our quest to finding a lasting solution to this problem. Research on students' interest in mathematics is very important in tackling the problem of poor performance in mathematics. When students become interested in mathematics they are more likely to invest effort and time into learning of mathematics (Tapola, Veermans, & Niemivirta, 2013; Thoman, Smith, Brown, Chase, & Lee, 2013). The interest shown by students in mathematics will further energize them to work for performance. It is therefore stated that the performance is a function of interest and performance is a bye product of interest. Research on students' interest in mathematics is one of the foremost constructs that requires immediate attention in our quest to find solutions to problem of poor mathematics performance in school (Chen, Ennis, & Ennis, 2004; Andreas Krapp, 2005). There are many factors that can be attributed to why students do not show interest in mathematics and even those who show interest in mathematics do not perform as expected of them. Seeking first students' interest in mathematics will provide the needed solution for students' performance in mathematics. The problem of identifying teacher-student factors that contribute to students' interest in mathematics and how these factors interrelate to improve students' interest in mathematics has not been exhausted in research, hence the need to fill the gap by modelling statistically students' interest in mathematics using both student and teacher-oriented factors. There is the need for concerted efforts to devise strategies to improve on the existing state of interest in mathematics education in the Ghanaian secondary schools since the poor performance in mathematics is increasingly becoming of much concern in recent times.

The central problem is the lack of coordinated factors in the area of students' interest in mathematics in the sub-Saharan Africa, and especially in Ghana. It may be misleading to assume that results on factors that affect and influence students' interest in mathematics in the developed world are applicable to developing and emerging economies such as Ghana. For this reason, it is of great essence to develop a model that includes both global and localized factors that influence students' interest in mathematics. It is in the interest of this study to develop a model that builds on the existing theory in the field to measure and explain some important, intangible constructs that determine students' interest in mathematics in senior high schools in Ghana. The study will explore factors that could be associated with high school students' lack of interest in Mathematics with the intention to give a voice to educators, students and the policy makers.

1.3 Purpose of the study

The purpose is to provide an empirical model to predict students' interest in mathematics based on student oriented factors, teacher oriented factors and student-teacher oriented factors.

1.4 Specific Objectives

The study derived the following specific objectives based on the problem and the purpose of the study.

i. To determine student-oriented factors that influence students' interest in mathematics.

ii. To determine teacher-oriented factors that influence students' interest in mathematics.

iii. To predict students' interest in mathematics using student-teacher oriented factors.

iv. To determine the effect of career interest on students' interest in Mathematics.

1.5 Research Questions

The study derived the following research questions based on the problem and the purpose of the study

i. Which students-oriented factors have influence on students' interest in mathematics?

ii. Which teacher-oriented factors have influence on students' interest in mathematics?

iii. Which student-teacher oriented factors significantly predict students' interest in mathematics?

iv. To what extent does career interest influence students' interest in Mathematics?

1.6 Research Hypotheses

The research hypotheses of the study are stated as follows

H_{o1}: Student oriented factors do not significantly influence students' interest in mathematics.

H_{o2}: Teacher oriented factors do not significantly affect students' interest in mathematics.

H_{o3}: Student-teacher oriented factors do not significantly predict students' interest in mathematics.

H_{o4}: Students' interest in mathematics does not depend on students' future career interest.

1.7 Significance of the Study

On the basis of the context explained in the previous section, this study aims to model the Ghanaian students' interest in mathematics.

1.7.1 Significance to school administration

This study would enable educational administrators explore and explain the concept of students' interest by identifying students and teacher-oriented constructs that contribute to their interest in mathematics. The models built will help in the explanation of low standard of mathematics performance and interest in mathematics in Ghanaian senior high schools. When this is done, it will be the first major research that seeks to explore and explain what contribute to the low student interest in mathematics. Hence, adding to the theory of interest and expanding the body of knowledge in the study of mathematics.

1.7.1.2 Significance to Teachers

The study will enable teachers to empirically identify key students and teacher oriented factors that contribute significantly to students' interest in mathematics. The study will also enable teachers to understand students better on how to improve on their interest in mathematics.

1.7.1.3 Significance to Students

The findings from this study will help students to better understand the dynamics of students oriented factors and their contribution to students' interest in mathematics.

7.1.4 Significance to Stakeholders

The benefit of this research to the policy makers will be enormous since a wide range of information would be available to stakeholder to better understand the factors that contributes to students' interest in mathematics. Furthermore, this study would contribute to the mathematics education research in Ghana in general as there is no major study on this area in Ghana. The study can finally be replicated in the other developing countries that have not yet identified factors that contribute to building students' interest in their countries.

1.8 Organization of the Study

This study consists of six chapters. Chapter one contains the general introduction, which includes a as the background of the study, statement of problem, purpose of the study, specific objectives, research questions, research hypotheses, significance of the study, limitations and delimitations. Chapter two discusses review of relevant literature related to students' interest. Chapter three focuses on the research methodology. This includes the research design, population, sample and sampling techniques, instrument etc. Chapter four present the data analysis and results. The Chapters five discuss the finding. Chapter six presents the conclusion and recommendations derived from the research.

1.9 Limitations of the study

In this study, although the research was carefully designed, there are limitations and shortcomings that should be noted.

First, the study was conducted in ten senior high schools in Ashanti region which lasted for ten weeks. Ten weeks in not enough time to observe all students in the selected schools. It would have been better if the study expanded to cover more senior high schools selected from different regions to ensure regional balance and inclusiveness.

Second, the sample was small compared to the students' population in Ghana since the sample was restricted to selected secondary schools in the Ashanti region. Hence the result of the study may not be generalizable to all senior secondary schools in other regions in Ghana or other types of schools.

Third, the study assessed responses only from students without considering teachers' point of view which could have been provided additional information,

Fourth, the study used purely quantitative approach to research. Mixed methods approach could have been used to explore the qualitative perspective of the study.

1.10 Delimitations.

The survey on students' interest in mathematics for the entire country Ghana is not possible for a Ph.D. student because it require large amount of money and a long period of time. Hence the choice of Ashanti region of Ghana was made for this study as opposed to studying the entire students' population in Ghana. The choice of the problem of student interest in mathematics as a subject under investigation was a delimitation because there were other related problems that could have been studied but were rejected. The researcher used purely closed ended questionnaire and quantitative research techniques which placed a boundary on the scope of statistical analysis.

CHAPTER TWO

LITERATURE REVIEW

2.0 Overview

The chapter discusses literature pertinent to the study. Thematic areas covered include: Operationalization of conceptual framework, operational definition of construct, integration of theories, students' interest, students' motivation, student's interest and perception, effect of school leadership on students interest, mathematics. teachers' impact on interest, classroom applications of intrinsic and extrinsic motivation, behavioural views of students motivation, humanistic views of student motivation, cognitive views of students motivation, expectancy theory, students' Attitude towards Mathematics, Gender Interest, Attitude and Perception towards Mathematics, Parental Involvement and Student Interest in Mathematics ,School Improvement Leadership, Teachers' Impact on Students' Learning ,Students' Perception and Interest, Goal-Setting Theory, General Educational Implications of Cognitive Theories, Achievement Goal Orientation, Affective Factors in Motivation, Student Interest, Importance of Interest and how it is Develop and

2.1 Conceptual Framework

In contribution to the previous research in the field, the conceptual framework presents the major constructs that determine students' interest in mathematics. There are three major models and they are (i) the teacher-oriented model; (ii) student-oriented model; and (iii) full model, made up of the combination of significant factors from both teacher and students-oriented structural equation model (SEM). The teacher-oriented model can be summed up briefly as: School leadership (SL) has effect on the student interest, pedagogy affect student interest; school leadership influences the teaching aids and facility for facilitation for mathematics, teaching aids and facilities affects student interest and the teaching aids and methods influence pedagogy.

The student-oriented model can be summed up briefly as: School leadership (SL) has effect on students' motivation; students' perception as well as students' interest, students' motivation and students' perception also influence students' interest. Students' perceptions also affect students' motivation. The students' socio-cultural background is conceptualized to influence his/her interest in mathematics. These conceptual frameworks in the Fig 1 and Fig 2 were self-designed models by the research based on the problem under consideration, objectives set out to be achieved, the research questions and hypotheses stated in the current study. These models were arrived at based on literature reviewed and further integrated to form a composite. The full model was not part of the conceptual framework because it is a derived model which can only be obtained when empirical students'-oriented model and teacher-oriented are built.

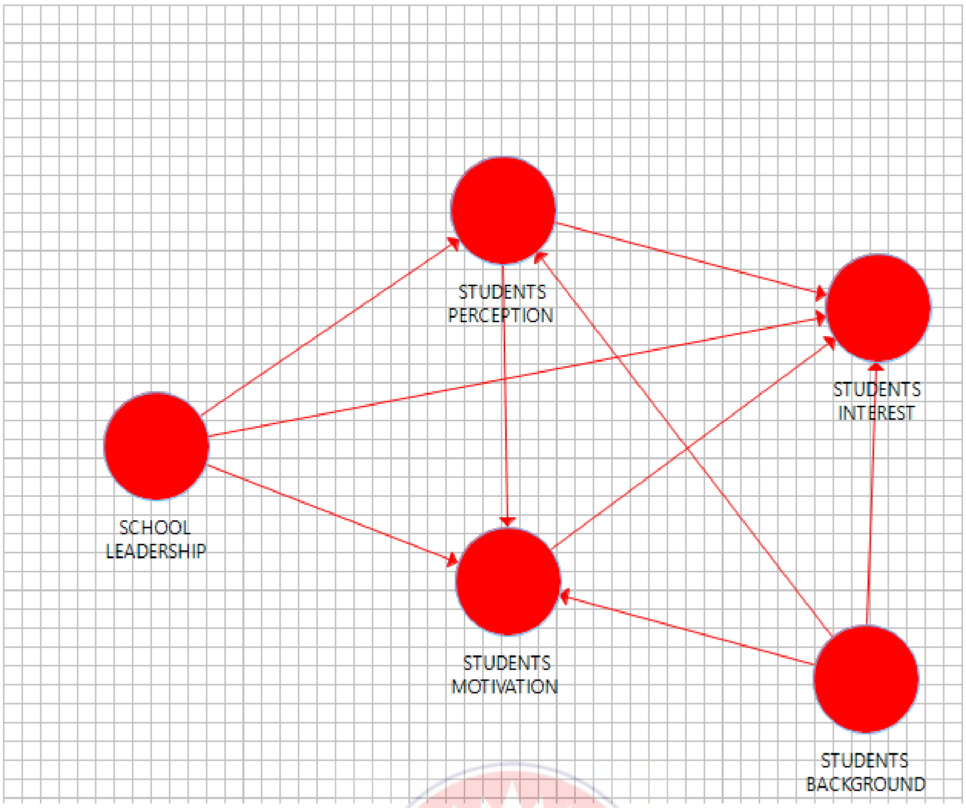

Figure 1 Student-Oriented Conceptual Mathematics interest Model (SOCMIM)

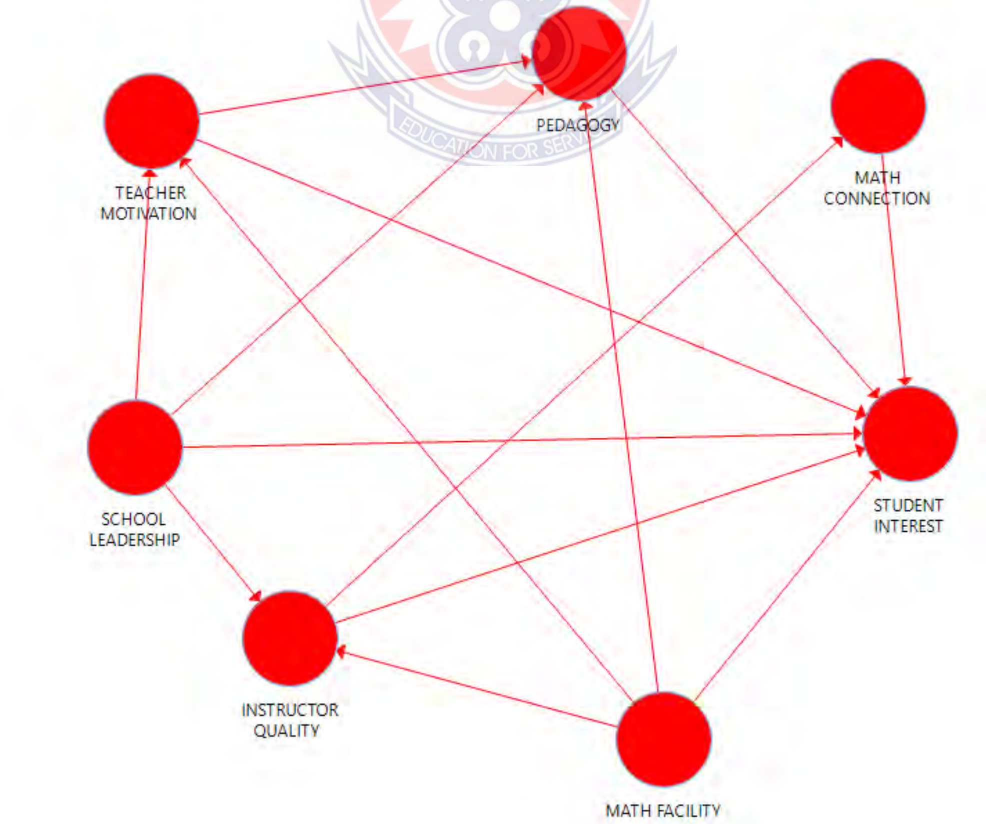

Figure 2: Teacher-Oriented Conceptual Mathematics Interest Model (TOCMIM)

2.1.1 Theoretical Implication

Researchers in the field of educational psychology have renewed their interest in the construct interest(Renninger, 2007; Renninger & Hidi, 2011). The role of interest generally permeates all subject area and mathematics education is no exception. Investigating into how learning and achievement are influenced by motivational and cognitive factors which are connected with individual and situational interests(Ainley, Hidi, & Berndorff, 2002; Chen & Darst, 2001). The interest theory has been advocated for as the most important motivational factors in learning and development.

The basic conceptualization of in interest theory is that, interest emerges from individual interaction with his or her environment(Prenzel, 1992; Ulrich Schiefele, Krapp, & Winteler, 1992). This represents a specific relationship between the developing person and some topic or content of his life space which is referred to as person –object relationship(Krapp, 2002; Krapp & Prenzel, 2011). In this perspective, the mathematics teacher is viewed as the person and mathematics a subject viewed as the object. The theory of interest further posits that, interest is characterized by affective as well as cognitive components(Krapp, 2002; Shen & Chen, 2006). This further extends that, interest based actions are mainly associated with positive emotional experiences, the notion of the personal relevance and individuals readiness to engage the object(Ainley & Ainley, 2011; Dewey, 1913).

Authors in the interest theory have it that interest is not simply a construct linking the affective and cognitive domain, however, it become part of a synthesis of these domains. In this regard this study seek to contribute to knowledge in interest theory by extending the theory of interest by (Schiefele et al., 1992).In this theory, three conceptualizations were identified to play important role in contemporary discussions on motivation and interest. This includes:1) interest as a dispositional characteristics of the person, (2) interest as a characteristics of the environment(interestingness) and (3) interest as a psychological state (Krapp, 1999; Krapp, Hidi, & Renninger, 1992). The theory relates these conceptualizations as connected with the psychological state connected to both characteristics of the person and characteristics of the learning context (Renninger, Hidi, & Krapp, 2014a; Schiefele & Krapp, 1996a). The current study posits that the psychological state within the person, in this case the interest is influenced by situational and environmental factors reasonable. The characteristics of the person and the characteristics of the learning context influence the interest of the person to engage a specific object (Krapp & Prenzel, 2011; Renninger & Hidi, 2011). The constructs extended by this study include student teacher motivation, students' background, student perception, mathematics facility, pedagogy, mathematics connection, instructor quality and school leadership. In relating these construct to the person-object-theory of interest which postulated that the individual as a potential source of action and the environment as the object of action constitute a bipolar unit. Therefore, the interest construct is conceptualized relational concept. Between a person and object, interests describe a specific relation between the person and the object of his or her life space. The assumptions exist that individual experiences and cognitively represents his or her environment in a meaningful structure. The cognitively represented environment consists of units that are separated from one another to a greater or lesser extent. The theory refers to the units as objects. The object in this context refers to concrete things, a topic, a subject-matter like mathematics, an abstract idea or any other content of the cognitively represented life-space (Krapp, 1999;

Renninger et al., 2014a; Schiefele, 1990).This theory require further expansion into construct that describe the factors that influence the individualized interest, the interestingness to give rise to the actualized individual and situational interest.

2.1.1 Operationalization of conceptual framework

The conceptual frameworks consist of student oriented variables and teacher oriented variables. The students oriented variables includes students motivation, students perception and students background. The teacher oriented variables include instructor quality, mathematics facility, teacher motivation, Pedagogy, school leadership, student interest and mathematic connections.

2.1.2 Operational definition of construct

i. Students' motivation refers to the internal and external factors that stimulate students desire to obtain continuous interest and commitments in mathematics.

ii. Students' perception refers to negative views students hold on students hold about teaching and learning of mathematics

iii. Students' background refers to the educational and environmental factors that affect students in teaching and learning of mathematic.

iv. Instructor quality refers to the factor that influences quality of instruction to help students develop interest in mathematics.

v. Mathematics facility refers to the provision of the needed teaching and learning materials for study of mathematics.

vi. Teacher motivation refers to the internal and external factors mostly influenced by school leadership to stimulate teachers desire to obtain continuous interest in teaching mathematics.

vii. Pedagogy refers to method and approach adopted by mathematics teachers in teaching and learning of mathematics.

viii. School leadership refers to individuals in educational institutions who have the responsibility to provide the needed teaching and learning materials in mathematic.

ix. Mathematic connections refer to the mathematics teachers' ability to relate mathematics to real life problems in the various subject areas and the immediate environment.

2.2 Integration of Theories

To understand the students' Mathematics interest development, the interest theory has to be integrated with three motivational development theories, namely, self-determination theory, achievement goal-theory and expectancy theory. The achievement theorist holds the view that the very moment a student enters a school, register for a course or found in a classroom setting, they mostly adopt a goal and they are expected to achieve these goals either to a good grade, to impress their friend or family, make new friends or perhaps learn something new. In order to achieve these goals, several research (Ames, 1984; Dweck, 1986; Elliot, 2005) have it that they either will have any of these competence, be it mastery, performance or both. The mastery goal deals mostly with developing and improving ones' skills or knowledge but performance focuses on doing better than others in a given situation. In this study since the factors of students' interest development is our focus, it will be limited to the mastery and skill development. This may possibly encourage individuals to explore the various aspects of the task, develop positive affect and skill (Hidi & Renninger, 2006). The study integrated the expectancy-value theory (Harackiewicz, Durik, & Barron, 2005) because as students engage in activity with the feeling that they will be successful in that activity and also have the perception that the activity is important to them. Over the years, there has been a number of authors on expectancy-value theory (Eccles & Wigfield, 2002; Harackiewicz et al., 2005; Wigfield & Eccles, 1992). As a result of relevance, this study will focus on the work of (Eccles et al., 1983) in the sense that their model of expectancy-value breaks down task engagement as having an intrinsic value (fun and enjoyable) or useful and relevant to their future career or task. In this study, emphasis will be laid on both in that they are related to some extent (Hulleman, Durik, Schweigert, & Harackiewicz, 2008). The achievement goal setting theory integration also explains why the need for goal setting and how the goal setting influences performance. The goals set by the individual are likely to motivate the individual to execute the task and such goals should be Specific, Measurable, Attainable, Realistic and Time-Bound (SMART). The integration of self-determination theory, achievement goal theory, expectancy theory and interest theory has proven that if an individual sets a goal and further adopt strategies to achieve them, then with self-determination, interest will be developed in that activity. This further forces the type of goal and interest individuals have before taking a challenge which will determine the type of task value they perceive when pursuing the task.

2.3 Students' Interest

The concept of interest and motivation are tools for students' successful learning outcomes. The construct interest, known in Latin as 'inter-esse' meaning participating or being into something was not given the needed attention in the field of educational and pedagogical-psychological sciences for many years. In the 1950s, academics at the time came to the realization that it was important to give the construct interest the attention it deserved if one wanted to realize the full potential of students for successful and efficient learning (Deci & Ryan, 1975; Mitchell, 1993; Pantziara & Philippou, 2014). After realizing the importance of the construct interest, educational researchers have tried to understand the dynamics of interest and how it works and further steps to promote it. Many educational psychologists and scientists who have contributed to the associated phenomena of interest base on the pedagogical and psychological examination did so to improve students' performance and achievement (Lopez, Lent, Brown, & Gore, 1997; Tapola et al., 2013). Studies by (Jansen, Lüdtke, & Schroeders, 2016; Schiefele & Krapp, 1996b), clearly established that students' motivation is highly dependent on or widely driven by students' interest. This remains the basis for many educational researchers to channel their efforts into research aiming at making known the mysteries surrounding different parts of learning motivations (Renninger, Hidi, & Krapp, 2014b).

Students' interest in mathematics has received little attention although students' performance in mathematics continues to fall every year. The major factor that contributes to students' performance is students' interest in mathematics(Ainley & Ainley, 2011; Eisenberger, Pierce, & Cameron, 1999; Harackiewicz et al., 2005). It is therefore of great concern to school administrators and other stakeholders to curb the falling standard of mathematics performance among high school students. Studies into the construct, interest, although has received little attention it has contributed to the building and extending the literature in mathematics education. There are factors such as gender, students' background, motivation, facility availability and instructor quality that contribute to students' interest in mathematics. Most people have the view that mathematics is a male dominated domain with a few females showing interest in the subject. The effect of students' gender on students' mathematics interest has been found to be significant.(Arthur, Aseidu-Addo, & Annan, 2015; Arthur, Oduro, & Boadi, 2014; Chen & Darst, 2001).There are other studies that suggest that students interest in mathematics is dependent on the age of the student (Köller, Olaf, Jürgen Baumert, 2001; Köller, Baumert, & Schnabel, 2001a). Studies suggest that students' interest in mathematics is not affected by the type of basic school attended (Arthur et al., 2015).In addition to these factors, students interest in mathematics is influenced by mathematics teachers, some of them making mathematics distasteful for students. Mathematics educators' role in making teaching and learning of mathematics interesting and enjoyable requires continuous improvement (Arthur et al., 2015; Ball, 1988; Pepin, 2011).

2.3 Students' Motivation

The internal and external factors that stimulate desires and energy to find continuous interest and commitments in objects to attain the needed goal in learning is called motivation. Motivation has been known to be the process that initiate and maintain any goal oriented behavior. Motivation has been explained as the internal power that gives a push when taking action and its achievement (Daskalovska, Gudeva, & Ivanovska, 2012; Wang et al., 2015). This internal power is powered by desire and ambition so their absences imply absence. Other studies has further inform us on the fact that motivation is a force that compels individual to take and action and drives hard work for success(Suzanne Hidi & Harackiewicz, 2000; Wigfield, Eccles, Schiefele, Roeser, & Davis-Kean, 2006). The success of motivation is the ability to influence individual's behavior and ability to achieve a goal. Motivation is the result of individuals interaction with factors such as desire or need intensity, incentive or reward value of goals, as well as expectations of the individual both the consciously and unconsciously(Elliot & Harackiewicz, 1994).There are studies that suggest that motivation accounts for the way individuals behave and the way they act (Eccles & Roeser, 2009; Eisenberger et al., 1999; Middleton & Spanias, 1999). They behave the way they do because there is incentive and direction to encourage and persist to follow the attainment of the set goals (Deci, Ryan, & Koestner, 1999; Suzanne Hidi, 2000).

The construct motivation is most important key to success (Franken, 1998) and whatever is needed by an individual to achieve his or her goal. Motivation is strong for every individual with clear perception about what needs to be achieved and further awakens the internal strength and power to push towards goal attainment. It presupposes that the presence of motivation will produce needed results and the lack of it will either produce no or mediocre results. In strictly translation to the educational sciences, a student who lacks motivation hardly studies, compare to a student with higher motivation who devote apparently all his/her time to studies. Students' motivation accounts for students desire to participate or not to participate in any academic activities with different motivation (Decker, Calo, & Weer, 2012; Patterson, Decker, Eckert, & Klaus, 2003). The differences may be due to the meaningfulness, value, and benefits of academic tasks (Fry, Ketteridge, & Marshall, 2009; Parker, Marsh, Ciarrochi, Marshall, & Abduljabbar, 2014), regardless of whether or not the activity is interesting. Further, studies by (Ferguson & Ladd, 1996), contend that motivation to learn is a competence characterized by long term quality involvement in learning and commitment to learning. The competence of motivation is acquired through interaction, socialization, and direction by society, especially parents and teachers. Parental motivation of their children by welcoming their questions, encouraging them to explore and familiarizing themselves with resources that enlighten their world also influence their motivation to learn(Bedford, 2017). The study by (Aunola, Viljaranta, Lehtinen, & Nurmi, 2013c; Mesa, 2012) contributes to the existing knowledge of motivation that students raised from homes that nurture self-confidence, competence, autonomy and self-efficacy will take risk oriented task. Conversely when students do not have the basic competence and ability, they seem not to have the freedom to engage in challenging academic pursuit. This makes the home and the environment the student grows up an important component in student's academic development. According to (Williams & DeSteno, 2008), beliefs formation in children about their school related successes and failures begins as soon as they start schooling. Students to large extent learn when their teachers expect them to do so. In addition to the beliefs, system formed by the students, the schools' goals, policies and procedures also interact with the climate in the classroom to affirm or alter students learning related attitude and beliefs. The work by (Williams & DeSteno, 2008) explains that the more conducive in terms of caring, providing needed support and having sense of belonging where every student is supported, valued and respected participation in learning processes is high. The study by (Bj∅rnebekk, 2008) affirms with empirical evidence and has explained that keeping the learning process flow can be explained with the following guidelines:

- The explanation begins by saying; students are highly motivated to learn if the task before them matched their level of skills. In this case, the task may not be too easy or too boring and not hard to frustrate them. The teachers are those with singular responsibility to fashion learning exercises that suite students' ability to keep their interest. This is what is termed "fine-tune the challenge"
- The teacher should start with question and not answers just as discovering the solution to a puzzle is stimulating. Live question should be given, which may require an explanation but not already solved materials.
- The ability to connect abstract learning to concrete situation by adopting the case-study method that has proven effective for students from various fields by

applying abstract theories and concepts to real life scenario to make sense of situations involving real people and stakes.

- The teacher should make learning social by putting together learning groups or help students find learning partners they can share their learning discovering as well as their points of confusion. The teacher can also divide the learning tasks into parts as well as taking pain to explain what is to be learnt to help them understand and remember it better.
- Going deep into what has been learnt is the beginning point of being an expert. The insight people get into subject makes the subject interesting to them. The journey to expertise has it that, the task of becoming the world's expert begins with assigning learners to small aspect of materials they are to learn and when they have developed interest, then we extend their new expertise outward by exploring how the piece they know so well connects to all the other pieces they need to know about. The study by (Franken, 1998) says, students' motivation is a construct which emanates from individuals learning activities and experience and it is known to vary from one situation or context to another. In view of these, a reform in mathematics literature promotes practices believed to enhance motivation since high motivation is considered as desirable tool to enhance learning. He finally concludes that motivation cannot be measured directly but it can be noticed when its interaction affects cognition and behavior. The cognitive behavioral psychologists accept that motivation is essential for learning and the concepts and theories of students' motivation can be discussed under five main headings, namely:, Extrinsic and intrinsic motivation, behavioral views of motivation, humanistic views of motivation, cognitive theories of motivation, and affective factors in motivation.

2.4 Extrinsic and Intrinsic Motivation

Everyone who participates in an activity does so for a reason. The question of why people do what they do and what drives their behavior has its answer in motivation. Thinking about motivation, psychologists have proposed several ways of thinking about it and one of such way is looking at whether motivation arises from outside (extrinsic) or inside (intrinsic) (Lightbody, Siann, Stocks, & Walsh, 1996; Siann, Lightbody, Stocks, & Walsh, 1996).

2.4.1 Intrinsic Motivation

Many authors in educational psychology have worked on intrinsic motivation. The study by (Bargh, Gollwitzer, & Oettingen, 2010) explains the concept of intrinsic motivation as a drive that stimulates individuals to adhere to changes or perhaps adopt to some behavioral change that will be beneficial to their internal fulfillment and satisfaction. The self-applied nature of the intrinsic motivation is known to have direct connectivity between the individual and situation interest. In the design of all learning programme such as mathematics, intrinsic motivation is very important factor since it reflects the desire to do something. Studies postulate that if students are internally motivated then external motivation may not appear, yet the work will be done (Latham, 2004). Thus, when students are intrinsically motivated, the enjoyment they experience is sufficient for them to perform the activities in future. The study by (Williams & DeSteno, 2008) further explains it to be undertaking of an activity as a hobby without external incentives and personal satisfaction is driven by self-initiated achievement. They further explain in terms of performance, that students with high intrinsic motivation are bound to perform better in classroom activities since they are willing and eager to learn new things. A student who is motivated intrinsically finds learning as a nice experience, which is more meaningful and delve deeper for full understanding.

That is where a student will work on mathematics equations because they are enjoyable and not because there exists a reward such as a prize, a payment or a good grade (Bargh et al., 2010).

Contrarily to these views, (Lightbody et al., 1996; Walsh & Osipow, 2013)explains that intrinsic motivation does not imply a person does not seek for reward. This further explains that external rewards are not enough to keep the person motivated. The renowned theorist, Abraham Maslow, has clarified that there are conditions that need to be satisfied before we can be intrinsically motivated and these conditions include the satisfaction of the basic human needs. By his theory, there exist five basic levels of human needs (Krapp, 2005; Maslow, 1965;Maslow, 1943) The first among these needs are the physiological needs. People are motivated to satisfy a need that ensures physical survival. These needs may include food, water, air, shelter, clothing and sex. As people get satisfied with these needs they are allowed to concentrate on more high level of needs. The second to the physiological survival is the safety needs. With this type of needs once the need of physiology is met, our attention and concentration are brought to safety and security of our lives. These safety and security needs include order, stability, routine, familiarity, control over one's life and environment and health. When the physiological and safety needs are satisfied the third need called, the social need or love and belonging need is ushered. The love and belonging needs include love, affection, belonging and acceptance. These needs usually exist in relationship with others and people are mostly motivated for these needs by the love from families. At the end of the first three needs, robes in the fourth, which is esteem needs. This is where people find the need for stability, firmly based, usually evaluation of themselves for self-respect or self-esteem and for the esteem of others. The self-esteem needs are classified into two categories. The first categories include the desire for strength, achievement and adequacy, mastery of competence, confidence, independence and freedom. The second category includes the desire for reputation and prestige, where they command respect from other people (status, fame, glory, dominance, importance, recognition, dignity and appreciation). The final of such needs is the needs for self-actualization, which are levels of hierarchy concentrated on the individual's ability to reach their full potential in life. These fifth needs can only be concentrated upon when we first satisfy the first four and it is by then that we can concentrate to function to our full potential.

The first four needs are called the deficiency needs according to (Aunola, Viljaranta, Lehtinen, & Nurmi, 2013a; Maslow, 1965). This is because they come from things we lack in life and can only be met by external source, be it the environment, the people or the things surrounding us while the need of self-actualization is a growth need. The self-actualization need provides the needed room to grow and develop as an individual. This is a need always motivated intrinsically because it is as a result of pure enjoyment and desire to grow. Although the originator of the theory accepts that self-actualization is rarely achievable even in adults but it is worth noting that teachers must make sure students deficiency needs are satisfied in order to move on to their growth. Intrinsic motivation will not occur until they are well-fed, safe in their environment, and can love and respect the teachers and their classmates. From there on intrinsic motivation will be a breeze. Maslow's hierarchy of needs tells that an individual will not be motivated to strive for higher level goals such as education, until lower level needs have been met (Deci & Ryan, 2008;Maslow, 1943). Applications of Maslow's hierarchy theory to student's cognitive needs mean that students can be only intrinsically motivated if and only if their basic physiological needs are met first. For example, a tired and hungry student will find it difficult to focus on learning. Students need to feel emotionally and physically safe and accepted within the classroom to progress and reach their full potential. Maslow suggests students must be shown that they are valued and respected in the classroom and the teacher should create a supportive environment. Students with a low self-esteem will not progress academically at an optimum rate until their self-esteem is strengthened.

2.4.2 Extrinsic Motivation

The second part of motivation is the extrinsic motivation, which generally refers to any form of motivation apart from intrinsic motivation. The extrinsic motivation is the factors that are outside or external rewards which may include money or grade for students. These rewards provide satisfaction and pleasure that the task itself may not provide. The study by (Huitt & Dawson, 2011) contends that, an extrinsically motivated person will work on a task when there is no or little interest because of the anticipated satisfaction they will get from the reward. Extrinsic rewards for students are tangible rewards given by teachers to students to motivate them and reinforce performance and behavior. They are extrinsic because they come from outside the student rather than inside (Finkelstien, 2009; Vansteenkiste & Deci, 2003). According to (Finkelstien, 2009), students who are extrinsically motivated may not enjoy certain activities because they will only engage in activities that they can receive some external reward. (Siann et al., 1996; Wigfield, 1994)explained that extrinsic motivation does not mean that a person will not get any pleasure from working on the activity. It just means that the pleasure they anticipate from some external reward will continue to be the motivator even when the task to be done holds little or no interest. An educational psychologist (Finkelstien, 2009; Xiang, Chen, & Bruene, 2005) has shown that abuse of extrinsic motivation in the form of praise and reward related may cause resentment, limitation of transfer, may cause dependency on teachers and will undermine intrinsic motivation

They suggested that to limit the negative effects of extrinsic rewards, teachers should use extrinsic forms of reward only when correct or desired responses occur. Motivation drawn from extrinsic factors is more likely to create behavior changes and can involve little to no preparation or effort to produce effective results. Applying this type of motivation also requires little or no knowledge of students interests (Riedl & Stern, 2006; Schunk, 2005).

2.5 Student's Interest and Perception

Interest cannot be a stand-alone construct, as such it needs other constructs to be able to measure and further measure other variables. Without isolating interest and motivation as spoken of (Schiefele, Krapp, & Prenzel, 1983) the study of the students' features and parts of their personality remains important for fruitful education. These features and parts of the students' personality are essential for their training and development. The student's perception describes the mental representation of a person with regards to his or her ability and features (Dickhauser & Moschner, 2006; Wegner, Duck, Borgmann, & Weber, 2014) The study by Wegner et al.,(2014) emphasizes that student academic perception provides a picture on the students own ability pertaining school and education. The experiences the students have or will gather in their schooling career is known to be influenced by students' academic perception either positive or negative influence each year. An investigation by Atkinson, (1957) has it that, a student who demonstrates strongly positive academic perception has higher intrinsic motivation or interest with less fear for failing. The converse of this assertion by Atkinson, (1957) is true for a student with negative academic perception. The study by Wegner et al.,(2014) further explains that students who are not challenged habitually will develop negative perception which may result in low motivation in learning and further imparts negatively on student's schooling career. Having this in mind unravel the needed to delve more into research on interest construct to help them build their full potential in their field of endeavor.

2.6 Effect of School Leadership on Students Interest

The school leadership involvement in the academic achievement is significant to the schools' success story and this section will delve more into the effect of school leadership on the students' interest building process in mathematics. Studies such as (Fullan, 2001; Hallinger & Heck, 1996; Marks & Printy, 2003) argues that, effective school leadership can provided the needed support for effective teaching and learning process and as well as enhancing professional capacity building. The efficiency in school leadership will bring out best of the staff and motivates them in the pursuit of their duties and responsibilities and this will in turn aid in the students' interest building process as in the study by Li & Adamson, (1995). This can further be explained that school leadership influence motivation and further influence interest. It can be researched further from the study by Li & Adamson, (1995) as filling the gap that exist between the effects of students' interest in mathematics as influenced by school leadership and mediated by teacher motivation. The discussion on school leadership has not been limited to principals of schools and heads but has extended to explore broadly all sources available to help manage the school.(Gronn, 2002; Ogawa & Bossert, 1995) School leadership concepts takes many forms, it can either be distributed, shared or collaborative as described by many scholars have suggested a distinction between the distrusted (Gronn, 2002; Spillane, Halverson, & Diamond, 2004) shared (Marks & Printy, 2003; Pounder, Ogawa, & Adams, 1995) and collaborative leadership. All the above-mentioned terms works together to broaden the sources of the school leadership. In focusing on the strategic school wide actions the collaborative leadership is on directed to the attainment of school improvement and are mostly seen as shared responsibility among the principal, teachers, administrators and others. In the current study, the collaborative leadership will be adopted since entailed the use of governance structures and organizational processes that empowered staff and students, encouraged broad participation in decision making, and fostered shared accountability for student learning. Increasing the school's capacity for improvement represents a key target of leadership efforts designed to impact teacher practice and student learning (Fullan, 2001;Hallinger & Heck, 1996; Robinson, Lloyd, & Rowe, 2008).

The school leadership hold the responsibility in providing the school with the capacity to improve on the school condition that facilitate teaching and learning as well as enabling professional development of the staff. In doing so will lead to the implementing strategic action aimed at continuous school improvement (Fullan, 2001; Hill & Rowe, 1996; Mulford & Silins, 2003; Silins & Mulford, 2004; Stoll & Fink, 1996). Leadership, and especially head-teachers' leadership, has been object of study since the late '60s, but the concept of leadership is neither unanimously defined, nor a consensus has been yet reached on its actual role and relevance within the school environment (Fullan, 2001; Harris, 2004; Sergiovanni, 2001). Good leadership can contribute to school improvement by abetting the motivation, participation, and coordination of the teachers; recent studies have widened the range of action of school leadership research to the various organizational levels: school managers, department heads, coordinators, teachers (Harris, 2004; Harris et al., 2013) and distributed leadership that could yield a higher impact on student achievement and interest (Spillane et al., 2004). This article takes its moves within the strand of research that identifies a significant role of leadership for student achievement (Edmonds, 1979; Lin, 2008; Waters, Marzano, & Mcnulty, 2003). The next section of this paper will discuss the mathematics teacher and the impact on the student interest building process.

2.6.1 Mathematics Teachers' Impact on Interest

The student-teacher relationship is another factor that influence students interest in Mathematics. There has been a general impression that Mathematics teachers are not friendly and the concept of mentoring is now not common practice among Mathematics teachers (Frenzel, Goetz, Pekrun, & Watt, 2010). Many threatens their students with statements like ''you will fail if you are not careful'' Mathematics is a difficult subject, Never expect A in mathematics or for you no matter how you are taught you will never pass among other are the few we can mention by Ali & Awan, (2013) and Crosnoe et al., (2010) which impact negatively on students interest in Mathematics.

The Mathematics teachers who devote time and exercise patience for their students will motivates them to aspire for high interest and achievement although students may not be strong in mathematics. This may be done with patience to attend to students' questions in classroom is lacking among many teachers possibly due to the fact that many teacher of Mathematics are not trained to teach the subject Mathematics (Goldhaber & Brewer, 2000; Pimta, Tayruakham, & Nuangchale, 2009). For this reason, the teachers of Mathematics has been seen only to have knowledge of Mathematics but without psychological will power to mentor and teach their student through proper guidance and counseling for better academic achievement (Mensah, Okyere, & Kuranchie, 2013).

Teachers who are willing to mentor and guide student are always proud of their students when they are brilliant and succeeding but mostly the opposite happens. It must however be noted that the teacher factor is the most recommended factors impacting students learning. There are accumulated findings that suggest that teacher factors moderates other factors such as parents educational level, students background (Cave & Brown, 2010; Linda Darling-Hammond & Richardson, 2009; Pianta, Belsky, Vandergrift, Houts, & Morrison, 2008). The teacher has some level of responsibility to contributes significantly towards the kind of learning experience the students' may obtain in the studies as well as setting the educational goal for the total development.

In assessing students' achievement, the professional development of teachers on content-focused instruction has tremendous effect and the study by (Blank & Alas, 2010) empirically provided evidence for its positive effect of teachers content instructional leadership on student interest achievement. The students of the teacher who participated in programs for faculty development scored above the students whose teachers did not participate. The study by Hill, Rowan, & Ball, (2005) expanded the argument of that a teacher's Mathematical knowledge had strong and significant relationship on student achievement and interest. The study in mathematics education by Quimbo, (2010) explains that teachers who always absent or did not teach had among the lowest score in Mathematics achievement test for their student hence negatively impacting on their performance and interest.

The student interest in Mathematics vis-à-vis their interest can be improved when the teachers Mathematics content knowledge is improve among other factors such as commitment to the ethical and professional code as well as professional development. The teachers' ability to lead their student to autonomy and self-efficacy is crucial in the students' interest development process (Gagné & Deci, 2005; Krapp & Prenzel, 2011) to build problem solving attitude. The teachers' stake in the interest building process can further be enhanced through problem based learning where teachers instructional abilities are crucial as compared to traditional teacher-centered classrooms (Roh, 2003; Rotgans & Schmidt, 2011).Their studies further contends that beyond presenting Mathematical knowledge to the students, teachers in problem based learning environments must engage students in marshaling information and using their knowledge in applied and real settings. Evidence of poor performance in Mathematics by basic and senior high school students highlight the facts that the most desired technological, scientific and business application for Mathematics are not used for instruction.

These are indeed teaching strategies that aim at improving students' interest and through motivation that come with understanding and performance by students practicing (Okigbo & Osuafor, 2008). Problem solving as a method of teaching may be used to accomplish the instructional roles of learning basic facts, concepts, and procedure, as well as goals for problem solving. Problem solving is a major part of Mathematics because it has many applications and often these applications represent important problems in Mathematics (Pajares, 1996; Phonapichat, Wongwanich, & Sujiva, 2014; Pimta et al., 2009). Although the effects of school leadership on students learning are largely indirect, researchers such as (Leithwood & Levin, 2010) best describes the leadership effects on students learning and academic performance. The leadership quality of school leaders could influence conditions (such as the quality of classroom instruction, the nature of the curriculum taught, and the disciplinary climate in the school and classroom) that indirectly affect student learning outcomes.

2.7 Classroom Applications of Intrinsic and Extrinsic Motivation

The review of relevant literature on motivation can bring us to the conclusion that both intrinsic and extrinsic motivation is needed but time dependent. They are time dependent because the things that people find interesting some years ago may not be interesting today, irrespective of the rewards that may accompany them. The theorist of motivation suggests that intrinsic and extrinsic motivations are not two opposing constructs but two ends of a motivation continuum. The extrinsic and intrinsic motivations both represent the extent to which actions are controlled by either rewards or self-determined (Mott & Lester, 2006). This makes it clear that a person can engage in activities to simultaneously fulfill both intrinsic and extrinsic goals. For example, when someone chooses a career that is also intrinsically rewarding, working can produce both intrinsic rewards (i.e. interest and enjoyment) and extrinsic rewards (i.e. salary and prestige). It is therefore very important in mathematical education that one must use both intrinsic and extrinsic rewards for students (Huitt & Dawson, 2011). If a student is not intrinsically motivated to do well, using extrinsic motivators such as rewards or punishments can sometimes prod the student into action. However, using rewards and punishments effectively is an art. As a general rule, positively reinforcing good behavior or high achievement is far more effective than punishing bad behavior or low achievement. However, even rewards need to be used carefully, since even rewards can have an adverse impact on subsequent motivation (Huitt & Dawson, 2011). Motivational researchers have concluded that working on a task for intrinsic reasons is not only more enjoyable, but also relates positively to learning, achievement and perceptions of competence (McQuiggan & Lester, 2006).

2.8 Behavioral Views of Students Motivation

The behaviorist interpretation of motivation is anchored on the study by (Skinner, 1938). His behavioral learning theories stressed on reinforcement of the desired behavior by the use of extrinsic rewards. The interpretation provided by the behaviorist in learning explains why some people react favorably to particular subject and dislike others and further suggests that motivation emanates from effective reinforcement. Contrary to the behaviorist view of reinforcement are the critics who hold the view that extrinsic motivation are detractors of intrinsic motivation that causes the learner to focus on rewards instead of learning (Lepper, Greene, & Nisbett, 1973; Pittman, Emery, & Boggiano, 1982) The study by (Skinner, 1938) further explains that students' behavior can be shaped by repetitive actions that are reinforced. With this in mind many behavioral learning theorists devised techniques that are able to change behavior on the assumption that students who are motivated to complete a task by being promised a reward of some kind (Wentzel, 1997). The study by Skinner (1938) has it that in many cases reward takes the form of praise or a grade. It can also be traded in for some objects of interest and other times the rewards may be privileged of engagement in self-selected activity. These may account for the instance that some students may participate in mathematics class with the feeling of delight and others feel like they have been "sentenced into prison". It was in this spirit that (Skinner, 1938) proposed that existence of these differences can be traced to past experience or the background of the student. The argument of Skinner further extends that a student who loves mathematics has been shaped to respond that way by series of positive experiences with mathematics. On the contrary, the haters of mathematics have also been shaped to respond that way by series of negative experiences.

2.9 Humanistic Views of Student Motivation

In the domain of the humanistic views of motivation, the focus is on the learner as a whole person by examining how the physical, emotional, intellectual and aesthetic needs are related. The holders of humanistic view of motivation have it that every human being is driven to achieve their maximum potentials unless impediments such as hunger, thirst, financial problems, safety or anything that may impede their psychological growth is placed on their way. In the views of the humanistic perceptions, the positive image is what matters to human and not the negatives. Thus, human nature is viewed as basically good and humanistic theorists focus on method that allows fulfillment of potential human beings with emphasis on students (Orpen, 1998; Porter, 1961). The theory can be best described using the Maslow famous pyramid of 1970 known as the hierarchy of needs. With this theory, Maslow was of the views that every human being has specific needs and that need should be met. In meeting such needs, the lower needs must first be met before the higher ones are met. The hierarchy has it that if the basic needs such food, shelter, and safety is not met, how possible can we focus on higher levels such as respect, education and recognition. Throughout our lives, we work towards achieving the top of the pyramid, self-actualization or realization of all of our potentials. According to Maslow things get tough as we move up the pyramid such that it sometimes makes it people not able to reach the peak of the pyramid. The point of self-actualization which means complete understanding of which you are, a sense of completeness of being the best person you could be.

2.10 Cognitive Views of Students Motivation

The section discusses the cognitive theories of motivation which include the expectancy theory and goal-setting theory. The expectancy theory explains why and how individuals choose on behavioral option over the other while the goal-setting theory, on the other hand, explains the importance of creating goals in motivating a person. The focus of the cognitive theories of motivation is on learners' beliefs, expectation and needs for order and understanding(Cook & Artino, 2016; Malone, 1981). The unobservable change in mental knowledge is the focus of cognitivist and it came about as a rejection of behaviorist views to further conclude that cognitivist could not be ignored.

2.10.1 Expectancy Theory

The expectancy theory emerged in 1964 by Victor H Vroom discusses the behavioral processes in which a person selects a behavioral option over another and how the decision is made in relation to achieving their set goal in life or specifically for student in their academic goals. The theory by Vroom introduces three main variables to explain the behavioral process of an individual. The variables are "V" for valence, "E" for expectancy, and "I" for instrumentality.

2.10.2 Expectancy

The expectancy is the variables that represent the belief that if there exists an effort (E) of an individual to be applied, then the effort will result in a performance (P) of the desire goal of the individual. The theory further states that three factors account for achievement of the expectancy perception of a person.

2.10.3 Self-efficacy

Self-efficacy is commonly defined as the student's belief about their capabilities to achieve a goal or an outcome. It is individualistic or personal expectation or judgment concerning one's competence to accomplish some task. (Renner, Kwon, Yang, Paik, & Kim, 2008). The view has emanated from other writers and has been further defined as the student's decision of their capabilities needed for organization and execution of an action needed to achieve a designated task (Luszczynska & Gutiérrez-Doña, 2005). Students who are with strong sense of self-efficacy mostly take- up difficult tasks that are challenging and are mostly motivated intrinsically. The students with high self-efficacy mostly recover quickly and do not become victims of setbacks, and mostly likely to achieve their personal goals. On the other hand, students with low self-efficacy are believed to make initiative for self-determination. Since they are less determined, they mostly consider challenging tasks as threats needed to be avoided instead of opportunities. This has made people with low self-efficacy as pessimist with little aspiration which may result in disappointing academic performance as part of the self-fulfilling feedback cycle (Gutiérrez-Doña, Lippke, & Renner, 2009). The students' level of self-efficacy plays an important role in their academic achievement. The study by Schunk (1991) suggests that there is relationship between self-efficacy and students' academic performance. Thus, self-efficacy predicts academic achievement. According to him, self-efficacy influences the amount of effort and persistence devoted by a person to accomplish a task. In any learning situation, students enter with a sense of efficacy that is based on their aptitudes and past experiences in similar tasks. Students' self-efficacy influences what they do, how hard they try, and how long they persist, as Schunk (1991) refers to it "task engagement variables." Throughout the learning episode, the students seek efficacy cues signaling how well they are capable of doing on the task. They use these efficacy cues to establish their self-efficacy for similar tasks in the future. According to Schunk (1991) motivation can be enhanced when students have perception that they are progressing in learning and, also as students become more skillful they maintain their level of self-efficacy for performing well.

2.10.4 Valence

The degree to which students place value on reinforcement or rewards is referred to as valence. The valence depends on the individuals' values, needs, goals and intrinsic or extrinsic sources of motivation. The valence of positive one, zero or negative one means the person welcomes the results, the person is indifferent towards the results and the person tries to avoid the results, respectively (Colquitt & Simmering, 1998; de Volder & Lens, 1982; Schiefele, 1991).

2.10.5 Instrumentality

The concept of instrumentality denotes to the idea that establishes a person's will to get a reward upon the satisfaction of the expected performance. The rewards that may take different form can be intrinsic or extrinsic, monetary or non-monetary. If this reward is similar for all the activities that a person must perform, instrumentality is said to be low. There are three factors influencing instrumentality. They are policies, control and trust. (Andriessen, Phalet, & Lens, 2006; de Volder & Lens, 1982; Gregory, 2011)

2.10.6 Motivational Force

The product of the three variables mentioned earlier, expectancy (E), valence (V) and instrumentality (I) gives the motivational force (MF). Thus, MF = E*V*I. An individual who is stronger or high in these three variables also has higher or strong motivation. (Colquitt & Simmering, 1998; Yang, Allenby, & Fennel, 2002).

2.11 Students' Attitude towards Mathematics

Attitude is central to the human identity and it is exhibited by people to describe how they feel; what they like, love, favor, agree or disagree; and what they are persuaded of or may argue about and possibly oppose afterwards. Attitude is defined as the inclination and predisposition that provides an evaluative guide of an object of thought or an individual's behavior (Rubinstein, 1986). Attitude can be developed and changed over a time period. It is action-oriented and these actions can either be negatively or positively evaluated (Fishbein & Ajzen, 1975; Rubinstein, 1986). It actually forms part of the evaluative responses to an object (Bohner & Wänke, 2002).

Studies have shown that in a multicomponent model of attitude, there are three principal components of attitude. These are cognitive, thoughts and attributes. The effective component is characterized by feelings and emotions while behavioral information component of attitude is characterized by past events and experiences (Eagly & Chaiken, 1993; Maio & Haddock, 2010). It is known that several factors contribute to the attitude a student demonstrates towards the study of mathematics (Bramlett & Herron, 2005; Mensah et al., 2013). Interestingly, the student achievement score, has been shown to be one of the most important factors that affect student attitude towards achievement and interest (Köğce, Yildiz, Aydin, & Altindağ, 2009). Further studies have demonstrated that student achievement score is influenced by the anxiety students demonstrate towards mathematics, student's self-efficacy and self-concept, as well as extrinsic motivation which emanates from the self-determination of the student to learn mathematics (Tahar, Ismail, Zamani, & Adnan, 2010) and experiences at high school (Klein, 2004). The school leadership and the stakeholders of mathematics education are next students' achievements and self-determination factors. The school leadership and stakeholders of mathematics education ability to provide the needed infrastructure and facilities for the teaching and learning of mathematics will improve the attitude, interest and perception towards mathematics. Other studies have posited that teachers' content knowledge, personality, teachers' classroom management skills, and teaching materials used by the teacher to influence the students' attitude towards mathematics, which intends have an effect on students' interest. The concept of relating topics in mathematics to real-life examples as well as reinforcement influence students' interest and attitude in mathematics (Papanastasiou, 2000). The practice of private tuition by teachers, their beliefs and attitude towards the teaching of mathematics also influence students interest and attitude in mathematics (Carter & Norwood, 1997; Ford, 1994; Köğce et al., 2009). The third factor known to have an influence on students' interest in mathematics was the environment and society, which can also be termed as students' background affecting their interest and attitude towards mathematics. Further studies have shown that factors such as educational background and parental expectations from their wards (Köğce et al., 2009; Tobias, 1993) have been demonstrated to play a vital role in changing students' attitude towards mathematics. As a result of these and among other several factors, students exhibit diverse attitudes toward mathematics. Several studies have also shown a positive correlation between students' attitude and perception toward mathematics and academic achievement of students (Bramlett & Herron, 2005; Ma, 1999; Ma & Kishor, 1997; Mohd, Mahmood, & Ismail, 2011; Papanastasiou, 2000). Specific attitudes such as problem solving in terms of patience, confidence and willingness have positive relation with students' mathematics achievement (Mohd et al., 2011; Nicolaidou & Philippou, 2003). However, mathematics has been branded as difficult, cold, abstract, theoretical and uninterested subject thereby creating a bad public image for the subject. Conversely, other studies (Fan & Williams, 2010; Tezer & Karasel, 2010) showed that relatively some students have a positive attitude and interest towards mathematics although the study by (Bhana, 2005) affirm that mathematics is very important subject but it is largely seen as a masculine subject.

2.12 Gender Interest, Attitude and Perception towards Mathematics

This section interrogates the effect of gender on attitude, interest and perception toward mathematics. The concept of education permeates gender in that gender is not a barrier to education for which mathematics education is no exception. In Africa, mathematics is seen by students as a masculine subject. This assertion is confirmed by many other studies (Hyde, Fennema, Ryan, Frost, & Hopp, 1990; Meelissen & Luyten, 2008; Odell & Schumacher, 1998), which in comparing male and female mathematics achievements concluded that the males exhibit greater confidence in working mathematics than their female counterparts. Notwithstanding the enormous evidence which supports the positive correlation between the interest in mathematics and performance, there are many studies that suggest that there is no statistically significant difference between attitude and interest towards mathematics among male and female students (Köğce et al., 2009; Mohd et al., 2011; Nicolaidou & Philippou, 2003).

There are explanations offered on how gender differences affect the learning motivation of gifted students' as well as achievement motivation in mathematics. The study by Li & Adamson (1995) supports the fact that the achievement of student in subject-specific areas like mathematics is likely to achieve success if students' have interest in the subject. The study further posits that the success or failure of a girl-child in mathematics can strongly be attributed to effort and strategy. This study suggests that gender is not so important in mathematics achievement if the student is willing and able to put in the needed effort and strategies for achievement and performance.

Furtherance to the investigation of gender and mathematics interest is the study level of the students. The study by Grootenboer & Lowrie (2002) reports that students interest and attitude towards mathematics are positive as they progress to the final years of their education as compared to the early years of their education. This presupposes that students' attitude towards mathematics is personal and may vary from one student to the other and to a higher extent increases as they progress in their study. Therefore, gender has been shown in the past of having no influence on the interest of students in the study of mathematics, although a greater proportion of male is found to perform better than their female counterparts. The students' perception in mathematics has not been conceptually proven its effect on the student interest in mathematics and it is among the gaps this study seeks to investigate.

2.13 Parental Involvement and Student Interest in Mathematics

The theory of parental involvement in the development of student academic interest is paramount and this section gives a brief background of parental influence on student interest in mathematics. The study of parental association with their children's interest has been taken by many early authors in the field. The parental effect on students' achievement, attitudes and belief in the socialization model by Gonida & Cortina, 2014 and Soni & Kumari (2017) suggested that parental values and beliefs system shape students' own values and performance. The theoretical assumptions were raised by Harackiewicz, Rozek, and Hulleman (2012) during their theory-based interventional study aiming at helping parents to present the need for mathematics and science among senior high schools children. The study further found that, the parents' perceived utility value and conversation are as an intervention has an indirect effect of student's value for mathematics and science. Longitudinal studies have shown the existence of a relationship between parental value for mathematics and the interest with which students pursue mathematics (Frenzel et al., 2010). It can further be suggested that domain-specific value attached to mathematics by parents help motivates student extrinsically (Lorenz, Roth, Priese, Peukert & Mertel, 2016). In addition to the role school administration play in improving students' interest in mathematics is the role of parents in motivating students in learning mathematics. The influence of parents interest in mathematics and level of education on their students' academic performance in mathematics is very important (Arthur et al., 2015; Farooq, Chaudhry, Shafiq, & Berhanu, 2011; Frome & Eccles, 1998).

Self-determination theory suggests that intrinsic motivation such as interest is needed to improve students internal needs for competence, autonomy and relatedness in learning situations is supported and facilitated by supportive behaviors' (Deci & Ryan, 1985). The theory of self-determination infers that a parent who exhibits positive beliefs, expectation as well as encourages their children, influence their children's mathematics interest and achievement (Ing, 2013). Support by parents in general for their children has been found to motivate their children. This is evidenced in a study by Aunola, Viljaranta, Lehtinen, and Nurmi, (2013) where they specifically showed that maternal support for their children's need for autonomy and relatedness help build interest in their children better. Knowing the effect of maternal influence on student interest, there are studies that present mixed findings concerning the role of gender-related perception of parental support. While, some previous studies (Rice, Barth, Guadagno, Smith, & McCallum, 2012) strongly support the assertions that the parental support for girls are higher compared to their male counterparts, a documentation by Malecki and Demaray (2003), however, found no such gender-related disparity in parental support for Senior High School students.

2.14 School Improvement Leadership

In studying students' academic achievement, school leadership is key and this section of the study investigates further into the role of school leadership on student interest in mathematics. There are a number of empirical research findings pointing out the fact that how effective school leadership can create the needed support for effective teaching and learning process and further builds professional capacities (Fullan, 2001; Hallinger & Heck, 1996; Marks and Printy, 2003). The study by Li and Adamson (1995) also explains the effect of the teacher motivation in developing the interest of the student. This can further be explained that school leadership influences motivation and interest. There can be extension from the study by Li and Adamson (1995) as means of filling the gap in students' interest in mathematics as influenced by school leadership and mediated by teacher motivation.

Over the past decade, researchers have not limited their research on school leadership on only principals and heads of schools but rather, have intensified their quest to explore broadly the sources, the means and implication in viewing school leadership (Gronn, 2002; Leithwood & Levin, 2010; Ogawa & Bossert, 1995). School leadership can either be distributed, shared or collaborative as described by many scholars, who have suggested a distinction between the distributed (Gronn, 2002; Spillane et al., 2004), shared (Marks & Printy, 2003; Pounder et al., 1995) and collaborative leadership. All the above-mentioned terms work together to broaden the sources of the school leadership. In focusing on the strategic school-wide actions the collaborative leadership is one directed to the attainment of school improvement and are mostly seen as shared responsibility among the principal, teachers, administrators and others. In the current study, the collaborative leadership was adopted since it entails the use of governance structures and organizational processes that empowered staff and students, encouraged broad participation in decision making, and fostered a shared accountability for student learning. Increasing the school's capacity for improvement represents a key target of leadership efforts designed to impact teacher practice and student learning (Fullan, 2001; Hallinger & Heck, 1996; Robinson et al., 2008).

School leadership holds the responsibility in providing the school with the capacity to improve on the school condition that facilitates teaching and learning as well as enabling professional development of the staff. In doing so will lead to implementing strategic action aimed at continuous school improvement (Fullan, 2001; P. Hill & Rowe, 1996; Mulford & Silins, 2003; Silins & Mulford, 2004; Stoll & Fink, 1996).

Leadership, and especially head-teachers' leadership, has been extensively studied since the late '60s, but the concept of leadership is neither unanimously defined, nor a consensus has been yet reached on its actual role and relevance within the school environment (Fullan, 2001; Sergiovanni, 2001). Good leadership can certainly contribute to a school's improvement by abetting the motivation, participation, and coordination of the teachers. Recent studies have widened the range of action of school leadership research to the various organizational levels: school managers, department heads, coordinators, teachers (Robinson et al., 2008; Spillane et al., 2004) and distributed leadership that could yield a higher impact on student achievement than what yet shown(Hallinger & Heck, 1998;Leithwood & Levin, 2010). This thesis takes its moves within the strand of research that identifies a significant role of leadership for student mathematics interest and achievement(Heck & Hallinger, 2010; Mwangi, 2009).The influence of school leadership on students' interest in mathematics and other students-teacher oriented variables are empirically determined based on the literature informed conceptualization. The study conceptualizes that school leadership influence students' perception, students' motivation, students' background, teacher motivation, teachers' ability to connect mathematics to real life problems, instructor quality, mathematics facility and students interest in mathematics.

2.15 Teachers' Impact on Students' Learning

The student-teacher relationship is another factor that influences students' interest in mathematics. There has been a general impression that mathematics teachers are not friendly and the concept of mentoring is now not a common practice among mathematics teachers. Many mathematics teachers threaten their students with statements like ''you will fail if you are not careful'', "mathematics is a difficult subject'', "Never expect A in mathematics" or "for you, no matter how you are taught you will never pass" (Ali, 2013), among others. The agents of students motivation such as parents, teachers and peers plays significant role in projecting students interest in mathematics (Mata, Monteiro, & Peixoto, 2012).Similar studies by (Hemmings, Grootenboer, & Kay, 2011; Keong et al., 2005) recommended to mathematics teachers need to be friendly and sensitive to students' needs as a means to improve their satisfaction. Many studies into students and teacher dominated factors are known to influence students' interest in mathematics. For example, (Siegle, Rubenstein, & Mitchell, 2014) suggest that students' interest is influenced by teachers' classroom management strategies. Thus, lack of qualified mathematics teachers will negatively influence students' interest and performance in mathematics. (Voss & Gruber, 2006), have indicated that students' have preference for quality instructors who are knowledgeable, friendly and approachable to deliver quality of instruction in mathematics. Studies has also shown that mediocre teachers who are inexperienced negatively affect students interest in mathematics.Negative perception of students about mathematics arguably affects their interest in mathematics, however in that students who hold positive attitude and perception towards mathematics affect their mathematics grade and achievement positively (Mata et al., 2012; Mata, Monteiro, & Peixoto, 2012). School administrators role in building students interest in mathematics, as well as teacher motivation influence students interest in mathematics (Li & Adamson, 1995; Robinson et al., 2008). Further studies have noted that effective school leadership can create the needed support for effective teaching and learning process and further builds professional capacities (Fullan, 2001; Hallinger & Heck, 1996; Marks & Printy, 2003).

The patience to attend to students' questions in the classroom is lacking among many teachers possibly due to the fact that many teachers of mathematics are not trained to teach the subject. For this reason, the teachers have been seen only to know mathematics but "psychological willpower" to mentor and teach their students through proper guidance and counsel for better academic achievement. Teachers who are willing to mentor and guide students are always proud of their students when they are brilliant and succeed. But mostly the opposite happens. There are findings that suggest that the teacher factors moderate other factors, such as, parents' educational level, students' background (Cave & Brown, 2010;. Darling-Hammond & Snyder, 2000; Pianta et al., 2008). The teacher holds the single responsibility for the kind of learning experience the student may obtain in the studies as well as setting the educational goal for the total development. In assessing students' achievement, the professional development of teachers on content-focused instruction has a tremendous effect and the study by (Blank & Alas, 2010; Ciani, Middleton, Summers, & Sheldon, 2010) provided a scientifically based evidence for its positive effect. The students of the teacher who participated in the programme for faculty development scored above the students whose teachers did not participate. A teacher's mathematical knowledge had a strong significant relationship on student achievement (Hill et al., 2005). According to (Quimbo, 2010), teachers who were always absent or did not teach had the lowest score in mathematics achievement test. Thus, mathematics achievement can be improved by improving teacher's mathematical knowledge, commitment in the profession and always engaging in professional development. The most important achievement of a teacher is to help his/her students along the road to independent learning. In problem based learning, the teacher acts just as a facilitator, rather than a primary source of information or dispenser of knowledge. (Roh, 2003) argued that within problem-based learning environments, teachers' instructional abilities are more critical than in the traditional teacher-centered classrooms. Evidence of poor performance in mathematics by elementary school students highlight the facts that the most desired technological, scientific and business application for mathematics cannot be sustained. This makes it paramount to seek for a strategy for teaching mathematics that aims at improving its understanding and performance by students practically (Okigbo & Osuafor, 2008).

Problem-solving as a method of teaching may be used to accomplish the instructional roles of learning basic facts, concepts, and procedure, as well as goals for problem solving. Problem-solving is a major part of mathematics because it has many applications and often these applications represent important problems in mathematics. Other authors have suggested that problem-solving in school mathematics can stimulate the interest and enthusiasm of the students in the learning of mathematics and other related subjects (Wilson, Fernández, & Hadaway, 1993).The study further situate the influence of teacher on students interest in learning mathematics by empirically determining how instructor quality ,teacher motivation and teachers ability to connect mathematics to real life problems influence students interest in mathematics.

2.16 Students' Perception and Interest

In recent times the perception of students about Mathematics has become a topical issue among educational stakeholders in their quest for finding lasting solution to the problem of poor performance and lack of interest in mathematics. Students perception about mathematics are views held by students about mathematics and these perceptions of learners about mathematics may be as a results of experiences learner have gone through either at their early stages in their educational life (Taylor & Graham, 2007; Waugh & Su-Searle, 2014). The experiences learners go through in their academic life comes together in forming 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 by students in many African countries, remains crucial for investigation (Kim & Schallert, 2014; Papanastasiou, 2002; 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 with admission that lack of mathematics achievement is mainly beyond students' control. The perceptions held by students in mathematics has in many cases prevented learners from reaching their desired academic height (Frenzel, Pekrun, & Goetz, 2007; Winheller, Hattie, & Brown, 2013). The fear of bad performance in mathematics is among other negative perceptions students hold about mathematics. These negative perceptions resist the studying of mathematics since the learning of the subject depends on perceptions and beliefs (Wang et al., 2015). The roles of teachers in shaping the perceptions of students are an important component of eradicating negative perceptions about mathematics (Ampadu, 2012; Graham, 1990; Siegle et al., 2014). The teacher's role of eradicating negative perception about mathematics may be to learn about their students and their perception they hold in order to help tackle this perception. 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.

There have been a lot of misconceptions by students about the difficult nature of mathematics which has scare many in the course of their educational career. This misconceptions being a negative perception hold by students has 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, lack of students involvement during lessons as well as the perceptions that only bright student can perform in mathematics (Ampadu, 2012; Etuk, Afangideh, & Uya, 2013; Vandecandelaere, Speybroeck, Vanlaar, De Fraine, & Van Damme, 2012a). There are studies that posit that the perceptions of student about the mathematics does not only lies in the teachers and students attitude alone but rather the environment also place significant role. (Siegle et al., 2014; Vandecandelaere, Speybroeck, Vanlaar, De Fraine, & Van Damme, 2012b; Winheller et al., 2013). The bad perception of students and people who dislike mathematics has created quite unfortunate and bad public image of Mathematics in Ghana and other parts of the globe describing Mathematics as difficult, cold, abstract, theoretical and uninteresting subject (Björklund, 2010; Ernest, 1995; Sam, 2002; Wang et al., 2015). This problem of misconception and bad perception needs to be dealt with in order to secure students interest in the learning of Mathematics at all levels of our education curricular. The negative students' perception about mathematics has a great tendency of undermining the students' interest in mathematics as well as their achievement.

2.17 Goal-Setting Theory

The goal setting theory is another cognitive theory proposed by Edwin Locke in 1960. The theory explains the need for goal setting and how goal setting influences task performance(Latham, 2004; Schunk, 2003). The theory further explains that when the goals set by the people is specific and challenging, these people are more likely to be motivated and hence will lead to the execution of the set tasks but it should, however, be noted that vague and easy goals may result to poor task performance. In application, the goals set must be SMART, meaning specific, measurable, attainable, realistic and time-bound. (Burnette, O'Boyle, VanEpps, Pollack, & Finkel, 2013; Elliot & Harackiewicz, 1994; Solmon, 1996)

2.18 General Educational Implications of Cognitive Theories

There has been a general implication of these cognitive theories. The implications are that cognitive processes influence learning. As children grow they become capable of increasingly more sophisticated in thought (Krapp, Hidi, & Renninger, 1992; Treasure & Roberts, 2001). People organize the things they learn. New information is most easily acquired when people can associate with things they have already learned and finally people control their own learning. The expectancy-value theory suggests that motivation depends on the extent to which people are expected to succeed in the task they have been engaged (Maddux, Norton, & Stoltenberg, 1986; Vernadakis, Kouli, Tsitskari, Gioftsidou, & Antoniou, 2014). The learners' perseverance and willingness to accept challenges in completing a specific task depends on the self-efficacy or beliefs about the individuals' capabilities. Since students bring a variety of goals into the classroom, including learning goals, performance goals and social goals, goal setting can significantly increase task value. If the goals are effective, then they are moderately challenging, specific and time-bound. The more learning is goal focused the more sustained motivation and higher achievement.

The theory of attribution has the assumption that learners have an innate need to understand their success and failure. The common explanation or attribution includes effort, ability, luck and relatedness. In addition to the attribution theory, is the self-determination theory (Deci & Ryan, 2008; Edward & Ryan, 1985) which holds the assumption that in making our expectation clear and achievable using high-quality and personalized examples as well as giving the student choices to increase learners perception of control and autonomy there is the need for competence, control and relatedness as basic requirement.

2.19 Achievement Goal Orientation

Achievement goal theory considered motivational variables such as students' inner characteristics concerning motivation (e.g. fear of failure and self-efficacy), teacher practices in the classroom that are associated with students' adoption of different achievement goals and demographic variables (e.g. gender) (Komarraju & Nadler, 2013; Wigfield & Cambria, 2010). Achievement goal theory is concerned with the purposes students perceive for engaging in an achievement-related behavior and the meaning they ascribe to that behavior. A mastery goal orientation refers to one's will to gain understanding, or skill, whereby learning is valued as an end itself. In contrast, a performance goal orientation refers to wanting to be seen as being able, whereby ability is demonstrated by outperforming others or by achieving success with little effort(Bong, 2004; Komarraju & Nadler, 2013). These goals have been related consistently to different patterns of achievement-related affect, cognition and behavior. Being mastery focused has been related to adaptive perceptions including feelings of efficacy, achievement, and interest. Although the search on performance goals is less consistent, this orientation has been associated with maladaptive achievements beliefs and behaviors like low achievement and fear of failure. There are many different forms of motivations. Each one influences behavior in its own unique way. No single type of motivation works for everyone. People's personalities vary and so accordingly does the type of motivation that is most effective at inspiring their conduct (Meissel & Rubie-Davies, 2016; Wigfield & Cambria, 2010). What can one do to strengthen one's motivation?

2.20 Affective Factors in Motivation

In the quest to be motivated, the individuals' self-worth plays an important role. People's self-worth is strongly linked to their ability perceptions and this makes the person's ability to achieve strongly valued in our society.(Sher-Censor, Parke, & Coltrane, 2011; Singh, Granville, & Dika, 2002) People will procrastinate, blame others and engage in other self–handicapping behaviors in order to protect their high perception ability. An anxious student will have reduced performance by filling working memory space with thoughts about failure and negative consequence. Research indicates that one of the primary problems for test-anxious students is that they do not understand the content very well to start with. With increased understanding, failure decreases, which in turn lessens fear of lowered performance. (Z. Wang et al., 2015)

2.21 Student Interest

The United States of America conceptualized its first interest research initiative by Dewey, (1913a). The Germany's interest development research followed afterwards by Schiefele (1974). The theory of interest proposed by Dewey, (1913a) that: people develop new interest in activities they see to further an existing project of interest. He further states that anything indifferent or repellent becomes of interest when seen as means to an end already commanding attention''. According to (Dewey, 1913a, 1933) external attempt to impute interest will lead to only a temporary effort but do not result with identification of the theory. The study by several authors including (Prenzel, 1988; Schiefele et al., 1983) express that the first work on interest involves on primary theoretical issues. It was further studied empirically by (Müller, 2006; Schiefele, 1990) who related interest to pre-school and literacy in high schools with the confirmation that interest as construct requires attention in the student achievement orientation .A study by(Prenzel, 1992) holds the view that, interest is a freely chosen interaction with objects of interest over several points in time. He further expands that interest may be in stages, while one may develop it as a go, others may revolve. The study by

(McDougall, 1960) view interest as sentiments derived from the curiosity instinct and its emotions. The study by (McDougall, 1960; Shand, 1914) further hold the view that when students have repetitive and continuous encounter with objects, interest will be created. Thus, interest develops as a result of continuous and repetitive encounter, which implies that when interest does not exist in an object and we have continuous encounter, interest may be developed. This might have led to the cognitive dissonance theory, which describes how cognitive consistency motivates and influences behavior and attitude(Andreas Krapp, 2007; Möller & Marsh, 2013). Studies by some authors explain that investing in an activity and lack of external incentives can lead people to experience an activity of object as more interesting (Aronson & Mills, 1959; Mitchell, 1993). The cognitive dissonance theory can be viewed as the positive transformational mechanisms that reconfigure the influence of external incentives on intrinsic motivation. It can be viewed further as the force that bridges the deficiencies of external motives and awaken the intrinsic motivation (Aronson, 1960). The other view by the authors (Berlyne, 1949; Nunnally & Lemond, 1973) presents that something might be interesting because it is uncertain, complex, novel or inconsistent with existing information.

The study of the construct interest has focused on two different concepts being individual concept and situational interest (Hidi, 1990; Renninger, 2000). These studies defined individual interest as interest conceived as enduring preference for some topic, subject areas or activities. The situational interest on the other hand is brought about as a result of emotions states produced by situational stimuli (Rotgans & Schmidt, 2011; Tanaka & Murayama, 2014). The study of individual interest translates to long-term orientation of an individual towards a type of object an activity or area of knowledge(Krapp et al., 1992; Schiefele, 1991). Typical of interest is presumably feelings of enjoyment, and involvement is characteristics of interest. The interestingness of subject occurs when personal significance is attached to the subject with the view that it will contribute to one's personal development, competence or understanding of important problems. The interest theorist have it that investigation into the effect of interest on the quality of learning, the use of learning strategies and quality of learning experience is paramount in educational research(Ulrich Schiefele, 1991). It was further revealed in (Schiefele, 1991) that interest will motivate readers to go beyond the text but also seek understanding. The actual learning activities are affected by interest in that activity (Schiefele, 1991).The study by (Schiefele et al., 1992; Wigfield & Cambria, 2010) reports that there exists a significant correlation between topic interest and student involvement, enjoyment, concentration and activation in a task. The work by (Benita, Roth, & Deci, 2014) found that if the ability of every student is held constant then students with high educational interest will have high achievement compared to students with low educational interest.

2.21.1 Importance of Interest and how it is Develop

The concept of interest development and its importance in society cannot be neglected in educational psychology. The situational interest such as watching a political rally, political documentary can develop into an enduring interest in politics. Although politics permeates our entire human endeavor but not everyone have interest in politics. Situational interest has been studied by (Hidi & Renninger, 2006) to develop into individual interest and further outlined the conditions under which these occur. The study by Hidi and Renninger, acknowledges knowledge, positive emotion, and personal value as the three major factors that contribute to interest. In addition, as persons spend more time and continuously having contact with an activity, they may have personal relevance interest, which may also develop. Other studies from the field of mathematics education have identified factors that have positive effect on students' interest and these have been classified into two. These are situational interest factors and individual factors. The situational factors include pedagogical strategies and learning environment, whereas the individual factors include learners' prior experience and beliefs of the learners. The studies by(Abrantes, Seabra, & Lages, 2007; An, Kulm, & Wu, 2004) argue that pedagogical practices adopted by teachers promote interest. It was further argued by (Ferrer-Caja & Weiss, 2000; Wang, 2012) that the social climate of the student can promote interest in the students. It was further revealed by several authors (Köller, Baumert, & Schnabel, 2001c; Wong, Lawson, & Keeves, 2002) that interest in mathematics has some association with the students' prior knowledge and their competency based beliefs (thus, their perceptions). The study by (Fox, 1982) points that parents and teachers influence a student's rating of career.(Tanaka & Murayama, 2014) strengthens the argument that interest is predicted by students' perception about the teachers' classroom management, the extent to which teachers outline class rules and how teachers monitor students' progress. (Köller, Baumert, & Schnabel, 2001b) further stressed that age as a factor contributes to building interest and states further that interest diminishes as we grow.

The study by (Lopez et al., 1997) predicts that self-efficacy beliefs predict students' interest in mathematics.(Marsh, Trautwein, Lüdtke, Köller, & Baumert, 2005; Nagy et al., 2010) have both demonstrated that there is association between academic self-concept and students' interest in mathematics but (Nagy et al., 2010) states specifically that students' academic self-concept strongly predicts students' interest in mathematics. The construct interest has been known to contribute effectively towards learning and achievement process. The interest developed in an activity or topic is a mental resource to enhance learning and improve performance (Suzanne

Hidi, 1990). It is therefore important to note that both situational and individual interest promotes attention, recall, task persistence, and effort. (Ainley, Hidi, & Berndorff, 2002; Hidi & Renninger, 2006; Hidi, 1990).Also the meta-analytical study by (Schiefele, 1992) using 150 studies to establish the extent of relationship revealed the existence of correlation between academic performance and interest. This indicates that interest has important role in learning and academic achievement.

2.22 Chapter conclusion

In the chapter under review, the theories of education have been discussed with more emphasis on interest, motivation and achievement and goal setting theories. Specifically, self-determination theory, achievement goal theory, behavioral, humanistic and cognitive theory of motivation as well as importance of students' interest and how it is developed was also discussed. The chapter under review also reviewed some general educational implication of cognitive theories among other relevant theory. The chapter has given enough theoretical bases for the study and further explored gaps that need to be filled. The chapter finally concluded that students' interest in mathematics has not seen much research in recent times that require greater research attention.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Overview

This chapter discusses the methods and procedure used in the study. These include:

Research paradigm,Ontology ,Epistemology (Philosophy),Positivism, Research Philosophy and Orientation, The positivist research tradition,The Interpretivist Research Tradition,Pragmatic Research Tradition, The philosophical position of the study,Research Design, Population ,Sample and Sampling Techniques, Instrument for Data collection ,Validity and Reliability, Data collection ,Data Analysis Procedure ,Statistical Methods and Packages, cope of Statistical Analysis, Statistical Product and Service Solutions (SPSS),Partial Least Square (PLS) –Structural Equation Model (SEM)

3.1 Research paradigm

The theoretical framework is sometimes referred to as the paradigm which is distinct from a theory (Mackenzie & Knipe, 2006).It influence the way knowledge is studied and interpreted. The choice of the paradigm set down the intent, the motivation and expectations for the research. To some research, without nominating the paradigm as a first step, the purpose or the basis for further choices for research design, literature and methodology is nonstarter.

Research paradigms has been known as a systematic investigations as posit by (Mackenzie & Knipe, 2006).It has been further been viewed as inquiry whereby data are collected, analysed and interpreted in somewhere in an effect to understand describe and predict or control an educational or psychological phenomenon or to empower individuals in such context. The very nature of the definition of research is influenced by the researcher's theoretical framework, where theory is being used to establish relationships between or among constructs that describe or explain phenomenon by going beyond the local events, however, establish some connection with similar events. (Cohen, Manion, & Morrison, 2000)

3.1.1 Ontology

The word ontology emanates from the Greek word meaning "on" or "being"(Drath et al., 2008; Mackenzie & Knipe, 2006; Thomas, 2004) It expresses a way of understanding, which is the reality that researcher investigates (Crotty, 1998; Wisker, 2008). Ontology is central element of metaphysics that attempt to answer questions such as: what kind of creature is human being? What is the nature of reality? .The ontological scheme has several epistemological implications. Each level of being can be known through methods most appropriate to that level (Bryman & Bell, 2007; Thomas, 2004). Ontological assumptions describe different epistemological and methodological positions (Howe, 2004; Suárez Riveiro, Cabanach, & Arias, 2001). Some ontologists claimed that reality exist, which we may not be aware because of our limited perceptual equipment. The reality exists but we have no complete knowledge about it. Others argued that only publicly observable phenomena are to be considered real and mental states are held not to quality (Crotty, 1998; Thomas, 2004; Wisker, 2008). Based on these expressions ontology could broadly be classified into objectivism (realism) and Interpretivism (constructionism)(Bryman & Bell, 2007; Burrell & Morgan, 2017; Mackenzie & Knipe, 2006).

3.1.2 Epistemology (Philosophy)

The term epistemology comes from the Greek word episteme their term for knowledge. Simply put, epistemology is the philosophy of knowledge or how we come to know(Howe, 2004). Epistemology is intimately related to ontology and methodology;

as ontology involves the philosophy of reality, epistemology addresses how we come to know that reality while methodology identifies the particular practices used to attain knowledge of it.'Epistemology is a pivotal issue in any form of research for it is about how we know whether or not any claim; including our own, made about the phenomena we are interested in, is warranted. That is, what do we mean by the concept 'truth' and how do we know whether some claim is true or false? In other words, what is our theory of truth?'(Mackenzie & Knipe, 2006). Epistemology is the study of the nature of knowledge, its possibility, scope and general basis. It deals with how we create new knowledge or validate the existing knowledge. The aim is to provide philosophical grounding for deciding what kinds of knowledge are possible and how we can confirm that they are adequate and legitimate (Crotty, 1998; Uba & Lincoln, 1994). Philosophical ideas have great influence on research practices and therefore they must be identified (Creswell, 2011). Epistemology distinguishes knowledge from opinion, belief or falsehood (Creswell, 2011) and provides justification for methodologies (aims, functions and assumptions of method) (Cooper & Schindler, 2011; Crotty, 1998). While ontology deals with the nature of being (the nature of reality/knowledge), epistemology deals with how to acquire and understand the knowledge (Guba and Lincoln, 1994). Social sciences research epistemology is broadly divided into two: empiricism/positivism and rationalism/constructionism(Bryman & Bell, 2007; Crotty, 1998; Zikmund, Babin, Carr, and Griffin, 2010). Below is a brief account of positivism assumptions:

3.1.3 Positivism

Positivism was coined in the nineteenth century by Auguste Comte (Thomas, 2004). Positivism is also called scientific method or doing science research, positivist/post-positivist research, post positivism and empirical science (Creswell, 2011; Niglas, 2010). Positivism is an epistemology linked with empiricism, behaviourism, naturalism or scientific status to social research (Robson, 2011; Wisker, 2008). Others view it as an ordered universe made up of atomistic, discrete and observable events (Blaikie, 1993; Crotty, 1998). The assumption of Positivism is that legitimate knowledge is those that are obtained directly from experience or scientific observation (Creswell, 2011; Crotty, 1998; Robson, 2011; Thomas, 2004). That is meaning and reality or causes of social phenomena exists freely from the operation of our consciousness; meaning/reality exists only if they can be proved (Crotty, 1998; Patton, 2002; Thomas, 2004; Wisker, 2008). Positivism rejects speculation, theoretical entities (invisible or unknowable view), theological and metaphysical explanations (Newman & Benz, 1998). Their belief is that 'a real world with verifiable patterns that can be observed and predicted-that reality exists and truth is worth striving for' (Patton, 2002, p, 91). "The world is essentially knowable; that it consists of knowledgeable facts; and that, if we ask the right question in the right way, use the right research methods, carry out the right kind of experiments and processes, we will discover these facts or truths" (Wisker, 2008. p. 65). The world is big variables net of kinds and these variables directly and indirectly interrelate to each other (Thomas, 2004). Positivists' social scientist adopts natural sciences methods of doing research where results are expressed on empirical generalizations (Cohen, Manion, & Morrison, 2007; Walliman, 2011). In positivism human behaviour is studied the same way as natural objects such as stones or fishes (Thomas, 2004). Subject to fixed laws, behaviour can be determined and there is no room for multiple interpretations (Wisker, 2008). The researcher is an observer of social reality and cannot manipulate the result of the research (Cohen et al, 2007). Positivism largely uses quantitative data derived from the application of strict rules and procedures (Robson, 2011). It often uses experiment, observation, survey and statistics to collect and analyze data (Neuman, 1997). Data obtained from experiment and surveys are used to prove the relationships between variables in which some variables are isolated and their interactions are observed, and/or use correlational methods to discover their statistical relationships. Through these processes, behaviour of the net or part of it, selected for study can be understood, explained and predicted. Observations are expressed as descriptions; descriptions are only valid if they objectively depict the properties of object and exclude any elements that cannot be verified by multiple observers (Thomas, 2004).

3.1.4 Research Philosophy and Orientation

Research is not neutral, but reflects the researchers, interest, values, abilities assumptions, aims, ambition and philosophies (Creswell, 2011). Wittingly or unwittingly every research is based on a philosophy, particularly the philosophy of the researcher which is informed by the philosophy of the area of knowledge or discipline. According to Creswell (2011), Collis and Hussey (2013), philosophical thinking revolves epistemological, ontological and axiological assumption.

In order to give this study intended rigour and vigour and to assess the knowledge that emerges from this study in terms of its validity and reliability there is the need to explore various research philosophies in order to conduct this study based on the right epistemology, which according to (Sunders,& Mark, 2007)), is what constitutes accepted knowledge or truths in a particular discipline or field of study. This is normally based on two main philosophical paradigms which are positivism and interpretivism. Positivism is an epistemological approach that believes in the application of natural science methods to the study of society since the positivist view of reliable knowledge are those created through empirical and measurable means. However, interpretivism involving both phenomenology and constructivism see knowledge as created by the meanings individuals attach to phenomena to construct meaning (Creswell, 2011). Interpretivism is based on the thinking that humans as respondents in a research situation are different from resources or equipment and substances in natural science research, because they have feelings and consciousness which cannot be studied in the way natural science is studied, therefore researchers should grab the subjective meaning of social behaviour (Bryman, 2008). Consequently, the research philosophy one adopts should be informed by the knowledge area, or discipline as this will influence the researcher's methodology and strategy. Moreover, research philosophy also reflects the kind of relationship between knowledge and the process by which it is developed. That is whether the researcher will consider data on resources (the resource researcher), that is more akin to the position of a natural scientist or collection of data on feelings, opinions and attitudes, which has no external reality (Creswell, 2011). It must be noted that, in this postmodern era, different epistemologies have arisen that hold different assumption about the nature of knowledge, even within the same discipline; in view of this different schools of thoughts are possible (Creswell, 2011). Consequently depending on the discipline involved, a study may take a polar stance of embarking on a research either through a positivist research route or interpretivist research tradition, or where a discipline or mixture of disciplines allow the use of eclectic approach of pragmatism which is an omelette of methodologies thriving on both interpretivism and positivism to embark on a study.

It follows then that, arriving at the right approach, involves a thorough assessment of philosophy or philosophies of their methods, in order to gauge the motives that underpins the choice of their methods through prudent assessment of the type of discipline(s) involved, and their perception of reality (ontology) in order to create or extend knowledge that fit in the concepts and constructs of that knowledge area or discipline like a puzzle in order to grab the big picture and also add to it in a systematic way in a particular area.

In consonance with the aforesaid, provided a framework for choosing a philosophical approach, when multiple areas are involved, akin to problem solving through inter disciplinary research approach through contextualization and conceptualization.

To highlight the significance of a research philosophy to choose the right methodology, maintains that the choice of appropriate research philosophy helps to choose the right research methodology in three ways:

1. First and foremost, it can help the researcher refine and improve the overall research strategy.

2. Secondly, knowledge of research philosophies will enable researchers analyze different methodologies and avoid pitfalls by identifying the strengths and limitations of a method or approach at an early stage.

3. Finally, it would help the researcher to be creative and innovative in the selection or adoption of research methodologies.

To choose the appropriate philosophy for this study various philosophical positions are discussed below:

3.1.5 The positivist research tradition

Most studies including that of continue to trumpet the ideology that Positivism relates to philosophical stance that entails working with observable social reality. The positivist advocates the use of natural science methods, where observable social reality form the basis and the methods of data collection, to generate knowledge that can exist in a form of law-like generalization (Payle, 1995). Hence the central thesis of positivism is that research must be based on the empiricist approach and shouldn't be subject to value judgments based on human values or intentions.

To the positivist, reality must be objective and independent of the observer, and even human behaviour should be explained in a similar way as the natural scientist do, employing methods that are value-free neutral, impartial and objective methods(Fossey, Harvey, McDermott, & Davidson, 2002). Subsequently the positivist observer assumes phenomena can be studies as hard facts and the relationship between these facts can be established as scientific laws. To the positivist, such laws represent truths. They are of the view that social objects should be studied the same way as natural objects, since objective reality that is not depended on human mind exists. Arguably, it is based on this premise that (Creswell, 2012) suggests that all real knowledge should be derived from human observation of objective reality and the senses must be used to accumulate data that is discernible and measurable and must reject any approach that is transcendental. In this regard, the positivist antipathy to meta-physics is rooted in scientific reasoning and not any construct or concepts that are abstract and has the tendency to generate sophistry and illusion(Howe, 2004). Hence the positivist epistemologist stresses the importance of induction and verification in addition to establishment of laws and cleanses its approach from knowledge created through specialization and subjectivism.

Therefore, the positivist research tradition favours the use of quantitative approach, thus employing data collections techniques that involve rigorous quantitative measurement by employing research strategies such as: experiments, surveys and statistics, with the testing of hypothesis through analysis of the measured values to develop theories. This was also reinforced by when he posits that the research methodology of a positivist should be quantitative which is the only basis for valued generalization and law, and should be value free, meaning the research design should be informed by this criterion rather that human beliefs and interest, with an ultimate aim to identify casual explanations and generation of laws that explain human behaviour, while the researcher should play an independent role and should not manipulate the subjects under scrutiny. To the positive methodology reflects that of a linear and logical structure in which hypothesis takes the form of causal links between the constituent variables stated in the hypothesis leading to acceptance or rejection of the theoretical proposition. It is instructive to note that, the positivist approach has several implications for research. For operationalization of concepts, the process of reductionism, where problems are better understood by reducing them to the simplest possible elements are employed. This brings to the fore that researchers leaning towards the positivist epistemology must employ objective methods, rather than making inferences subjectively through sensation, reflection or intuition (Fossey et al., 2002). In the positivist approach, speculations and assumptions related to knowledge based on the metaphysics are discarded, hence the exploration and examination of human feelings goes beyond the scope of positivism (Creswell, 2011).

3.1.6 The Interpretivist Research Tradition

In contrast to a positivist investigator whose approach is hinged on quantitative techniques and also by employing statistical methods, the Interpretivist investigators are of the view that, it is necessary for researchers to understand differences between humans in their role as social actors and also interpret phenomena in accordance with the set of meanings humans give to a particular phenomenon, by the way humans make sense of the world around us. The heritage of interpretivism comes from two intellectual traditions of phenomenology and symbolic interactionism (Creswell, 2011). Phenomenology refers to the way we see the world around us while symbolic interactivism reflects the process of interpreting the world around us. The interpretivist epistemology posits that, the pattern of human behaviour are not due to pre-existing laws but created from the evolving systems of meaning generated through social interaction. Crucial to the interpretivist epistemology is that, the researcher must lay emphases on analyzing the world view of the population or subjects under study. Thus, the interpretivist researcher must know the respondent's perception of reality or truths, and what they hold as relevant. In view of this, an interpretivist researcher does not attempt to be value free, because of the held on notion that the world is constantly changing and what is perceived as reality today may change overtime. As some philosophers would put it; truths are plastic in nature, since they vary with people, place and time and what is accepted as truths today may be dangerously insulting tomorrow(Schunk, Meece, & Pintrich, 2012). Consequently, the interpretivists are not concerned about generalizability but only aim to capture rich complexity of social phenomena (Creswell, 2011), through the collection of detailed qualitative data to acquire in-depth understanding of the subjects and social actions in everyday life (Cooper & Schindler, 2011). Undoubtedly, this kind of approach to research undermines the fundamental postulates and tenets of positivism as it does not support the positivist approach of reductionism and hypothesis testing. This is why Creswell (2011) view the interpretivist approach as an inquiry process of understanding social or human phenomena based on complex and holistic picture of problems in a natural settings and this kind of thinking is the fulcrum on which interpretivism rest, and also glued to the precepts that researchers cannot and should not be neutral by dissociating themselves from observed phenomena in their enquiry in the social world (Guba and Lincoln, 1994). In sum, the interpretivist methodology entails working with qualitative data or qualitative approach to research in sharp contrast to positivism since it lay much emphasis on subjectivism and individuality rather than objectivism and replication as truth(Creswell, 2011). However, the interpretivist approach is also criticized especially by critical scientist for concentrating on the individual actors, their intentions and meanings, but the interpretivist is comfortable with qualitative techniques instead of quantitative techniques which is the pivot of the positivist ideological creed.

3.1.7 Pragmatic Research Tradition

Though in recent times there is promotion of the application of the orthodoxy and orthopraxis of positivism to social issues, many a researcher will also take polar stance conducting research within the positivist or interpretivist research traditions. Undoubtedly, this has also brought about competition for methodological primacy as to whether the interpretivist or the positivist approach offers the best way to create or extend knowledge. To iron out this great controversy, Guba and Lincoln (1994) argue that the question of methods are secondary to questions of epistemology and ontology, hence choosing between one of the two positions is unnecessary and somewhat unrealistic in practice as no approach is necessarily superior to the other, it all depends on the research questions for which answers are being sought (Creswell, 2011). This brings to the fore the most important determinant of research philosophy that depends on the research questions since one approach may be better than the other for answering a particular question.

This confirms the pragmatic view that it is perfectly possible to work with both positivist and interpretivist research philosophies by employing mix methods, both qualitative and quantitative techniques in the same study (Sunders *et al.*, 2007). Therefore, Tashakkori,& Teddie, (1998) maintain that pragmatism is intuitively appealing and more appropriate for researchers, since they must think of a research philosophy to be adopted in a continuum rather than opposite positions, as the knower and the known at some point must interact, and researchers must avoid pointless debate about what constitutes truth and reality. Hence, a researcher must study what interest them, and that which is of value to them to bring about the positive consequence within their value system.

3.1.8 The philosophical position of the study

Based on the earlier discussion about the philosophies that underpins the choice of a particular research methodology, and given the overall objective of this study which seeks to model students' mathematics interest in Ghanaian senior high schools, the researcher adopts positivism. Consequently, the research cannot take an eclectic approach by applying the orthodoxy and orthopraxy of pragmatism. Therefore, it remains the conviction of the researcher to orient this study around the Positivist research ontology, as the nature of reality which in the researcher's opinion can create and extend knowledge in students' interest in mathematics.

3.2 Research Design

Research design defines the guide that enables the researcher to structure the questions or problems to produce valid objectives and reliable answers and general empirical evidence (Creswell, 2012; Radford, 2011) .For this study, the researcher adopted a cross-sectional survey design because the study took place at a single point in time without the involvement of any manipulating variables. Moreover, the cross sectional survey allowed the researcher to look at numerous prevailing characteristics at once and also provide information about what is happening in the current population .Finally to generalize the results to the entire population of senior high schools in the Ashanti region, provided the selected samples are representative of all senior high schools in the region

3.3 Population

Research population is defined as the list of all units, elements, individuals or items, from which the samples are practically drawn. These items can share one or more characteristics (Cohen, Manion, & Morrison, 2007; Harackiewicz & Barron, 2004). The population consisted of all Senior High Schools students in the Ashanti Region. The region was chosen due to its wide range of ethnic and religious diversity. It is the second largest region in Ghana in terms of human population. In the Ashanti region of Ghana, almost every tribe can be found with a designated community therefore making the population heterogeneous in nature. According to the 2010 population and housing census, the total population of the Ashanti region was four million seven hundred and eighty thousand three hundred and eighty (4,780,380) accounting for 19.4% of the total

Ghanaian population. The population of senior high school students in Ashanti region is estimated to be a little over two hundred thousand (200,000)

3.4. Sample and Sampling Techniques

A sample is defined as the portion of the population that is studied to learn more about the population. According to Alf & Lohr, (2007) and Radford, (2011) sampling enables us to collect the needed data within a given population parameter of interest, and by using point estimates of the sample the population parameters can be obtained. The simple random sampling technique was used in selecting the schools to be included as well as selecting the respondents'.

For senior high school students population estimated little over two hundred thousand (200,000) in Ashanti region, a sample size of one thousand two hundred and sixty three (1,263) was adjudged to be representative of the population (Creswell, 2003; Creswell, 2012; Krejcie, & Morgan, 1970). In arriving at this sample size through proportionate stratified sampling technique, the schools in Ashanti region were first put into three strata based on the Ghana Education Service (GES) classification of schools .category A schools, category B schools and category C schools. The total number of students in each category was estimated by adding the number of students in the school under each category. The student in the school were then sampled using simple random sampling technique to obtain the total in each category of classified

Table 1 Categories of Senior High Schools in Ashanti Region

Category of school	Estimated Schools in category	Schools sampled	Estimated Number of student in category	Students sampled
Category A	5	4	10,754	554
Category B	55	4	97,450	546
Category C	75	2	35,809	163

3.5 Instrument for Data collection

The main instrument for data collection was purely structured questionnaire to allow respondents to select responses from the options provided. The self-administered questionnaire was used as method by which data were collected. The first part of the questionnaire solicited the demographic information of the respondents measured on nominal scale. The other parts of the questionnaire were used to collect data to model students' interest in mathematics. The items used to assess the study constructs employed reflective scale where responses were scored on a 5-point Likert agreement scales ranging from 1 (strongly disagree) to 5 (strongly agree). The questionnaires were adapted and modified to suite the stated objectives, research questions and the hypotheses stated for the study. The questionnaire was pre-tested to identify and correct misconstruction and ambiguities that arose from respondents' responses. The demographic data includes the age, gender, and educational background. The questionnaire also presented some questions on the students and parents' interest in mathematics .The main questionnaires consists of ninety-two (92) items. The part of the questionnaire which dealt with mathematics interest variable was made up of 11 items. The respondents were asked to rate the extent to which these variables contributed to building student interest. Using a five-point Likert-scale the item were be rated from "strongly disagree" (1) to "strongly agree" (5). The part of the questionnaire which dealt with the mathematical connectivity to real-life problems. This comprises six (6) items. The respondents expressed their level of agreement and disagreement to the statements. Using a five-point Likert-scale the item were rated from "strongly disagree" (1) to "strongly agree" (5). The part of the questionnaire which deals with the teaching methods teachers adopt, which has ten (10) statements the students responded to using a five-point Likert-scale the types could be rated from "strongly disagree" (1) to "strongly agree" (5). The part of the questionnaire which deals with student background has eight (8) statements responded to by students using a five-point Likert-scale the types could be rated from "strongly disagree" (1) to "strongly agree" (5). The part of the questionnaire which dealt with school leadership had eight (8) statement responded to by students using a five-point Likert-scale the item were rated from "strongly disagree" (1) to "strongly agree" (5). The part of the questionnaire which deals with instructor quality and availability. It has eight (8) statements responded to by students using a five-point Likert-scale the item were rated from "strongly disagree" (1) to "strongly agree" (5). The eighth part, deals with mathematics facility. It has six (6) statements responded by students using a five-point Likert-scale, the items were rated from "strongly disagree" (1) to "strongly agree" (5).The part of the questionnaire which deals student teacher motivation. This part was made up of thirteen (13) statements, for which the students were asked to express their level of agreement or disagreement using a five-point Likert-scale the were rated from "strongly disagree" (1) to "strongly agree" (5). The part of the questionnaire which dealt with students' perception about mathematics with ten (10) statements. The students were made to rate their level of agreement and disagreement to statements.

disagreement using a five-point Likert-scale the were rated from “strongly disagree” (1) to “strongly agree” (5).

3.6 Validity and Reliability

The data collected were appropriately coded to make analyses easy and simple to handle. To check for validity and reliability of the questionnaire, test of Cronbach’s alpha was performed. To ensure that the instrument was valid for the study. The instrument was given to expert in mathematics education to ensure content validation. A pilot study was conducted using 100 post senior high school students who were in their first year in the University of Education –Kumasi to obtain a generic overview (that is, the pros and cons before the main study was carried out).The post-secondary school students was used because they have experienced in full mathematics teaching and learning in the secondary school and they may have expect views with problems associated with mathematics. Validity determines whether the research truly measures what it was intended to measure or how truthful the research results are (Becker, Woerner, Hasselhorn, Banaschewski, & Rothenberger, 2004). Face validity ascertains that the measure appears to be assessing the intended construct under study. Sampling validity (similar to content validity) ensures that the measure covers the broad range of areas within the concept under study. This study examined both content validity and construct validity. With content validity, the instrument was given to experts in mathematics education for review. This was the first point in my validity test on my instrument for data collection. Finally, construct validity were checked for the constructs to be included in the model, they included discriminant validity and convergent validity.

Reliability is the extent to which results are consistent over time and an accurate representation of the total population under study, and if the results of a study can be reproduced under a similar methodology, then the research instrument is considered to be reliable (Yavuz, Ozyildirim, & Dogan, 2012). Reliability is assurance that the research is enough true to believe in. The primary data is one of the main sources of information that improves the reliability of the research. Test-retest reliability is a measure of reliability obtained by administering the same test twice over a period of time to a group of individuals. The scores from both tests can then be correlated in order to evaluate the test for stability over time. Inter-rater reliability is a measure of reliability used to assess the degree to which different judges or raters agree in their assessment decisions. In this study, the internal consistency reliability was used and the Cronbach's alpha value for all constructs computed and presented. The study investigated the reliability of the instruments for the individual construct as well as the overall measure of reliability for the entire instruments; the constructs and their respective Cronbach's alpha together with the number of measurement for each construct are indicated in Table 1

Table 2 Test of Reliability Statistics

Constructs	Cronbach's Alpha	Number Of Items
Instructor Quality and Availability	0.699	8
Mathematics Connections	0.692	6
School Leadership	0.599	8
Mathematics Facilities	0.701	6
Mathematics Interest Variables	0.815	11
Students Interest	0.741	4
Teachers Teaching Methods	0.59	10
Students Background	0.765	8
Student and Teacher Motivation	0.676	13
Total Constructs Reliability	0.939	84

The items used in the study were self -designed, with a minimum Cronbach's alpha reliability coefficients, of approximately 0.6, they are fairly reliable for self-constructed instruments.(Chen, Darst, & Pangrazi, 1999; Cronbach, 1951; Primi, Busdraghi, Tomasetto, Morsanyi, & Chiesi, 2014). To conclude, it would be noted that this study has high level of validity and reliability because for a test to be reliable, it also needs to be valid (Williams & DeSteno, 2008).

3.7 Data collection

The study used survey approach to obtain primary data using designed questionnaires administered to respondents from the randomly selected participating senior high schools in Ghana. The multi-stage sampling techniques were used. The first stage was to put the school into their grading categories, namely categories A, B and C. The school in these clusters was randomly selected using simple random sampling technique. The next stage of the sampling was the selection of the programme to be selected using simple random sampling. The final stage of the sampling was selection of the students from their course areas to be included in the survey which was also accomplished using simple random sampling technique. The self-administered questionnaires were filled during mathematics lesson through the help of mathematics teachers as field assistant

3.8 Data Analysis Procedure

The second generational smart partial least square (PLS) and statistical package for service solutions (SPSS) were adopted to analyze the data collected to facilitate accuracy. The data collected were analyzed and the findings presented using tables and diagrams to establish relationships that existed among the variables.

3.9 Statistical Methods and Packages

The study utilized both descriptive and inferential statistical techniques. The descriptive statistical techniques include tables, charts, and descriptive measures such as mean and standard deviation. The study further used inferential statistical analysis such as correlation analysis, regression analysis as well as chi-square test of independence. The study also used logistic regression analysis to model the effect of other factors on the determination of the students' interest in mathematics. In addition to these statistical techniques, the study also employed the multivariate statistical analysis such as principal component analysis. The statistical analysis of this study was performed using statistical package for service solution (SPSS) as well as Smart PLS second generation path modeling statistical software package 3 for Structural Equation Modeling (SEM) technique.

3.9.1 Scope of Statistical Analysis

The data analysis was divided into four parts. The first part used descriptive statistics such as tables, charts, percentages, mean, standard deviation and relative importance index to summarize the data. The second part used Chi-square test of independence to assess whether or not students interest in mathematics is depends on some variables. Base on the findings from the chi-square test of independence, a binary logistic regression analysis was undertaken using the students' interest in mathematics as dependent variable. The third part used the principal component analysis (PCA) to determine the constructs that significantly on the various construct under investigation believed to influence students' interest in mathematics. Multiple linear regression analysis was used to model students' interest in mathematics based on both students and teacher oriented factors under study. The regression model was used to access the individual and overall contribution of the factors under study. The statistical package, Smart PLS version 3.0, was finally used to undertake the structural equation modeling of the various construct under study to ascertain their effect and significance in determining students' interest in mathematics.

3.10 ` Statistical Product and Service Solutions (SPSS)

Statistical Product and Service Solutions (SPSS), formerly Statistical Package for the Social Sciences, is an integrated system of computer programs designed for the analysis of social sciences data. It is one of the most popular of the many statistical packages currently available for statistical analysis. Its popularity stems from the fact that SPSS holds the following features

- It allows for a great deal of flexibility in the data format.
- It provides the user with a comprehensive set of procedures for data transformation and file manipulation.

- It offers the researcher a large number of statistical analyses processes commonly used in social sciences.(Anthony, 2010; Gigliotti, 2007).

Due to the ease of use both beginners and advanced researchers sees SPSS as an indispensable tool. Not only is it an extremely powerful program, it is also relatively easy to use once the researcher has been taught the rudiments. The Windows version of SPSS has introduced a point-and-click interface that allows the researcher to merely point-and-click through a series of windows and dialog boxes to specify the kind of analysis required and the variables involved. The current study made use of the SPSS in parts of its statistical analysis (Ho, 2006; Anthony, 2010; Gigliotti, 2007).

3.11 Partial Least Square (PLS) –Structural Equation Model (SEM)

The use of partial least square (PLS) path model has gained much popularity nowadays in most business marketing research as well as mathematics education (Richard P. Bagozzi & Yi, 2012; C. M. Ringle, Wende, & Becker, 2015). This may be due to the essential characteristics of PLS Path Modeling and its ability to investigate the effects of changes in the model specification as well as the weakness of the covariance based structural equation modeling (CB-SEM)(Hair, Hult, Ringle, & Sarstedt, 2014; Henseler, Ringle, & Sinkovics, 2009).

The PLS Path Modeling has been popular due to the ease of its ability to handle complex problems or small sample size. The PLS Path Model uses soft assumptions that gives its serious advantages over the covariance based SEM. The PLS Path Modeling may also be used when the study consist of complex models containing many latent (Coelho & Henseler, 2012; Henseler et al., 2009). The study by Hair, Sarstedt, and Ringle, 2012 explains that the PLS-SEM can be used without the assumption of normality where small sample size is applicable. The study further explained that it is the preferred alternative with formative construct with the assumptions that all variances including errors is useful for explanation prediction of the causal relationship. Based on the foregoing discussion on the use of the PLS Path Modeling, this study used the PLS Path Modeling techniques to construct student oriented model, teacher oriented model and combined model of students interest in mathematics.

CHAPTER FOUR

RESULTS

4.0 Overview

This chapter presents the data analysis and presentation of results of the study. The research questions are presented first, followed by the demographic characteristics of the samples selected. The first three components of the statistical analysis were implemented using statistical package for social scientists (SPSS) while the final part of the data analysis was performed using smart PLS. Microsoft Excel and Microsoft Word were used for the tables and editorial works.

The following research questions were investigated

i. Which students-oriented factors have influence on students' interest in mathematics?

ii. Which teacher-oriented factors have influence on students' interest in mathematics?

iii. Which student-teacher oriented factors significantly predict students' interest in mathematics?

iv. To what extent does career interest influence students' interest in Mathematics?

4.1 Response rate of Questionnaire

The study presented 1,500 questionnaires in all to ten (10) senior high schools in the Ashanti Region representing a sample size of 1500 students. Each school was given questionnaires proportionate to the total questionnaires to administer to the students. Completely filled questionnaires were 1,263, representing 84.2% response rate.

4.2 Respondent' Demographic Characteristics

The first section of the study focused on the demographic characteristics of the sampled students, which included gender, age, type of basic school attended, the grade of secondary school and the class of the respondents they are currently enrolled. The discussion of the demographic characteristics is presented in the tables below.

Table 3 Respondents' Gender

Response Categories	**Frequency**	**Percent**
Male	551	43.6
Female	700	55.4
No Response	12	1
Total Respondents	1263	100

Table 3 presents the gender of respondents' for which 551(44%) of the valid respondents were males and 700(56%) of the valid respondents were females but 12(1%) of the total respondents did not indicate their gender

Table 4 Respondents' Age

Response Categories	**Frequency**	**Percent**
14 – 16	238	18.8
17 – 19	566	44.8
20 – 22	294	23.3
23 and above	156	12.4
No Response	9	0.7
Total Respondents	1263	100

Table 3 presents the age categories of the respondents. The total respondents for the age category were 1263. Out of the total respondents', 238 (19%) were within the age bracket of 14-16 years, 566 (45%) of the valid respondents were within the age bracket of 17-19 years, 294 (24%) of the valid respondents were found to belong to the age bracket of 20-22 years, while 156 (13%) of the respondents were found to be 23 years and above but 9 (0.7%) of the total respondents' did not respond to the question of the age categories.

Table 5 Respondents' Basic School Attended

Response Categories	Frequency	Percent
Public School	692	54.8
Private School	526	41.6
No Response	45	3.6
Total Respondents	1263	100

Table 5 describes the basic school attended by the respondents'. Out of the 1263 total respondents, 692 (56.8%) attended public school and 526 (43.2%) of the total respondents' attended private basic schools. The study, however, observed that 45 (3.6%) of the respondents' did not respond to the type of basic school the student attended as indicated in Table 4.

Table 6 Respondents' grade of secondary school

Response Categories	Frequency	Percentage
Grade A School	554	43.9
Grade B School	546	43.2
Grade C School	156	12.4
No Response	7	0.6
Total Respondents	1263	100

Table 6 describes the grade of secondary school attended by the respondents. Out of the 1263 total respondents, 692 (56.8%) attended public school and 554 (43.9%) of the total respondents' attended grade A schools. The study, however, observed that 546 (43.2%) total respondents' attended grade B schools.

Table 7 Respondents' Programme of Study

Response Categories	Frequency	Percentage
General Art	230	18.2
Visual Art	111	8.8
Science	575	45.5
Business	204	16.2
Home Economics	137	10.8
No Response	6	0.5
Total Respondents	1263	100

Table 7 present the programme of study by respondents. The result of the study showed that 575(45.7%) of the total valid respondents were from the science class 204(16.2%) were business students 230(18.8%) were general art students, 137(10.8%) were home economics students while 111(8.8%) of the valid respondents were from the visual art class.

Table 8 Respondents' Class Level

Response Categories	Frequency	Percentage
S H S 1	200	15.8
S H S 2	298	23.6
S H S 3	712	56.4
No Response	53	4.2
Total Respondents	1263	100

Table 8 describe the class level of the study respondents', it was revealed that more than 50% of the participant from the form three and close to 24% of from the form two classes and 16.5% were first year students. The third years were more than half the entire sample because they have spent enough time going through a number of mathematical topics.

Table 9 Respondents' Enjoyment of Mathematics

Response Categories	Frequency	Percentage
Yes	927	73.4
No	248	19.6
No Response	88	7
Total Respondents	1263	100

Table 9 describes whether the respondents enjoy learning mathematics during lessons or at their private studies. The result showed that over 70% of the students who participated indicated they enjoy mathematics; however, 21.1% of the valid respondents were of the opinion that they do not enjoy learning mathematics.

Table 10 Respondents' Basic School Mathematics Teachers' Motivation toward the subject

Response Categories	Frequency	Percentage
Yes	444	35.2
No	806	63.8
No Response	13	1
Total Respondents	1263	100

Table 10 describes the fear imposed on students by mathematics teachers during mathematics lessons. The result from the field survey indicated that, 64.5% of the valid respondent were of the opinion that they were not scared by their basic school mathematics teachers during mathematics lessons, however, the study revealed further that 35% of the respondent were of the view that the basic school mathematics teachers scared them during mathematics lessons.

Table 11 Respondents' Parents Highest Qualification

Response Categories	Frequency	Percentage
Uneducated	139	11
'O' or 'A' Level	303	24
Graduate	419	33.2
Others	386	30.6
No Response	16	1.3
Total Respondents	1263	100

Table 11 indicates the highest educational level of parents. The result revealed the close to 34% of the respondents' had parents who are graduates while 31% of the respondents had other qualification. Of note, 24% of the respondents had parent with O and A level certificate, while 11% were uneducated.

Table 12 Respondents' Parents Interest in Mathematics

Response Categories	Frequency	Percentage
Yes	649	51.4
No	116	9.2
Don't Know	479	37.9
No Response	19	1.5
Total Respondents	1263	100

Table 12 describes parents' interest in mathematics. The result revealed that 52% of the students were sure that their parents were interested in mathematics while 38.5% of the respondents' did not know if their parent were interested in mathematics. The study however found that 9% of the participant indicated that their parents were not interested in mathematics.

Table 13 Respondents' Parental Motivation to Study Mathematics at Home.

Response Categories	Frequency	Percentage
Yes	910	72.1
No	345	27.3
No Response	8	0.6
Total Respondents	1263	100

Table 13 presents investigation into whether the parent of the participating students motivates them in studying mathematics. The result indicated that 73% of the total respondents' have their parents motivating them in learning mathematics while 27% responded that their parents do not motivate them in learning mathematics.

Table 14 Respondents Mathematics Teachers' Discouragement

Response Categories	Frequency	Percentage
Yes	514	40.7
No	696	55.1
No Response	53	4.2
Total Respondents	1263	100

Table 14 examined the influence of mathematics teachers in discouraging student in learning mathematics. The result revealed that 42.5% of the valid respondent said their mathematics teachers discourage them in learning mathematics while 57.5% of the valid respondents said their mathematics teacher does not discourage them in learning mathematics.

Table 15 Respondents Agent of Motivation to Study Mathematics

Response Categories	Frequency	Percentage
Parent	351	27.8
Teachers	644	51
Friends	244	19.3
No Response	24	1.9
Total Respondents	1263	100

Table 15 presents the agents of students' motivation. The result revealed that teachers are the greatest agent of students' motivation in learning mathematics (52%) followed by parent (28.3%) and finally friends which represent 19.7% total respondents.

Table 16 Respondents Compulsion in studying Mathematics

Response Categories	Frequency	Percentage
Yes	749	59.3
No	499	39.5
No Response	15	1.2
Total Respondents'	1263	100

Table 16 presented the compulsion in learning mathematics. The investigation into the effect of compulsion in studying mathematics revealed that 60% of the valid respondents' learn mathematics in the senior high schools because it is a compulsory subject. However, the study found 40% of the valid respondents' were of the view that if mathematics is not compulsory then they would not have taken it as a subject.

Table 17 Respondents' Interest in Mathematics as a Subject

Response Categories	Frequency	Percentage
Yes	983	77.8
No	267	21.1
No Response	13	1
Total Respondents	1263	100

Table 17 examined respondents'' interest in learning mathematics. The study accomplished the task by asking the respondents' question on whether they are interested in mathematics. It was found that 78.6% of the total respondents' expressed interest in mathematics while 21.4% informed the study of their dislike for mathematics as a subject.

4.3 Research Question 1: Which students-oriented factors have influence on students' interest in mathematics?

Research Question 1 focuses the extent to which student oriented factors influencing students' interest in mathematics. The study presented the findings by first discussing the descriptive analysis of the items making up the student oriented factors (Students' perception, Motivation, and background).The findings on structural equation model for students' oriented factors followed after the descriptive analysis.

4.3.1 Descriptive Statistical Analysis of Students' Perception Construct

The negative perception held by students in mathematics was subjected to scientific investigation to ascertain their influence on students' interest in mathematics. The student perception construct consisted of ten items. Respondents' responses on these are presented below.

Table 18 Descriptive Statistical Analysis of Students' Perception Construct

FACTORS	SD	D	N	A	SA	RII	M	SD
Negative perception of student from basic schools affects student interest in mathematics	11.2%	9.2%	21.6%	24.5%	33.5%	0.72	3.6	1.33
Misconception of about mathematics affects student interest in mathematics	5.6%	8.8%	27.2%	26.6%	31.8%	0.74	3.7	1.17
The time of the day in which mathematics is taught affects student interest in mathematics	5.7%	10.6%	31.9%	16.4%	35.4%	0.73	3.65	1.22
Students with bad perception about mathematics affects student interest in mathematics	5.6%	8.6%	25.8%	24.2%	35.8%	0.75	3.76	1.19
There are so many formulas in mathematics and that affect student interest in mathematics	8.1%	16.2%	30.6%	20.6%	24.4%	0.67	3.37	1.24
The complex nature of mathematics affects student interest in mathematics	8.4%	9.8%	29.9%	27.7%	24.2%	0.70	3.5	1.20
The students perception that mathematics is not enjoying affects student interest in mathematics	5.9%	17.4%	23.4%	27.8%	25.5%	0.70	3.5	1.21
Students feel they are not involved in the teaching and learning process	10.2%	27.2%	27.8%	21.3%	13.5%	0.60	3.01	1.20
Student attaches personal significance to the study of mathematics	8.4%	16.1%	35%	26.9%	13.6%	0.64	3.21	1.13
The students perception that only bright student can perform well in mathematics affects student interest in mathematics	8.1%	16.3%	24.2%	21.1%	30.3%	0.70	3.49	1.29

Table 18 investigated the effect of negative perception students have about mathematics from basic school on their interest in mathematics. The result from the descriptive analysis indicated that approximately 20.4% of the total respondents cumulatively disagree with the statement negative perception of mathematics by students from basic schools affects students' interest in mathematics. The study found 58.1% of the total survey respondents cumulatively agree to the statement 'negative perception of mathematics by students from basic schools affect student interest in mathematics' .The study however found that 21.6% of the total surveyed respondents neither agree nor disagree with the statement 'negative perception of mathematics by students from basic schools affect student interest in mathematics',. The assessment of the relative importance index of the statement 'negative perception of mathematics by students from basic schools affect student interest in mathematics 'was found to be 0.72.

Similar investigation was conducted on the effect of misconception about mathematics on students' interest in mathematics. The result from the survey indicated that approximately 14.4% of the total respondents cumulatively disagree with the statement 'Misconception about mathematics affect students' interest in mathematics' The study found 58.4% of the total survey respondents cumulatively agree to the statement 'Misconception about mathematics affect students' interest in mathematics'. The study however found that 27.2% of the total surveyed respondents neither agree nor disagree with the statement 'negative perception of mathematics by students from basic schools affect students' interest in mathematics'. The assessment of the relative importance index of the statement 'Misconception about mathematics affect students' interest in mathematics' was found to be 0.74.

The study also explored the students' perception about the time of the day in which mathematics is taught and how it affects students' interest in mathematics. The result from the surveyed data showed that, 16.3% of the total respondents cumulatively disagree with the students' perception that the time of the day in which mathematics is taught and how it affects students' interest in mathematics. The study result further revealed that 57.8% of the total surveyed respondents disagree with the perception that, the time of the day in which mathematics is taught and how it affects students' interest in mathematics. It was very interesting to note that 31.9% of the total respondents neither agree nor disagree on this perception by students. The assessment of the relatively importance index of the perception that the time of the day in which Mathematics is taught affects student interest in mathematics is found to be 0.73. The study also explored the 'students with bad perception about mathematics affects student interest in mathematics. The result from the surveyed data showed that, 14.2% of the total respondents cumulatively disagree with the students'. Students with bad perception about mathematics affect student interest in mathematics. The results further revealed that 60% of the total surveyed respondents agree with the perception that, 'Students with bad perception about mathematics affects students' interest in mathematics' It was very interesting to note that 25.8% of the total respondents neither agree nor disagree on this perception by students. The assessment of the relatively importance index of the perception that the 'Students with bad perception about mathematics affects student interest in mathematics' is found to be 0.75.

The perception of the student that 'there are so many formulas in mathematics and that affect student interest in mathematics was explored and the following results were obtained, 45% of the total respondents cumulatively agree with the perception that 'there are so many formulas in mathematics and that affect student interest in mathematics'. The study result further revealed that 24.3% of the total surveyed respondents disagree with the perception that, 'there are so many formulas in mathematics and that affect student interest in mathematics' It was very interesting to note that 30.6% of the total respondents neither agree nor disagree on this perception by students 'there are so many formulas in mathematics and that affect student interest in mathematics' The assessment of the relatively importance index of the perception that the 'there are so many formulas in mathematics and that affect student interest in mathematics' is found to be 0.67.

Furthermore, the study explored the perception of the student that 'the complex nature of mathematics affects student interest in mathematics'. The result from the surveyed data showed that, 51.9% of the total respondents cumulatively agree with the perception that 'the complex nature of mathematics affects student interest in mathematics'. The study result further revealed that 18.2% of the total surveyed respondents disagree with the perception that, 'the complex nature of mathematics affects student interest in mathematics' It was very interesting to note that 29.9% of the total respondents neither agree nor disagree on this perception by students 'the complex nature of mathematics affects student interest in mathematics' The assessment of the relatively importance index of the perception that the 'the complex nature of mathematics affects student interest in mathematics' is found to be 0.70.

Moreover, the research explored the perception that 'the student perception that mathematics is not enjoying affects student interest in mathematics'. The result from the surveyed data showed that, 53.3% of the total respondents cumulatively agree with the perception that 'the student perception that mathematics is not enjoying affects student interest in mathematics. The study result further revealed that 23.3% of the total surveyed respondents disagree with the perception that 'the student perception that mathematics is not enjoying affects student interest in mathematics'. It was very interesting to note that 23.4% of the total respondents neither agree nor disagree on this perception that 'the student perception that mathematics is not enjoying affects student interest in mathematics'. The assessment of the relatively importance index of the perception that the 'the student perception that mathematics is not enjoying affects student interest in mathematics' is found to be 0.70.

The research explored the perception that 'students feel they are not involved in the teaching and learning processes. The result from the surveyed data showed that, 37.4%

of the total respondents cumulatively disagree with the perception that 'students feel they are not involved in the teaching and learning process' but 34.8% of the total surveyed respondents agree with the perception that 'students feel they are not involved in the teaching and learning process'. It was very interesting to note that 27.8% of the total respondents neither agree nor disagree on this perception that 'students feel they are not involved in the teaching and learning process'. The study further examined the relative importance index of the perception that the 'Students feel they are not involved in the teaching and learning process' is found to be 0.60.

In addition, the study explored the perception that 'Student attaches personal significance to the study of mathematics' which basically affect the interest of mathematics. The result from the surveyed data showed that, 40.5% of the total respondents cumulatively agree with the perception that 'Student attaches personal significance to the study of mathematics'. The study result further revealed that 24.5% of the total surveyed respondents disagree with the perception that 'Student attaches personal significance to the study of mathematics'. It was very interesting to note that 35% of the total respondents neither agree nor disagree on this perception that 'Student attaches personal significance to the study of mathematics'. The assessment of the relatively importance index of the perception that 'Student attaches personal significance to the study of mathematics' is found to be 0.64.

The study further explored that 'the student perception that only bright student can perform well in mathematics affects student interests' in mathematics'. The outcome from the surveyed data showed that, 51.4% of the total respondents cumulatively agreed that 'the student perception that only bright student can perform well in mathematics affects student interest in mathematics'. The study result further revealed that 24.4% of the total surveyed respondents disagree that 'the student perception that only bright student can perform well in mathematics affects student interest in mathematics'. It was very interesting to note that 24.2% of the total respondents neither agree nor disagree on this perception that 'the student perception that only bright student can perform well in mathematics affects student interest in mathematics'. The assessment of the relatively importance index of the perception that 'the student perception that only bright student can perform well in mathematics affects student interest in mathematics is found to be 0.70.

4.3.2 Descriptive Statistical Analysis of Motivation Measurements

The student motivation as a construct that influence students' interest in mathematics was examined in this section. Respondents' responses on a five point Likert scale items are presented below. The results are presented below.

Table 19 Descriptive Statistics on motivation

FACTORS	SD	D	N	A	AS	RII	M	SD
Students are motivated to have sense of control	12.2%	16.4%	33.4%	23.4%	14.6%	0.67	3.33	1.17
Students are given challenging activities during and after lessons	11.3%	22.7%	27.7%	19%	19.3%	0.67	3.36	1.21
Students are made to understand the importance of the topics being taught	9.6%	14%	25.6%	22.6%	28.2%	0.66	3.32	1.25
Students' curiosity is provoked by teachers or academic mentors	8%	11.7%	30.3%	34.6%	15.4%	0.62	3.12	1.21
Teachers are not motivated by school leadership	10%	17.9%	16.6%	34.3%	21.2%	0.62	3.18	2.09
Government policy in education does not motivate teachers	8.6%	11.5%	22.2%	31.9%	25.8%	0.69	3.49	1.75
Students develop self-concept and motivation during lessons	12.2%	16.5%	33.4%	23.4%	14.6%	0.68	3.38	1.12
Students spend less time solving mathematics problems during or after lessons.	11.3%	22.8%	27.7%	19%	19.3%	0.68	3.43	1.90
Students are motivated to work extra after mathematics class	9.6%	14%	25.6%	22.6%	28.1%	0.71	3.55	1.23
Low level of interest in mathematics by students does not motivate them to work hard in mathematics	8%	11.7%	30.3%	34.6%	15.4%	0.75	3.77	1.21
Students are not motivated by their mathematics teachers	13.4%	18.1%	32%	20.5%	16%	0.61	3.07	1.25
Teachers are not accessible to students after mathematics lesions	10.5%	15.7%	20.7%	33.3%	19.9%	0.67	3.36	1.25
Teachers teach well in their private lessons as compared to the normal classes	7.6%	14.3%	16.9%	23.1%	38.1%	0.74	3.7	1.31

Table 19 indicates descriptive analysis of motivational factors from both students and teachers that turn to influence students' interest in mathematics. The effects of these factors are discussed below.

The study examined whether students are motivated to have sense of control during mathematics lessons, the results revealed that approximately 29% of the valid respondents cumulatively disagree that student have sense of control during mathematics lessons, 34% neither agree nor disagree, however, approximately 38% of the valid respondents cumulatively agree to the statement that students have sense of control during mathematics lessons. The study also found the relative importance index of the statement to be 0.67.

The study also investigated whether students are given challenging activities during and after mathematics lessons.it was found that, cumulatively 34% of the valid respondents disagree with the statement that students were given challenging activities during and after mathematics lessons, 28% of the valid respondents neither agree nor disagree, but 38% of the total valid respond cumulatively agree with the fact that students are given challenging activities during and after lessons. The study further examined the relative importance index of the statement as 0.67

The study investigated whether students are made to understand the importance of the concepts being taught, out of the total valid respondents, approximately 24% cumulatively disagree to the fact that students are made to understand the concepts been taught, 26% of the respondents neither agree nor disagree however approximately 50% of the total valid respondents cumulatively agree to the fact that students are made to understand the concepts been taught. The study further examined the relative importance index of the statement as 0.66.

In examining whether students' curiosity is provoked by teachers or academic mentors during and after mathematics lessons, it was indicated that approximately 20% of the total valid respondents cumulatively disagree to the fact that their curiosity is provoked by mathematics teachers, 30% of the respondents neither agree nor disagree but almost 50% of the respondents cumulatively agree with the fact that students curiosity is provoked by their mathematics teachers and academic mentors. The study further examined the relative importance index of the statement as 0.62.

The study also investigated that 'teachers are not motivated by school leadership'. It was found that approximately 28% cumulatively of the valid respondents disagree with the statement that 'teachers are not motivated by school leadership'. Approximately 17% of the valid respondents neither agree nor disagree, but approximately 55% cumulatively of the total valid respondents agree with the fact that 'teachers are not motivated by school leadership'. The study further examined the relative importance index of the statement that 'teachers are not motivated by school leadership' is found to be 0.62.

The study also investigated that 'Government policy in education does not motivate teachers'. It was found that approximately 20% cumulatively of the valid respondents disagree with the statement that 'Government policy in education does not motivate teachers'. Approximately 22% of the valid respondents neither agree nor disagree, but approximately 58% cumulatively of the total valid respondents agree with the fact that 'Government policy in education does not motivate teachers'. The study further examined the relative importance index of the statement that 'Government policy in education does not motivate teachers' is found to be 0.69.

The study also investigated that 'students develop self-concept and motivation during lessons. It was found that approximately 29% cumulatively of the valid respondents disagree with the statement that 'students develop self-concept and motivation during lessons'. Approximately 33% of the valid respondents neither agree nor disagree with the statement that 'students develop self-concept and motivation during lessons'. The results also revealed that approximately 38% cumulatively of the total valid respondents agree with the fact that 'students develop self-concept and motivation during lessons'. The study further examined the relative importance index of the statement that 'Students develop self-concept and motivation during lessons' as 0.68.

The research indicated that ‘students spend less time solving mathematics problems during or after lessons’ which directly affect the interest of student in mathematics. It was found that approximately 38% cumulatively of the valid respondents agree with the statement that ‘students spend less time solving mathematics problems during or after lessons.’ Approximately 28% of the valid respondents neither agree nor disagree with the statement that ‘students spend less time solving mathematics problems during or after lessons’. Also approximately 34% cumulatively of the total valid respondents disagree with the fact that ‘students spend less time solving mathematics problems during or after lessons’. The study further examined the relative importance index of the statement that ‘students spend less time solving mathematics problems during or after lessons’ as 0.68.

The research also indicated that ‘students are motivated to work extra after mathematics class’ which will build the interest and confidence level of student in mathematics. It was found that approximately 51% cumulatively of the valid respondents agree with the statement that ‘students are motivated to work extra after mathematics class. Approximately 25% of the valid respondents neither agree nor disagree with the statement that ‘students are motivated to work extra after mathematics class. Approximately 24% cumulatively of the total valid respondents disagree with the fact that ‘Students are motivated to work extra after mathematics class’. The study further examined the relative importance index of the statement that ‘Students are motivated to work extra after mathematics class’ as 0.71.

The research also indicated that ‘low level of interest in mathematics by students does not motivate them to work hard in mathematics’. It was found that approximately 50% cumulatively of the valid respondents agree with the statement that ‘low level of interest in mathematics by students does not motivate them to work hard in mathematics’. It was observed that 20% cumulatively of the total valid respondents disagree with the fact that 'low level of interest in mathematics by students does not motivate them to work hard in mathematics'. But approximately 30% of the valid respondents neither agree nor disagree with the statement that 'low level of interest in mathematics by students does not motivate them to work hard in mathematics'. The study further examined the relative importance index of the statement that 'low level of interest in mathematics by students does not motivate them to work hard in mathematics' as 0.75.

The research indicated that 'students are not motivated by their mathematics teachers' which directly affect the interest of student in mathematics. It was found that approximately 37% cumulatively of the valid respondents agree with the statement that 'students are not motivated by their mathematics teachers'. Approximately 32% of the valid respondents neither agree nor disagreed with that statement. Almost 31% cumulatively of the total valid respondents disagreed with the fact that 'students are not motivated by their mathematics teachers'. The study further examined the relative importance index of the statement that 'students are not motivated by their mathematics teachers' as 0.61.

The research indicated that 'teachers are not accessible to students after mathematics lesions' which affect the interest of student in mathematics. It was found that approximately 53% cumulatively of the valid respondents agree with the statement that 'teachers are not accessible to students after mathematics lesions'. Approximately 21% of the valid respondents neither agree nor disagree with that statement. Additionally approximately 26% cumulatively of the total valid respondents disagree with the fact that 'teachers are not accessible to students after mathematics lesions'. The study further examined the relative importance index of the statement that 'teachers are not accessible to students after mathematics lesions' as 0.67.

More so, the research indicated that 'teachers teach well in their private lessons as compared to the normal classes. It was found that approximately 61% cumulatively of the valid respondents agree with the statement that 'teachers teach well in their private lessons as compared to the normal classes'. Approximately 17% of the valid respondents neither agree nor disagree with that statement. And also approximately 22% cumulatively of the total valid respondents disagree with the fact that 'teachers teach well in their private lessons as compared to the normal classes'. The study further examined the relative importance index of the statement that 'teachers teach well in their private lessons as compared to the normal classes' as 0.74.

4.3.3 Descriptive Statistical Analysis of Measures on Student Background

This section presents the descriptive statistical analysis of students background construct. Respondents' responded to items on a five point Likert scale. The results are presented in Table 20

Table 20 Descriptive Statistical Analysis of Students Background Construct (SBC)

Construct variables	SD	D	N	A	SA	RII	M	SD
Previous educational background of the student affects their interest in mathematics	13.6%	17.7%	9.7%	23%	36.1%	0.70	3.5	1.46
Environment in which the student grew up affects his interest in mathematics	11.3%	13.1%	27.2%	23.7%	24.7%	0.67	3.37	1.29
The use of canes on student when they make mistakes in class affect their interest in mathematics	9.5%	9.1%	14.6%	22.9%	44%	0.77	3.86	1.75
Fear of making mistakes during mathematics lessons affect students' interest in mathematics as they move ahead in their education ladder	5.4%	7.9%	16.5%	36.3%	33.9%	0.77	3.85	1.13
Fear imposed on student by previous mathematics teachers	6.7%	8.6%	22.8%	22.2%	39.6%	0.76	3.8	1.24
Negative impression on student from basic school.	5.2%	9.6%	20.2%	28.6%	36.4%	0.76	3.85	1.8
Basic concepts in mathematics at the foundation level is taken for granted	13%	13.2%	26.1%	25%	22.7%	0.66	3.31	1.31
The health condition of the student may influence their interest in mathematics	13.7%	20%	13%	26.5%	26.8%	0.67	3.33	1.41

The study results in Table 20 describe the individual items as perceived by the respondents' to have effect on students' interest in mathematics. The study revealed that, students from backgrounds where caning became an option for correction when the students were wrong for solving mathematical problem or answering mathematics question affect their interest in mathematics. These results found 66.9% of the total respondents' to agree cumulatively that students with this background are greatly affected in mathematics performance and interest. The study further reveals that, the fear of student making mistakes in class during mathematics lesions also influence students interest in mathematics as the student progressed in their academic ladder. This study shows that student from educational background where teaching and learning is seen as master and servants have problems with mathematics as they progress in their academic ladder. The study considers the fear imposed by previous mathematics teacher as well as the negative impression about mathematic from the basic schools were the two the most negative influential factors that affects students interest in their upward progression in their academic ladder. The study found that all the factors contributed significantly and respondents' cumulatively agree to these factors as contributing to their interest or lack of interest in mathematics.

The result from the survey indicated that approximately 31.3% of the total respondents cumulatively disagree with the statement that 'previous educational background of the student affects their interest in mathematics'. And also the study found 59.1% of the total survey respondents cumulatively agree to the statement that 'previous educational background of the student affects their interest in mathematics'. The study however found that 9.7% of the total surveyed respondents neither agree nor disagree with the statement that 'previous educational background of the student affects their interest in mathematics'. The assessment of the relative importance index of the statement that 'previous educational background of the student affects their interest in mathematics' was found to be 0.70.

The result from the survey indicated that approximately 24.4% of the total respondents cumulatively disagree with the statement that 'environment in which the student grew up affects his interest in mathematics'. Further, the study found 48.4% of the total survey respondents cumulatively agree to the statement that 'environment in which the student grew up affects his interest in mathematics'. The study however found that 27.2% of the total surveyed respondents neither agree nor disagree with the statement that 'environment in which the student grew up affects his interest in mathematics'. The assessment of the relative importance index of the statement that 'environment in which the student grew up affects his interest in mathematics' was found to be 0.67.

Furthermore, the study from the survey indicated that approximately 18.6% of the total respondents cumulatively disagree with the statement that 'the use of canes on student when they make mistakes in class affects their interest in mathematics'. And also the study found 66.9% of the total survey respondents cumulatively agree to the statement that 'the use of canes on student when they make mistakes in class affect their interest in mathematics'. The study however found that 14.6% of the total surveyed respondents neither agree nor disagree with the statement that 'the use of canes on student when they make mistakes in class affects their interest in mathematics'. The assessment of the relative importance index of the statement that 'the use of canes on student when they make mistakes in class affect their interest in mathematics' was found to be 0.77. Furthermore, the study from the survey indicated that approximately 13.3% of the total respondents cumulatively disagree with the statement that 'fear of making mistakes during mathematics lessons affect students' interest in mathematics as they move ahead in their education ladder'. And also the study found 70.2% of the total survey respondents cumulatively agree to the statement that 'fear of making mistakes during mathematics lessons affect students' interest in mathematics as they move ahead in their education ladder'. The study however found that 16.5% of the total surveyed respondents neither agree nor disagree with the statement that 'fear of making mistakes during mathematics lessons affect students' interest in mathematics as they move ahead in their education ladder'. The assessment of the relative importance index of the statement that 'fear of making mistakes during mathematics lessons affect students' interest in mathematics as they move ahead in their education ladder' was found to be 0.77.

Moreover, the study from the survey indicated that approximately 61.8% of the total respondents cumulatively agree with the statement that 'fear imposed on student by previous mathematics teachers'. Of note, 15.3% of the total survey respondents cumulatively disagreed to the statement that 'fear imposed on student by previous mathematics teachers'. The study however found that 22.8% of the total surveyed respondents neither agree nor disagree with the statement that 'fear imposed on student by previous mathematics teachers'. The assessment of the relative importance index of the statement that 'fear imposed on student by previous mathematics teachers' was found to be 0.76.

In addition, it was observed that about 65% of the total respondents cumulatively agreed with the statement that 'negative impression on student from basic school' affect the interest of mathematics. The study found 14.8% of the total survey respondents cumulatively disagree to the statement that 'negative impression on student from basic school' affect the interest of mathematics. The study however found that 20.2% of the total surveyed respondents neither agree nor disagree with the statement that 'negative impression on student from basic school'. The assessment of the relative importance index of the statement that 'negative impression on student from basic school' was found to be 0.76.

The results further indicated that approximately 47.7% of the total respondents cumulatively agreed with the statement that 'basic concepts in mathematics at the foundation level are taken for granted' affect the interest of mathematics. It was also found 26.2% of the total survey respondents cumulatively disagree to the statement that 'basic concepts in mathematics at the foundation level is taken for granted' affect the interest of mathematics. It was found that 26.1% of the total surveyed respondents neither agree nor disagree with the statement that 'basic concepts in mathematics at the foundation level is taken for granted'. The assessment of the relative importance index of the statement that 'basic concepts in mathematics at the foundation level is taken for granted' was found to be 0.66.

Lastly, the survey further indicated that approximately 53.3% of the total respondents cumulatively agree with the statement that 'the health condition of the student may influence their interest in mathematics' affect the interest of mathematics. While 33.7% of the respondents disagreed to the statement that 'the health condition of the student may influence their interest in mathematics' affect the interest of mathematics. 13% of the respondents neither agreed nor disagreed with the statement. The assessment of the relative importance index of the statement that 'the health condition of the student may influence their interest in mathematics' was found to be 0.67.

4.3.4 Structural Equation Model for Student Oriented Factors

This section essentially presents the structural equation model for students' oriented factors. The study presents brief overview of structural equation model in the subsection.

4.3.4.1 Assessment of Measurement Models

The necessity of assessing the measurement model is absolutely essential since it provides thorough reliability and validity testing for the scales used in measuring the latent constructs as well as their manifest variables. The assessment of the measurement model involves a number of steps which includes initial principal component analysis and subsequently followed by assessment of convergent and discriminant validity as well as evaluation of measurements reliability.

4.3.4.2 Test of Instrument Validity and Reliability

In order to test for the construct reliability and validity, the study first used convergent and discriminant validity and it was followed finally by reliability test for the evaluation of the items (Rossiter, 2002).

4.3.4.3 Convergent validity

In order to ascertain for convergent validity, it is believed that indicators of the constructs should share a high propotion of variance (Hair el al., 2006). There are three criteria used for assessing the convergent validity, the factor loading, which should be greater than 0.50 (Hair et al., 2007), the composite reliability of the constructs, expected to exceed 0.7, and finally the average variance extracted (AVE), for which each construct is expected to be above the recommended cut-off of 0.50 (Fornell and Larker, 1981).

4.3.4.4 Discriminant Validity

The discriminant validity is the next construct validation process. With discriminant validity, the extent to which the measure is unique and not simply reflects other variable has been documented (Peter & Churchill 1986). It is further explained that each construct dimension should be unique and different from the other although each dimension reflects a portion of that construct. In the determination of discriminant validity, the AVE is key and the most common method used(Bagozzi & Yi, 2012; Henseler & Chin, 2010). The evaluation of the discriminant validity could also be achieved by examining the cross loadings of each of the indicators in the construct as well as the square root of the AVE calculated for each construct. It is expected that all items should have higher cross loadings on their corresponding construct as compared to the cross loading on the other constructs in the model. The square root of AVE for all factors is expected to be greater that the correlations between the constructs and other constructs.

4.3.4.5 Construct item Reliability

The test of constructs item reliability is the final step in the determination of construct validity. The reliability of the instrument is crucial because it provides the degree to which a set of measures are internally consistent and the instrument will yield the same results on repeated trials. The study by (Hair et al., 2012) posits that reliability of a construct is necessary but it is not a sufficient condition for validity and argued further that measures with high reliability may not be valid in measuring the constructs importance. This further indicates that if indicators are reliable then it should measure the same construct. The composite alpha is the measure of internal consistency or composite reliability and the construct reliability coefficients should be greater than or equal to 0.7; however, other studies suggest 0.5 for newly designed constructs (Bagozzi & Yi, 2012; Nunnally & Lemond, 1973; Parasuraman, Zeithaml, & Berry, 1985)

4.3.5 PLS-SEM Estimation Results with Smart PLS

The focus of this study is explaining the endogenous construct using the variance based -partial least square (VB-PLS) analysis as a preferred method of analysis. The study used the PLS-SEM since the PLS understands the latent variable as weighted sums of their respective indicators and further attempts to predict values for the latent constructs by using multiple linear regression.

The study applied no standardization to the data collected but rather, PLS model estimations were all performed using Smart PLS with the original dataset. The study used t-test method to test whether path coefficients differ significantly from zero. The bootstrap procedure was used to calculate all t-values for the test of significance for the constructs. The study used bootstrap sample of 5,000 instead of original samples of 1,263 from the survey. The study reported both the PLS-algorithm results and the bootstrap results.

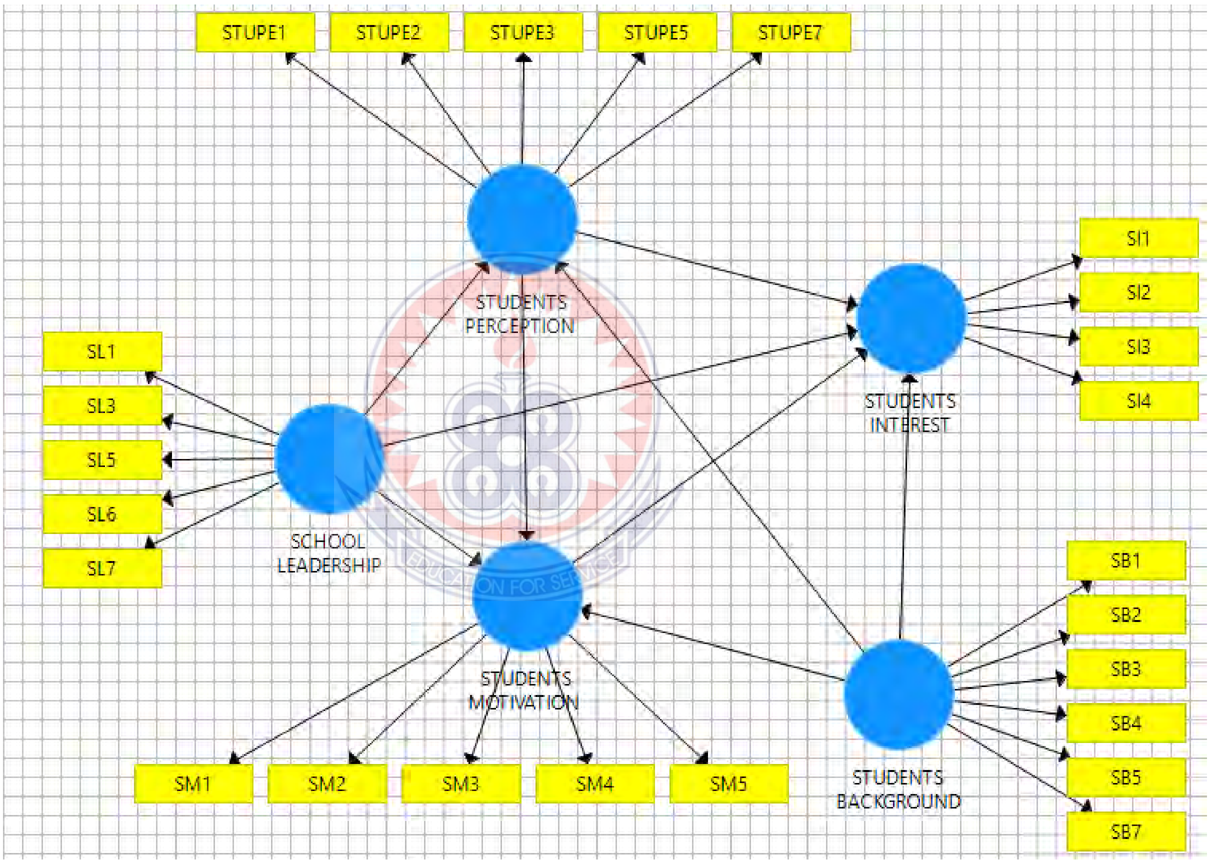

Figure 3 Student Oriented Conceptual Mathematics Interest Model (SOCMIM)

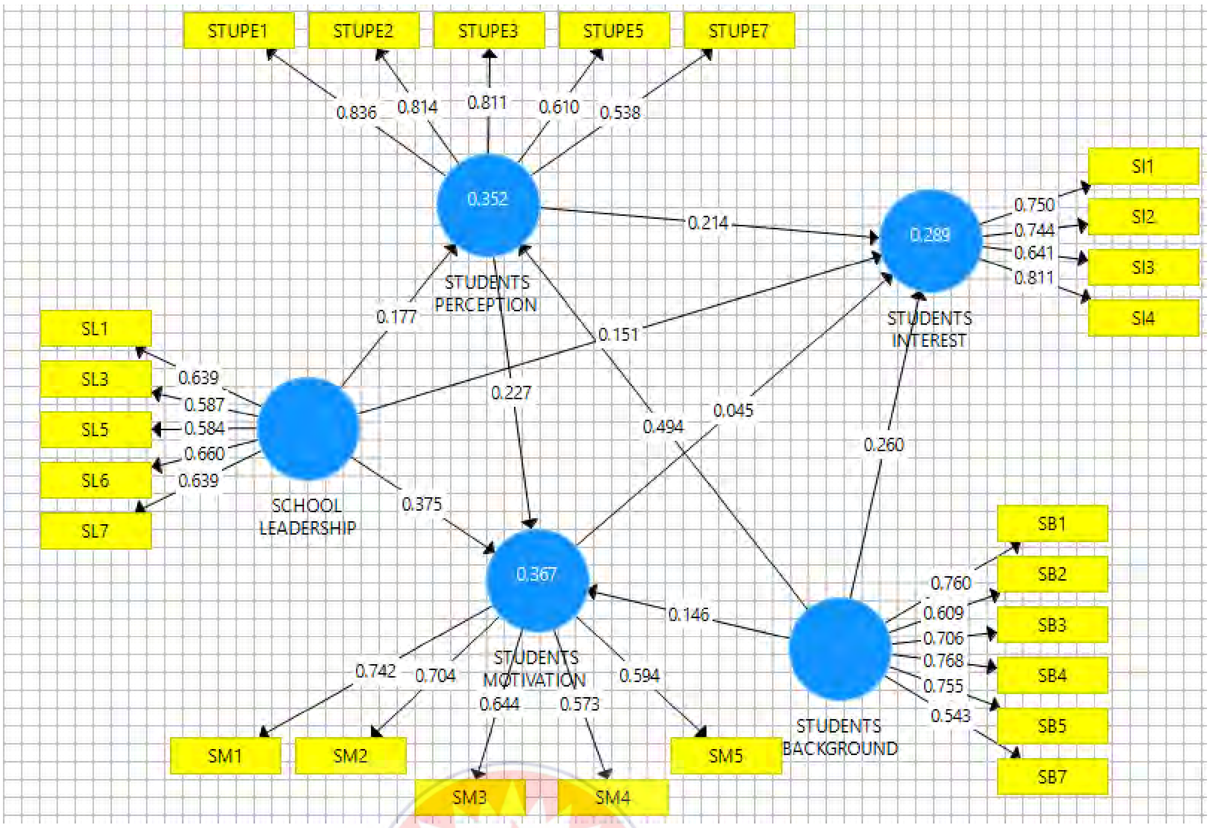

Figure 4 Student Oriented Empirical Mathematics Interest Model (SOEMIM)

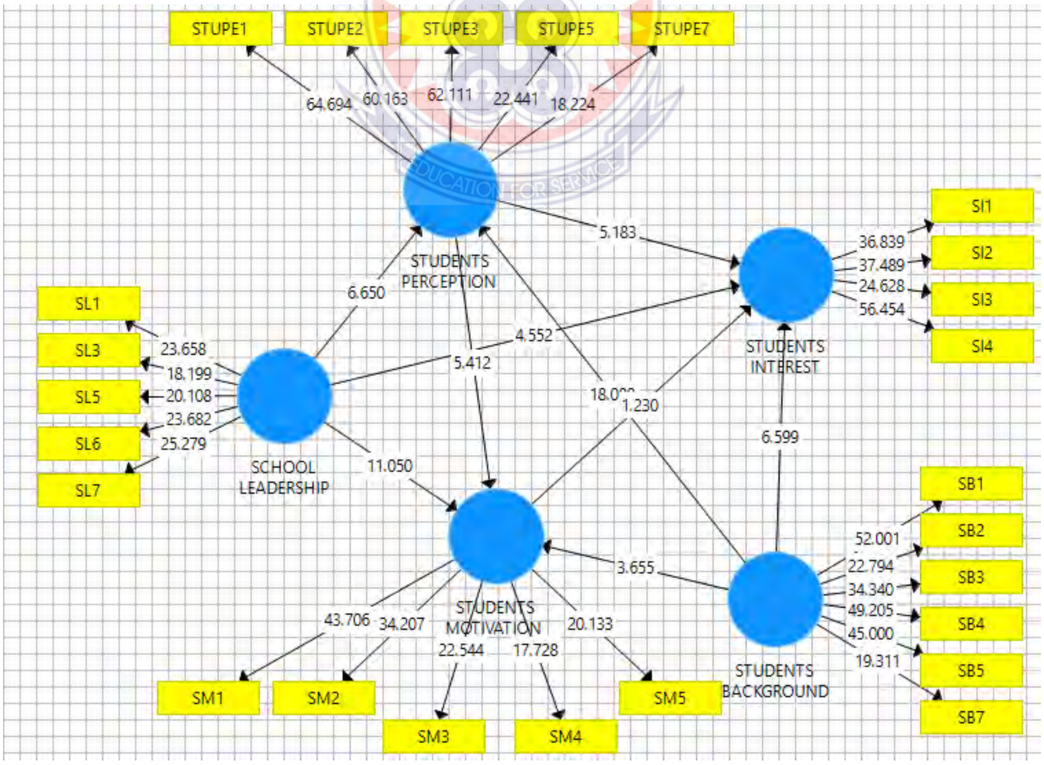

Figure 5 Student Oriented Empirical Mathematics Interest Model (SOEMIM)

Table 21 Path coefficients for student factor oriented SEM

CONSTRUCTS	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
SCHOOL LEADERSHIP -> STUDENTS INTEREST	0.151	0.151	0.033	4.552	0.000
SCHOOL LEADERSHIP -> STUDENTS MOTIVATION	0.375	0.376	0.034	11.050	0.000
SCHOOL LEADERSHIP -> STUDENTS PERCEPTION	0.177	0.178	0.027	6.650	0.000
STUDENTS BACKGROUND -> STUDENTS INTEREST	0.260	0.259	0.039	6.599	0.000
STUDENTS BACKGROUND -> STUDENTS MOTIVATION	0.146	0.148	0.040	3.655	0.000
STUDENTS BACKGROUND -> STUDENTS PERCEPTION	0.494	0.494	0.027	18.080	0.000
STUDENTS MOTIVATION -> STUDENTS INTEREST	0.045	0.047	0.037	1.230	0.219
STUDENTS PERCEPTION -> STUDENTS INTEREST	0.214	0.215	0.041	5.183	0.000
STUDENTS PERCEPTION -> STUDENTS MOTIVATION	0.227	0.226	0.042	5.412	0.000

Table 21 presents path coefficients with their corresponding t-values and ps. The results from the data analyzed indicate that, the path coefficient from students' motivation to students' interest is 0.045, which is not significant at 5%. The study further states that the path coefficient from school leadership to students' interest (0.151, $p<0.05$) and the remaining path coefficients were all significant at 5%.

Table 22 Endogenous Variables Explained Variance

R Square

	R Square	R Square Adjusted
STUDENTS INTEREST	0.289	0.286
STUDENTS MOTIVATION	0.367	0.366
STUDENTS PERCEPTION	0.352	0.351

For the prediction of the endogenous variables, the study predicted and explained 28.6% of the total variance in students' interest in mathematics, predicted and explained 36.6% of the total variance of students' motivation for studying mathematics and finally predicted and explained 35.1% of the total variance of students' perception about mathematics. In all the total variance explained by students' interest in mathematics, students' motivation in studying mathematics as well as students' perception for studying mathematics in were significant at 5% as shown in Table 22.

Table 23 R-Square Quality Criteria Test of Significance

CONSTRUCTS	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
STUDENTS INTEREST	0.289	0.293	0.025	11.769	0.000
STUDENTS MOTIVATION	0.367	0.371	0.028	13.053	0.000
STUDENTS PERCEPTION	0.352	0.355	0.028	12.397	0.000

Table 24 Construct Reliability and Validity Test for SO-SEM

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
SCHOOL LEADERSHIP	0.605	0.604	0.759	0.388
STUDENTS BACKGROUND	0.783	0.802	0.847	0.484
STUDENTS INTEREST	0.724	0.750	0.827	0.546
STUDENTS MOTIVATION	0.669	0.669	0.788	0.429
STUDENTS PERCEPTION	0.774	0.805	0.849	0.536

The study examined both descriminant and convergent validity for construct and the extent to which the indicators measure the construct. The study used the cronbach's alpha, composite reliability and the average variance extracted for the test of convergent validity. The results from the study showed that using the cronbach's alpha test school leadership and students' motivation had cronbach alpha value below the acceptable value above 0.7, while student background, students' interest and students' perception have values above 0.7. Thus, per the cronbach's alpha criteria only three constructs were reliable.

The use of composite reliablity is assumed to be a better measure of composit reliablity as compared to the cronbach's alpha due to its conservative nature of the cronbach's alpha. The assessement of the composite alpha reliability values showed that all constructs proved reliable with composite alpha values above 0.7. The study finally used the average variance extrated (AVE) to assess the convergent validity. It was found that, only the students' interest construct and students' perception construct had values above the recommended cut-off of 0.5 as a proof of convergent validity.

Table 25 Average Variance Extracted Test of Significance for SOSEM

CONSTRUCT	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
SCHOOL LEADERSHIP	0.388	0.387	0.013	30.062	0.000
STUDENTS BACKGROUND	0.484	0.484	0.012	40.376	0.000
STUDENTS INTEREST	0.546	0.546	0.013	41.789	0.000
STUDENTS MOTIVATION	0.429	0.428	0.014	31.497	0.000
STUDENTS PERCEPTION	0.536	0.536	0.012	46.053	0.000

Table 26 Composite Reliability Test of Significance

CONSTRUCT	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P- Values
SCHOOL LEADERSHIP	0.759	0.759	0.010	75.543	0.000
STUDENTS BACKGROUND	0.847	0.847	0.006	133.086	0.000
STUDENTS INTEREST	0.827	0.827	0.008	107.106	0.000
STUDENTS MOTIVATION	0.788	0.787	0.010	82.459	0.000
STUDENTS PERCEPTION	0.849	0.849	0.006	132.363	0.000

Table 27 Significance Test for Cronbach's Alpha Reliability.

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P -Values
SCHOOL LEADERSHIP	0.605	0.603	0.021	28.279	0.000
STUDENTS BACKGROUND	0.783	0.783	0.010	74.636	0.000
STUDENTS INTEREST	0.724	0.724	0.014	49.974	0.000
STUDENTS MOTIVATION	0.669	0.668	0.018	37.858	0.000
STUDENTS PERCEPTION	0.774	0.774	0.011	68.648	0.000

Table 28 Fornell-Larcker Test for Discriminant Validity

	SCHOOL LEADERSHIP	STUDENTS BACKGROUND	STUDENTS INTEREST	STUDENTS MOTIVATION	STUDENTS PERCEPTION
SCHOOL LEADERSHIP	0.623				
STUDENTS BACKGROUND	0.443	0.696			
STUDENTS INTEREST	0.375	0.469	0.739		
STUDENTS MOTIVATION	0.530	0.442	0.338	0.655	
STUDENTS PERCEPTION	0.396	0.572	0.443	0.459	0.732

Table 29 Heterotrait-Monotrait Ratio (HTMT) Significant Test.

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
STUDENTS BACKGROUND -> SCHOOL LEADERSHIP	0.637	0.639	0.034	18.973	0.000
STUDENTS INTEREST -> SCHOOL LEADERSHIP	0.554	0.555	0.038	14.563	0.000
STUDENTS INTEREST -> STUDENTS BACKGROUND	0.590	0.589	0.035	16.826	0.000
STUDENTS MOTIVATION -> SCHOOL LEADERSHIP	0.834	0.835	0.040	20.698	0.000
STUDENTS MOTIVATION -> STUDENTS BACKGROUND	0.581	0.582	0.041	14.269	0.000
STUDENTS MOTIVATION -> STUDENTS INTEREST	0.459	0.460	0.041	11.066	0.000
STUDENTS PERCEPTION -> SCHOOL LEADERSHIP	0.574	0.574	0.039	14.590	0.000
STUDENTS PERCEPTION -> STUDENTS BACKGROUND	0.715	0.715	0.031	23.299	0.000
STUDENTS PERCEPTION -> STUDENTS INTEREST	0.570	0.570	0.037	15.210	0.000
STUDENTS PERCEPTION -> STUDENTS MOTIVATION	0.608	0.609	0.038	16.139	0.000

In assessing discriminant validity, which is way of validating the constructs and a measure of how unique is the constructs dimension and simply not reflecting other variables, the average variance extracted(AVE) is used. The AVE has been the most common method used for the determination of discriminant validity. Although the cross loadings can be used, this study used the AVE (Gerbing & Anderson, 1988). The result indicated that the square root of AVE for all factors greater than the correlations between the constructs and other constructs as indicated in Table 87, which proves the existence of discriminant validity. Furthermore, assessments of discriminant validity can be done better using the Heterotrait-Monotrait ratio (HTMT) since the use of Fornell-Larcker criteria is known to have some shortcomings. Using the HTMT method of assessing discriminant validity, it showed the existence of discriminant validity between the pair of constructs since the HTMT ratio for each pair of constructs has a value below 0.85 and significant.

Table 30 Student Oriented Model Heterotrait-Monotrait Ratio (HTMT)

	SCHOOL LEADERSHIP	STUDENTS BACKGROUND	STUDENTS INTEREST	STUDENTS MOTIVATION	STUDENTS PERCEPTION
SCHOOL LEADERSHIP					
STUDENTS BACKGROUND	0.637				
STUDENTS INTEREST	0.554	0.590			
STUDENTS MOTIVATION	0.834	0.581	0.459		
STUDENTS PERCEPTION	0.574	0.715	0.570	0.608	

Table 31 Student Oriented Model Fit Summary

	Saturated Model	Estimated Model
SRMR	0.079	0.105
d_ULS	2.019	3.614
d_G	0.436	0.479
Chi-Square	2,683.459	2,709.799
NFI	0.713	0.710

The study further measured the approximate fit of the model using the standardized root mean square residual (SRMR). The SRMR measures the difference between the observed correlation matrix and the model-implied correlation matrix. The lower the SRMR value the better. The results met cut-off point and thus it can be concluded that the model has a good fit since the value is less than 0.8.

Table 32 Standardized Root Means Square Residual Test of Significance

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P V
Saturated Model	0.079	0.047	0.001	80.722	0.
Estimated Model	0.105	0.049	0.001	80.829	0.

4.4 Research Question 2: Which teacher-oriented factors have influence on students' interest in mathematics?

The research question one find answers to the extent to which teacher oriented factors influence students interest in mathematics. The study presented the findings by first discussing the descriptive analysis of the items making up the teacher oriented factors(Instructor Quality and Availability, mathematics Connectivity , Mathematics

Facility, School Leadership).The results from the student oriented structural equation model is presented using tables and figures.

4.4.1 Descriptive Statistical Analysis of Instructor Quality and Availability Construct

Table 33 Descriptive Statistical Analysis of Instructor Quality and Availability Construct

Factor	SD	D	N	A	SA	RII	M	SD
Shortage of qualified mathematics teachers affects student interest in mathematics	9.3%	11.9%	14.3%	32%	32.5%	0.73	3.7	1.49
Bad teaching methods adopted by teachers affects student interest in mathematics	5.3%	8.7%	16%	24.6%	45.4%	0.79	4	2.08
Poor illustration methods adopted by teachers affects student interest in mathematics	5.8%	7.8%	21.2%	25.9%	39.2%	0.77	3.9	1.19
Lack of patience on the part of the teachers affects student interest in mathematics	7.8%	11.9%	10.6%	29.5%	4 0.2%	0.77	3.9	1.88
Lack of trained mathematics teachers affects student interest in mathematics	7.8%	11.9%	10.6%	29.5%	40.2%	0.77	3.8	1.29
Large students to teacher ratio affects student interest in mathematics	8.4%	14.7%	21.5%	32.3%	23.1%	0.69	3.6	2.41
Students are refreshed on their previous knowledge in mathematics	9.3%	13.6%	30.5%	31.2%	15.3%	0.66	3.3	1.79
Poor teaching strategies adopted by teachers affect students' interest in mathematics	7.2%	8.7%	16.3%	27.4%	40.3%	0.77	3.9	1.24

Table 33 investigated how shortage of qualified mathematics teachers affects students' interest in mathematics. The respondents' were made to respondent to a Likert scaled question as to whether shortage of qualified mathematics teachers affects students' interest in mathematics. The results of the study showed that, cumulatively (21.2%) of the total respondents' disagreed that shortage of qualified mathematics teachers affects their interest in mathematics. However, the study found greater proportion (64.5%) of the respondents' agrees to the fact that shortage of qualified mathematics teachers affects students' interest in mathematics. The study investigated the relative importance of the factor 'shortage of qualified mathematics teachers affects students' interest in mathematics' and found a relative importance index value of 0.73 which is good enough to give it a relatively good position in the factor ranking. The study also found out how bad teaching methods adopted by mathematics teachers negatively affects students' interest in mathematics. The respondents' were made to rank whether they agree or disagree with the statement that bad teaching methods adopted by teachers affects their interest in mathematics. The study found that, 70% of the total respondents' cumulatively agreed to the facts that bad teaching methods adopted by mathematics teachers affect their interest in mathematics. However, 14% and 16% of the respondents' disagreed and stayed indifferent, respectively about the effect of bad teaching methods on students' interest in mathematics. The relative importance index of 0.79 was found for the factor. The study found bad teaching methods adopted by mathematics teachers as the most important factor that affects their interest in the study of mathematics. To confirm the response by the respondents' on the effects of bad teaching methods adopted by mathematics teachers and their effect on their students' interest in mathematics, the study further required of the respondents to rank the effect of poor illustration methods adopted by mathematics teachers and their effect on students' interest in mathematics. The study found that, 65.1% of the total respondents' cumulatively agreed that poor illustration methods adopted by teachers negatively affect their interest in mathematics. Nonetheless, 13.6% of the total respondents' disagreed while 21.2% were neutral to the statement that poor illustration methods adopted by mathematics teacher affect their interest in mathematics. Moreover, the study found in advanced to the percentages the mean of 3.9 and standard deviation of 1.19 with relative importance index of 0.77. These results confirm that bad teaching methods negatively affect students' interest in mathematics as shown in Table 33.

The study further examined the effect of impatience of mathematics teachers and their effect on students' interest in mathematics. The study found that 69.7% of the respondents' agreed to the fact that lack of patience on the part of mathematics teacher will affect their interest in mathematics; nonetheless, 18.7% and 10.6% of the total respondents disagreed and neutral to the statement that lack of patience on the part of the teacher will negatively affect their interest in mathematics. The study also produced a mean of 3.9 and the standard deviation, 1.88 of the respondents' ranking of statement that, lack of patient by mathematics teachers will affect their interest in mathematics with relative importance index of 0.77. The study results imply that if mathematics teachers exercise patience in their engagement with students during and after lesions, students will develop interest in mathematics for better performance. Table 34 presents the results from the descriptive statistical analysis. The study scrutinized the effect of lack of trained mathematics teachers on students' interest in mathematics on the students' interest in mathematics. The results showed that, cumulatively, 70.9% of the total respondents' agree to the statement that lack of trained mathematics teachers affect their interest in mathematics. The study on the other side found that 19.7% and 10.6% disagree and neutral, respectively on the statement that student's interest in mathematics is affected by the lack of trained mathematics teachers. The mean and the standard deviation of the students' ranking of the lack of trained mathematics teacher as cause of negative interest among Senior High Schools were 3.9 and 1.88, respectively with relative importance index of 0.77 as shown in Table 33.

The study investigated the effect of large student to teacher ratio on the students' interest in mathematics and found that 55.4% of the respondents agreeing to the fact that large student-teacher ratio affects their interest in mathematics, although, 23.1% and 21.5% of the respondents disagreed and indifferent, respectively, as large student - teacher ratio affects their interest in mathematics. The study extended analysis from percentages reveals that relative importance index of 0.69 (see Table18). The study also investigated the effect of refreshing student on their previous knowledge in mathematics and its effect on their interest development. The study results showed that 46.5% of the participant agreed on the statement that refreshing students mind on the previous mathematics topics will help improve their interest in mathematics, although 22.9% and 30.5% of the respondent disagreed and indifferent, respectively, that refreshing their mind on previous mathematics topics will improve their interest in mathematics. The relative importance index value of 0.66 which is good enough to give it a relatively good position in the factor ranking as shown in Table 33.

4.4.2 Descriptive Statistical Analysis of mathematics Connectivity Construct

The study investigated mathematics teachers' creativity in connecting mathematical concepts to real life problems was measured using the designed questionnaires responded by students. The construct included items such as: Teachers connect mathematical concepts to real life problems, Teachers link mathematics to other subject areas, Teachers provide examples and case studies while delivering instruction in mathematics, Teachers dedicate quality time for practicing class exercise, here is coordination between class work and assignments given by mathematics teachers and finally mathematics is abstractly taught.

Table 34 Descriptive Statistics of mathematics connectivity constructs

Factor	SD	D	N	A	SA	RII	M	SD
Teachers connect Mathematical concept to real life problems	14.9%	15.1%	21.2%	27.5%	21.3%	0.65	3.25	1.35
Teachers link mathematics to other subject areas	9.5%	9.3%	20.4%	23.8%	37%	0.74	3.69	1.31
Teachers provide example and case studies	7.4%	15.8%	25.6%	27.3%	23.9%	0.69	3.44	1.22
Teachers dedicate quality time for practicing class exercise	7.2%	9.9%	16.5%	28.2%	38.3%	0.76	3.8	1.25
There is coordination between class work and assignment given by mathematics teacher	10.4%	12.4%	19.4%	33.5%	24.3%	0.70	3.49	1.27
Mathematics is abstractly taught	8.9%	10.1%	25.4%	29%	26.6%	0.71	3.58	1.91

Table 34 present descriptive statistical analysis of mathematics connectivity construct. Out of the total respondents' of 1,263, 30% of the respondents, cumulatively disagrees that mathematics teachers connect mathematical concepts to real-life problems; however, 48.8% of the study respondents' were of diverse opinions that mathematics teachers' connect mathematical concepts to real-life problems. The study further found that 21.2% of the total respondents' neither agreed nor disagreed to the statement that mathematics teachers connect mathematics to other subject areas. The total rating of teachers' ability to connect mathematical concepts to real-life problem results in overall rating in terms of relative importance index as found to be 0.65. The study also investigated the measure of teacher ability to link mathematics to other subject areas of which out of the total respondents', 18.8% of the valid respondents', cumulatively disagreed. Contrary, 60.8% of the valid respondents' agreed to the facts that mathematics teachers' ability to link f mathematics to other subject area may influence their interest in mathematics. The study also revealed that 20.4% of the total respondents' were neutral of the claim that teachers' linkage of mathematics to other subject area contributes to student interest development in mathematics.

The study further investigated the effects of teachers' provision of examples and case studies during mathematics lesions impact on students' interest in mathematics. The results from the survey revealed that, 23.2% of the total respondents' disagreed that teachers' provision of exercises and case studies during lesions will influence their interest in mathematics, but contrary to this results is the 50.1% of the total respondents' who believed that teachers' provision of enough exercises and case studies during mathematics lesions will help build the interest of students in mathematics. The results showed that 25.6% of the valid respondents' strangely perceive that provision of enough examples and case studies will neutrally influence the students' interest in mathematics. The results further revealed a relative importance index of 0.69 as indicated in Table 34.

The effect of teachers' commitment of quality time for practicing class exercises was also investigated by the study. The results revealed that in total, 17.1% of the total respondents' were in disagreement that teachers dedicate quality time for practicing class exercise while 66.5% of the total participant agreed that teachers dedicate quality time for practicing class exercise, although 16.5% of the total respondents' were indifferent. The results further revealed that teachers' dedication of quality time for practicing class exercises was the most important factors with high relative importance index of 0.76.

The investigation into coordination between what is being taught in class and the assignment given to students by mathematics teachers gave the following revelation. The results indicated that, 22.8% of the total respondents' disagreed that, there is coordination between class work and assignment given by mathematics teachers, but 57.8% of the valid respondents' agreed to the claim that there is coordination between class work and assignment given by mathematics teachers'. The study revealed that, teachers ability to coordinate between the class work and assignment given by mathematics teachers' was very important to student interest develop with relative importance index was 0.70.

The study finally investigated how students' perception that mathematics is abstractly taught influence their interest in mathematics. The results indicated that 20% of the respondents' disagreed that mathematics is abstractly taught while 55.6% of the total respondents' agreed. It is important to note that 25.4% of the total respondents' were neutral about whether mathematics is abstractly taught or not. The overall ranking of the perception that mathematics is abstractly taught in Ghanaian high schools indicated a relative importance index of 0.71.

4.4.3 Descriptive Statistical Analysis of Mathematics Facility Constructs (MFC)

The study investigated the effect of mathematics facility construct (MFC) on students' interest in mathematics. The mathematics facility availability construct consist of six items and these items were descriptively analyzed and discussed in the paragraphs below

Table 35 Descriptive Statistics of mathematics Facility construct

Factor	SD	D	N	A	SA	RII	M	SD
There is library facility with relevant mathematics books	26.7%	18.2%	23.3%	19.9%	12.9%	0.55	2.75	1.42
The school provides the needed instructional materials for the study of mathematics	17.2%	21.3%	32.1%	15.9%	13.5%	0.57	2.87	1.26
The school have mathematics teaching equipment	19.7%	14.7%	29.7%	18.3%	17.6%	0.60	2.99	1.35
The school have adequate ICT facilities	26.6%	27.8%	15.7%	13.2%	16.7%	0.53	2.65	1.42
There is adequate access to mathematics teaching resource	21.1%	19%	32.3%	10.9%	16.7%	0.63	3.17	1.34
Teachers have effective teaching materials	24.3%	26.9%	22%	15%	11.8%	0.67	3.37	1.31

Table 35 presents descriptive statistical analysis of the items making up the mathematics facility construct. With the statement that: there is library facility with relevant mathematics books in the various secondary schools, out of the total respondents, cumulatively 44.9% of the total respondents were found to disagree with the fact that there is library facilities with relevant mathematics books while 32.8% of the valid respondents' cumulatively agreed with the statement that there is library facilities equipped with relevant mathematics text books. It was, however, not clear why 23.3% of the students neither agreed nor disagreed to the fact the availability of library facility with required mathematics text books will improve the students' interest in mathematics. The study cumulatively estimated the relative important index of provision of library facilities with relevant mathematics text books as 0.55.The study examined students' perception that the school provides the needed instructional materials for the study of mathematics. Out of the total respondents'' of the current study, 38.5% disagreed to the statement that schools has provided the needed instructional materials for the study of mathematics while 29.4% of the total respondents' agreed to the fact that schools provides the needed instructional materials for the study of mathematics. The study, however, found that 32.1% of the respondents' were neutral to the statements that schools provide the needed instructional materials for the study of mathematics. The study further found the importance respondents' attached to the statement ''schools provide the needed instructional materials for the study of mathematics'' it was low found to have a low relative importance index rating of 0.57.The study similarly investigated the respondents'' perception that Senior High Schools have mathematics teaching equipment. It was revealed that 34.4% of the total respondents' disagreed cumulatively that the schools have mathematics teaching equipment while the 35.9% of the total respondents' agreed. The study however found 29.7% of the total respondents' to be neutral to the statement; Ghanaian senior high schools have mathematics teaching equipment for instruction. The study found that the relative importance index for the statement that schools have mathematics teaching equipment was 0.60.Likewise, the study investigated the fact that there are adequate ICT facilities and adequate access to teaching and learning resources in the schools survey and the effect these facilities have on students' interest in mathematics. The study revealed that cumulatively, 54.4% of the study respondents' disagreed that there are adequate ICT facilities and 27.6% also agreed that there is adequate access to resources. The assessment of the fact that there is adequate ICT facilities as important for study of mathematics received very low rating of 0.53, which communicates that, indeed the provision of ICT facilities does not necessary ensures for building students' interest in mathematics. It was further found that teachers do not have effective teaching materials for the teaching and learning of mathematics as indicated in Table 35.

4.4.5 Descriptive Statistical Analysis of Measures of School Leadership

Given the key role school leadership plays in interest of students, the study further assessed the influence of school leadership on students' mathematics interest. The descriptive statistical analyses below present the individual items in the constructs and how these items are perceived to contribute to the mathematics interest development in Ghanaian Senior High Schools.

Table 36 Descriptive Statistical Analysis of Measures of School Leadership Construct

Factor	SD	D	N	A	SA	RII	M	SD
School leadership provides guidance and counseling to students	8.3%	11.1%	28.3%	33.3%	19%	0.69	3.43	1.16
School leadership provides instructional Supervision to students	10.6%	11%	23.7%	31.7%	22.9%	0.69	3.45	1.25
School leadership provide needed environment for studying mathematics.	7.4%	7.9%	20.3%	37.1%	27.2%	0.74	3.69	1.17
School leadership has not provided mathematics workshops interaction during and after lessons.	14%	16.9%	19.3%	23.9%	25.9%	0.66	3.31	1.38
School leadership provides needed support for teachers and students.	11%	12.8%	18.3%	32.8%	25.1%	0.70	3.48	1.29
School leadership makes provision for instructional materials.	10.8%	11%	22.6%	28.7%	27%	0.70	3.55	1.95
School leadership ensures teachers deliver quality in their instruction.	8.2%	12.5%	25.7%	36.7%	16.9%	0.68	3.42	1.15
Frequent change of mathematics teachers by school leadership is problematic to my interest in mathematics.	11.4%	14.2%	12.3%	28.4%	33.7%	0.72	3.59	1.37

Table 36 presents descriptive statistical analysis of items making up the school leadership construct. The results revealed that 19.4% of the cumulative respondents' disagreed that school leadership provides guidance and counseling to students while

42.3% of the total respondents' cumulatively agreed that school leader provides guidance and counseling to students. The study however found 28.3% of the total respondents' neither agreed nor disagreed to the fact that school leadership provides the need guidance and counseling to students. The study finally found the relative importance of school leadership provision of guidance and counseling to students relative to other factors making up the construct to be 0.69, which is moderate.

Among other responsibilities of school leadership is the provision of instructional supervision to students. In this study, students were asked to rank whether school leadership provides instructional supervision to students. In all 21.6% of the total respondents' believes that school leadership does not provide instructional supervision to the students although 54.6% of the total respondents' agreed to the fact that school leadership provides instructional supervision to students. The study, however, found that 23.7% of the total participant being neutral to the school leadership provision of instructional supervision to student by neither agreeing nor disagreeing to the statement. The assessment of relative importance of school leadership provision of instructional leadership was found to be 0.69.

The school leaders' provision of needed environment for studying mathematics was examined to ascertain its usefulness on the interest development in mathematics. The study observed that, 64.3% of the total respondents' agreed to the facts that school leadership provides needed environment for the study of mathematics and the provision of the needed environment provided by school leadership affects student interest in mathematics. The study however found that, 15.3% and 20.3% of the total respondents' disagreed cumulatively and neutral to the statement that school leadership provides needed environment for studying mathematics. The school leadership provision of needed environment for the study of mathematics was found to have a relative importance index of 0.74.

Similarly, the study further investigated how school leadership provided mathematics workshops interaction during and after lessons. It was found that, enough has not been done by the school in terms of providing mathematics works for interaction during and after lessons. This finding was made known when 49.8% of the total respondents' cumulatively agreed that school leadership has not provided mathematics workshops interaction during and after lesion although 20.9% of the total respondents' disagreed with the fact that the school leadership has not provided the needed workshops for the learning of mathematics. The study further investigated the overall strength of the factor in the constructs using the mean and relative importance index, were 3.31 and 0.66, respectively.

The study further examined the effect of school leaderships' support for teachers and students on students' interest in mathematics; 58.9% of the total respondents' agreed cumulatively that school leadership provides the needed support for teachers and students affects students' interest in mathematics while 23.8% of the respondents' disagreed cumulatively that school leadership provides the needed support for teachers and students for studying mathematics. The study attempted to find out the relative position of the school leadership provision of needed support for teachers which lead to a relative importance index of 0.70. The result of this variable indicates further that, it is of great importance to students for school leadership to provide the needed support both socially and materially to help boost their interest in mathematics.

The role of instructional materials for the teaching and learning is crucial for building student interest and understanding of mathematical concepts. This study examined effects of school leadership's provision of instructional materials on the students' interest in mathematics. The study found that, 55.7% of the study respondents' cumulatively agreed to the fact that school leadership makes provision for instructional materials although 21.8% of the study respondents' disagreed cumulatively. The study further found that the mean and relative importance index of the statement that: school leadership makes provision for instructional materials were highly ranked with relative importance index of 0.70. The result of the study suggested that school leadership should make enough provision for instructional materials needed for the study of mathematics which intend will improve the students' interest in mathematics.

The consistency in instruction as well as instructor consistency is important in teaching and learning of mathematics. The study examined the effect of frequent changes of mathematics teachers on students' interest in mathematics. The results from the study reveals that, 62.1% of the total respondents' agreed cumulatively that frequent changes of mathematics teachers by school leadership is problematic to their interest in mathematics but 25.6% of the total respondents' disagreed cumulatively that frequent changes of teachers by school leadership is problematic to their interest in mathematics. The result from the study further revealed that frequent changes of mathematics teachers by school leadership was ranked high relative importance index of 0.72 as indicated in Table 36.

4.4.6 Results on Teacher Oriented Model on mathematics Interest.

This section presents findings from the structural equation model based on teacher oriented factors and their influence on students interest in mathematics.

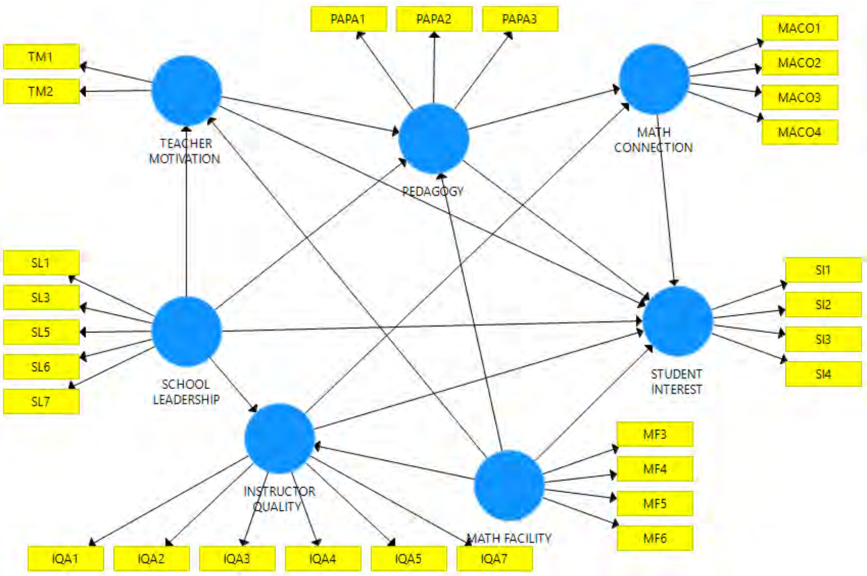

Figure 6 Teacher Oriented Conceptual Mathematics Interest Model

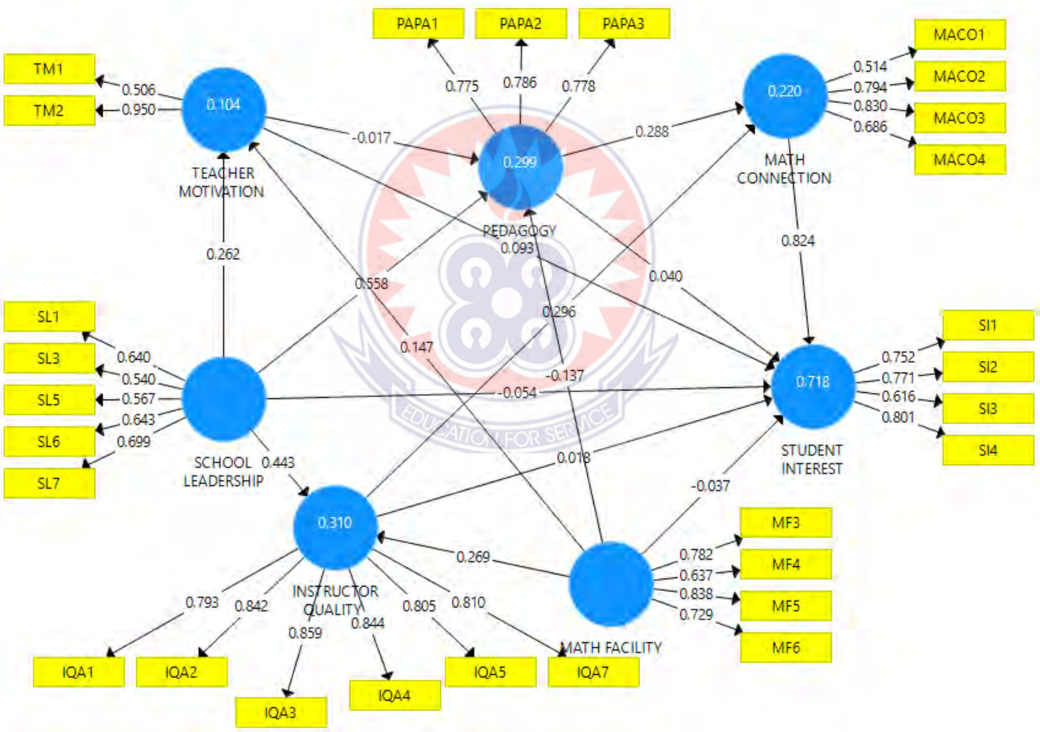

Figure 7 Teacher Oriented Empirical Mathematics Interest Model

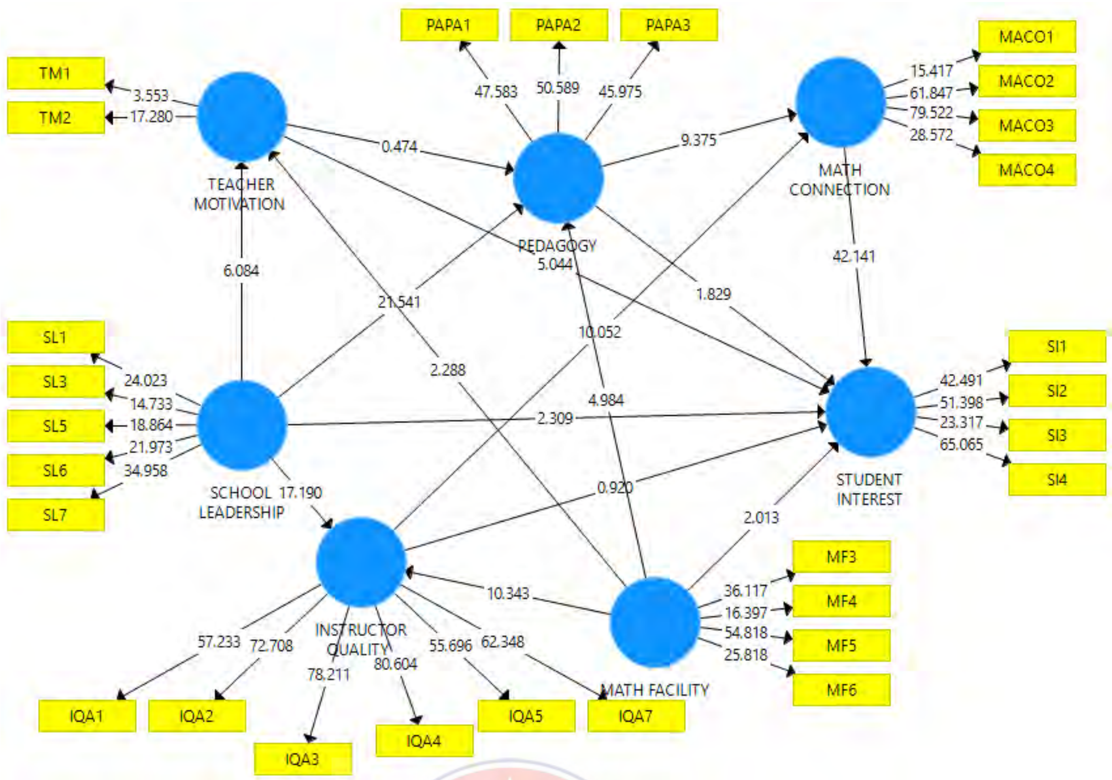

Figure 8Teacher Oriented Empirical Mathematics Interest Model (TOEMIM)

Table 37 Path coefficients for Teacher Factor Oriented SEM

CONSTRUCT PATH	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
INSTRUCTOR QUALITY -> MATH CONNECTION	0.296	0.297	0.029	10.052	0.000
INSTRUCTOR QUALITY -> STUDENT INTEREST	0.018	0.018	0.019	0.920	0.357
MATH CONNECTION -> STUDENT INTEREST	0.824	0.825	0.020	42.141	0.000
MATH FACILITY -> INSTRUCTOR QUALITY	0.269	0.271	0.026	10.343	0.000
MATH FACILITY -> PEDAGOGY	-0.137	-0.136	0.027	4.984	0.000
MATH FACILITY -> STUDENT INTEREST	-0.037	-0.037	0.018	2.013	0.044
MATH FACILITY -> TEACHER MOTIVATION	0.147	0.143	0.064	2.288	0.022
PEDAGOGY -> MATH CONNECTION	0.288	0.289	0.031	9.375	0.000
PEDAGOGY -> STUDENT INTEREST	0.040	0.040	0.022	1.829	0.067
SCHOOL LEADERSHIP -> INSTRUCTOR QUALITY	0.443	0.444	0.026	17.190	0.000
SCHOOL LEADERSHIP -> PEDAGOGY	0.558	0.558	0.026	21.541	0.000
SCHOOL LEADERSHIP -> STUDENT INTEREST	-0.054	-0.054	0.023	2.309	0.021
SCHOOL LEADERSHIP -> TEACHER MOTIVATION	0.262	0.263	0.043	6.084	0.000
TEACHER MOTIVATION -> PEDAGOGY	-0.017	-0.015	0.036	0.474	0.636
TEACHER MOTIVATION -> STUDENT INTEREST	0.093	0.093	0.018	5.044	0.000

The path coefficients with their corresponding t-values together with their significant values are indicated in Table 37. The results from the data analyzed indicate that, the path coefficient from teacher motivation to pedagogy (-0.017, $p > 0.05$), path coefficient from pedagogy to students' interest (0.040, $p > 0.05$) and the path coefficient from instructor quality to students' interest (0.018, $p>0.05$) were found not significant at 5%. The results further showed that the path coefficient with exception of the path coefficients from teacher motivation to pedagogy, from pedagogy to students' interest and from instructor quality to students' interest all other path coefficients were found to be significant with $p < 0.05$.

Table 38 Indirect Effect of PLS-SEM Path Model

CONSTRUCT PATH	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
INSTRUCTOR QUALITY -> STUDENT INTEREST	0.244	0.245	0.025	9.747	0.000
MATH FACILITY -> MATH CONNECTION	0.039	0.040	0.014	2.757	0.006
MATH FACILITY -> PEDAGOGY	-0.002	-0.003	0.006	0.395	0.693
MATH FACILITY -> STUDENT INTEREST	0.045	0.045	0.015	3.000	0.003
PEDAGOGY -> STUDENT INTEREST	0.238	0.238	0.026	9.262	0.000
SCHOOL LEADERSHIP -> MATH CONNECTION	0.291	0.292	0.023	12.829	0.000
SCHOOL LEADERSHIP -> PEDAGOGY	-0.004	-0.003	0.009	0.486	0.627
SCHOOL LEADERSHIP -> STUDENT INTEREST	0.294	0.295	0.025	11.839	0.000
TEACHER MOTIVATION -> MATH CONNECTION	-0.005	-0.004	0.010	0.475	0.635
TEACHER MOTIVATION -> STUDENT INTEREST	-0.005	-0.004	0.010	0.474	0.635

Table 39 Total Effect of PLS-SEM Path Model

CONSTRUCT PATH	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
INSTRUCTOR QUALITY -> MATH CONNECTION	0.296	0.297	0.029	10.052	0.000
INSTRUCTOR QUALITY -> STUDENT INTEREST	0.262	0.262	0.031	8.481	0.000
MATH CONNECTION -> STUDENT INTEREST	0.824	0.825	0.020	42.141	0.000
MATH FACILITY -> INSTRUCTOR QUALITY	0.269	0.271	0.026	10.343	0.000
MATH FACILITY -> MATH CONNECTION	0.039	0.040	0.014	2.757	0.006
MATH FACILITY -> PEDAGOGY	-0.140	-0.139	0.027	5.148	0.000
MATH FACILITY -> STUDENT INTEREST	0.008	0.008	0.021	0.376	0.707
MATH FACILITY -> TEACHER MOTIVATION	0.147	0.143	0.064	2.288	0.022
PEDAGOGY -> MATH CONNECTION	0.288	0.289	0.031	9.375	0.000
PEDAGOGY -> STUDENT INTEREST	0.277	0.278	0.033	8.436	0.000
SCHOOL LEADERSHIP -> INSTRUCTOR QUALITY	0.443	0.444	0.026	17.190	0.000
SCHOOL LEADERSHIP -> MATH CONNECTION	0.291	0.292	0.023	12.829	0.000
SCHOOL LEADERSHIP -> PEDAGOGY	0.554	0.554	0.023	23.953	0.000
SCHOOL LEADERSHIP -> STUDENT INTEREST	0.240	0.242	0.026	9.071	0.000
SCHOOL LEADERSHIP -> TEACHER MOTIVATION	0.262	0.263	0.043	6.084	0.000
TEACHER MOTIVATION -> MATH CONNECTION	-0.005	-0.004	0.010	0.475	0.635
TEACHER MOTIVATION -> PEDAGOGY	-0.017	-0.015	0.036	0.474	0.636
TEACHER MOTIVATION -> STUDENT INTEREST	0.088	0.088	0.023	3.822	0.000

Table 40 Endogenous Variables Explained Variance

CONSTRUCT	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
INSTRUCTOR QUALITY	0.310	0.313	0.025	12.442	0.000
MATH CONNECTION	0.220	0.223	0.027	8.129	0.000
PEDAGOGY	0.299	0.303	0.024	12.335	0.000
STUDENT INTEREST	0.718	0.720	0.018	38.819	0.000
TEACHER MOTIVATION	0.104	0.109	0.019	5.425	0.000

Table 41 Endogenous Variables R- Square Adjusted

CONSTRUCT	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
INSTRUCTOR QUALITY	0.309	0.312	0.025	12.378	0.000
MATH CONNECTION	0.219	0.221	0.027	8.071	0.000
PEDAGOGY	0.298	0.301	0.024	12.237	0.000
STUDENT INTEREST	0.717	0.719	0.019	38.562	0.000
TEACHER MOTIVATION	0.102	0.107	0.019	5.342	0.000

For the prediction of the endogenous variables, the study predicted and explained 71.7% of the total variance in students' interest in mathematics, predicted and explained 30.9% of the total variance of instructor quality and availability for teaching mathematics, predicted and explained 21.9% of the total variance of teachers ability to connect mathematics to real-life and social environment, predicted and explained 29.8% of the total variance of pedagogy and finally predicted and explained 10.2% of the total variance of teacher motivation in teaching mathematics. In all, the total variance explained by all endogenous constructs was significant at 5% as shown in Table 40.

The study examined both descriminant and convergent validity for construct and the extent to which the indicators measure the construct. The study used the, cronbach's alpha, composite reliability and the AVE for the test of convergent validity. The results from the study showed that using the cronbach's alpha test, school leadership, mathematics connection, pedagogy, and teacher motivation had cronbach alpha values below the acceptable value above 0.7, while students' background, students' interest and students' perception, instructor quality, mathematics facility and students' interest have cronbach values above 0.7. Thus, per the cronbach's alpha criteria only three constructs were reliable and meet the convergent validity conditionality. It is, however, worth noting that although not all constructs had cronbach alpha values above 0.7 but all constructs conbach alpha values were significnat at 5%. The assessement of the composite alpha reliability values showed that all constructs proved reliable with composite alpha values above 0.7. Finally, the AVE was ussed to assess the convergent validity. It was found that, with exception of school leadership which had AVE value of 0.385, below the cutoff value of above 0.5, the remaining constructs: Instructor qualaity, mathematics connection, pedagogy, students' interest mathematics facility and teacher motivation had AVE values above the recommended cut-off of 0.5 as a proof of convergent validity.

Table 42 Average Variance Extracted (AVE)

CONSTRUCT	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P- Values
INSTRUCTOR QUALITY	0.682	0.682	0.011	62.194	0.000
MATH CONNECTION	0.513	0.513	0.013	39.322	0.000
MATH FACILITY	0.563	0.562	0.015	38.665	0.000
PEDAGOGY	0.608	0.608	0.014	44.697	0.000
SCHOOL LEADERSHIP	0.385	0.385	0.013	28.829	0.000
STUDENT INTEREST	0.545	0.545	0.013	41.533	0.000
TEACHER MOTIVATION	0.579	0.576	0.028	20.733	0.000

Table 43 Composite Reliability Test of Significance

CONSTRUCT	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P -Values
INSTRUCTOR QUALITY	0.928	0.928	0.003	273.247	0.000
MATH CONNECTION	0.804	0.803	0.009	90.375	0.000
MATH FACILITY	0.836	0.836	0.009	98.223	0.000
PEDAGOGY	0.823	0.823	0.008	98.863	0.000
SCHOOL LEADERSHIP	0.756	0.756	0.011	69.917	0.000
STUDENT INTEREST	0.826	0.826	0.008	105.311	0.000
TEACHER MOTIVATION	0.716	0.705	0.053	13.393	0.000

Table 44 Cronbach's Alpha Test of Reliability and Significance

CONSTRUCT	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
INSTRUCTOR QUALITY	0.907	0.907	0.005	191.706	0.000
MATH CONNECTION	0.677	0.676	0.017	38.716	0.000
MATH FACILITY	0.747	0.747	0.014	54.934	0.000
PEDAGOGY	0.679	0.679	0.018	37.495	0.000
SCHOOL LEADERSHIP	0.605	0.604	0.021	28.204	0.000
STUDENT INTEREST	0.724	0.724	0.015	49.851	0.000
TEACHER MOTIVATION	0.348	0.346	0.043	8.079	0.000

Table 45 Heterotrait-Monotrait Ratio (HTMT) and Significance

CONSTRUCT	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
MATH CONNECTION -> INSTRUCTOR QUALITY	0.472	0.473	0.037	12.624	0.000
MATH FACILITY -> INSTRUCTOR QUALITY	0.396	0.397	0.033	11.944	0.000
MATH FACILITY -> MATH CONNECTION	0.221	0.233	0.032	6.992	0.000
PEDAGOGY -> INSTRUCTOR QUALITY	0.362	0.362	0.039	9.333	0.000
PEDAGOGY -> MATH CONNECTION	0.564	0.564	0.042	13.326	0.000
PEDAGOGY -> MATH FACILITY	0.109	0.128	0.027	4.003	0.000
SCHOOL LEADERSHIP -> INSTRUCTOR QUALITY	0.612	0.612	0.032	19.385	0.000
SCHOOL LEADERSHIP -> MATH CONNECTION	0.744	0.745	0.032	23.324	0.000
SCHOOL LEADERSHIP -> MATH FACILITY	0.269	0.284	0.031	8.711	0.000
SCHOOL LEADERSHIP -> PEDAGOGY	0.820	0.820	0.032	25.381	0.000
STUDENT INTEREST -> INSTRUCTOR QUALITY	0.383	0.384	0.037	10.268	0.000
STUDENT INTEREST -> MATH CONNECTION	1.120	1.122	0.023	48.530	0.000
STUDENT INTEREST -> MATH FACILITY	0.182	0.194	0.023	7.766	0.000
STUDENT INTEREST -> PEDAGOGY	0.469	0.470	0.044	10.692	0.000
STUDENT INTEREST -> SCHOOL LEADERSHIP	0.554	0.555	0.038	14.477	0.000
TEACHER MOTIVATION -> INSTRUCTOR QUALITY	0.450	0.455	0.060	7.493	0.000
TEACHER MOTIVATION -> MATH CONNECTION	0.544	0.549	0.065	8.362	0.000
TEACHER MOTIVATION -> MATH FACILITY	0.548	0.554	0.064	8.603	0.000
TEACHER MOTIVATION -> PEDAGOGY	0.392	0.400	0.065	6.045	0.000
TEACHER MOTIVATION -> SCHOOL LEADERSHIP	0.529	0.541	0.064	8.299	0.000
TEACHER MOTIVATION -> STUDENT INTEREST	0.538	0.545	0.063	8.580	0.000

The assessment of discriminant validity is a means of validating the constructs and a measure of how unique is the constructs dimension. It also indicates how the constructs reflect other variables and the extent to which each construct reflect other variables. The AVE has been the most common method used for the determination of discriminant validity. Although the cross loadings can be used, this study used the AVE (Hair, Ringle, & Sarstedt, 2011; Christian,Ringle, Sarstedt, & Straub, 2012). The result indicated that the square root of AVE for all factors greater that the correlations between the constructs and other constructs as indicated in Table 4.95.Furthermore, assessment of discriminant validity can be done better using the Heterotrait-Monotrait ratio (HTMT) since the use of Fornell-Larcker criteria is known to have some shortcomings. Using the HTMT method to assess the discriminant validity showed the existence of discriminant validity between the pair of constructs since the HTMT ratio for each pair of construct have a value below 0.85 and significant except the path students' interest -> Math Connection which had HTMT value above 1.0 as shown in Table 44.

Table 46 Standardized Root Means Square Residual Test of Significance

Models	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Saturated Model	0.088	0.044	0.001	95.443	0.000
Estimated Model	0.097	0.045	0.001	72.363	0.000

The study further measured the approximate fit of the model using the standardized root mean square residual (SRMR). The SRMR measures the difference between the observed correlation matrix and the model-implied correlation matrix. The lower the SRMR value the better. The result showed that the model has a good fit since the value is less than 0.8

4.4 Research Question 3: Which student-teacher oriented factors significantly predict students' interest in mathematics?

The influence of combined student-teacher oriented factors on students' interest in mathematics is discussed in this section. The study first presented multiple linear regression analysis using students' interest in mathematics as response variable while student-teacher oriented variables are used as predictor variables. The sections below presents the findings obtained beginning with the regression and correlation analysis of students' interest in mathematics. The finding on the combined student-teacher factor oriented structural equation model is presented using tables and figures.

4.4.1 Regression and Correlation Analysis of Students' Interest in Mathematics

The study used multiple linear regression analysis to evaluate the effect of mathematics connectivity, teachers teaching methods, students' background, school leadership, instructor quality and availability, facility availability in teaching mathematics, student and teachers' motivation and students' perception on the students' interest in mathematics. The result from the correlation analysis in the Table 71 indicates that, the predictor variables significantly relate with the dependent variable which is the students' interest in mathematics. The study of the correlation analysis reveals that some of the independent variables relate positively and significantly with each other. The study further built a regression model for the students' interest to ascertain how well the independent variables predicts the students' interest.

Table 47 Correlational Analysis of Student Interest in mathematics

	INTEREST	MC	TTM	SB	SL	IQA	FM	STM	SP
INTEREST	1	.795**	.320**	.446**	.458**	.258**	.115**	.329**	.362**
MC			.431**	.502**	.663**	.281**	.179**	.379**	.365**
TTM				.480**	.579**	.362**	.246**	.400**	.314**
SB					.550**	.459**	.212**	.470**	.532**
SL						.461**	.344**	.473**	.432**
IQA							.440**	.494**	.476**
FM								.391**	.290**
STM									.511**
SP									

**. Correlation is significant at the 0.05 level (2-tailed).

Table 48 Regression Analysis Model Summary

Model Summary					
R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics	
				R Square Change	F Change
.811a	0.657	0.655	0.55493	0.657	300.436

Table 48 provides a summary of results generated from the analysis. The results include the R Square and Adjusted R Square values of 0.657 and 0.655, respectively. The results suggest that the weighted combination of the predictor variables can predict 65.5% of the student interest in mathematics.

Table 49 Test of Regression Model Adequacy

ANOVA

	Sum of Squares	**Df**	**Mean Square**	**F**	**Sig.**
Regression	740.135	8	92.517	300.436	0.000
Residual	386.159	1254	0.308		
Total	1126.294	1262			

Table 50 Standard Regression Results

Model	B	SE-b	Beta	T-Statistics	Ps	Pearson r	sr^2	structure coefficient
(Constant)	0.565	0.107		5.295	0.000			
MC	0.916	0.025	0.848	37.017	0.000	0.795	0.375	0.98027127
TTM	-0.013	0.032	-0.009	-0.416	0.677	0.362	0.00005	0.446362515
SB	0.07	0.027	0.060	2.627	0.009	0.446	0.002	0.549938348
SL	-0.246	0.035	-0.187	-7.067	0.000	0.458	0.014	0.564734895
IQA	0.048	0.021	0.049	2.253	0.024	0.115	0.0014	0.141800247
FM	-0.043	0.022	-0.037	-1.918	0.055	0.258	0.001	0.318125771
STM	0.029	0.03	0.021	0.963	0.336	0.32	0.0003	0.394574599
SP	0.099	0.026	0.080	3.753	0.000	0.329	0.004	0.40567201

The study used , instructor quality and availability, mathematics connections, school leadership, mathematics facility availability, teachers' teaching methods, students' perception, , students' background and student and teacher motivation as independent variables in as standard regression analysis to predict students' interest in mathematics. The prediction model was statistically significant, yielding F (8, 1254) =300.44, P <0.05, which accounts for approximately 65% of variance of students' interest in mathematics (R Square =0.657, Adjusted R-Square =0.655). The students' interest in mathematics was predicted significantly by students' perception, students' background, school leadership, and mathematics connection; however mathematics facility availability was significant at 6%. The study, however, found that student and teacher motivation as well as the teachers' teaching methods have no significant effect on the students' interest.

The unstandardized and the standardized regression coefficients of the predictors together with their correlation with the students' interest in mathematics, their squared semi-partial correlation as well as their structural coefficient are shown in Table 49 mathematics connection received the strongest weight in the model followed by school leadership and students' perception but mathematics facilities availability was the lowest. Further examination of correlation proved strong existence of correlation between the predictor variable but the unique variance explained by the predictor variables which is indexed by the squared semi partial correlation was relatively low with the exception of mathematics connection to real-life problem. Mathematics connection and school leadership accounted for 37.5% and approximately 1.4% of the variance students' interest, respectively;

however, the remaining predictor variables accounted for less than 1% of the variance of students' interest in mathematics.

Table 51 Stepwise Forward Multiple Regression Analysis of Student Interest in mathematics

Model Summary					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change
1	0.795	0.632	0.632	0.5732	0.632
2	0.8	0.641	0.64	0.56675	0.009
3	0.806	0.649	0.648	0.56046	0.008
4	0.809	0.655	0.654	0.55584	0.006
5	0.809	0.655	0.654	0.55583	0.000
6	0.809	0.655	0.654	0.55602	0.000
7	0.81	0.656	0.654	0.55552	0.001
8	0.811	0.657	0.655	0.55493	0.001

a. Predictors: (Constant), MC
b. Predictors: (Constant), MC, SL
c. Predictors: (Constant), MC, SL, SB
d. Predictors: (Constant), MC, SL, SB, SP
e. Predictors: (Constant), MC, SL, SB, SP, STM
f. Predictors: (Constant), MC, SL, SB, SP, STM, TTM
g. Predictors: (Constant), MC, SL, SB, SP, STM, TTM, IQA
h. Predictors: (Constant), MC, SL, SB, SP, STM, TTM, IQA, FM

Table 52 Test of model Adequacy

ANOVA						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	711.983	1	711.983	2167	0.000
	Residual	414.311	1261	0.329		
	Total	1126.294	1262			
2	Regression	721.57	2	360.785	1123	0.000
	Residual	404.724	1260	0.321		
	Total	1126.294	1262			
3	Regression	730.827	3	243.609	775.549	0.000
	Residual	395.467	1259	0.314		
	Total	1126.294	1262			
4	Regression	737.621	4	184.405	596.855	0.000
	Residual	388.674	1258	0.309		
	Total	1126.294	1262			
5	Regression	737.95	5	147.59	477.723	0.000
	Residual	388.344	1257	0.309		
	Total	1126.294	1262			
6	Regression	737.99	6	122.998	397.848	0.000
	Residual	388.304	1256	0.309		
	Total	1126.294	1262			
7	Regression	739.001	7	105.572	342.099	0.000
	Residual	387.293	1255	0.309		
	Total	1126.294	1262			
8	Regression	740.135	8	92.517	300.436	0.000
	Residual	386.159	1254	0.308		
	Total	1126.294	1262			

Table 53 Test of Significance for Step-Wise Regression Coefficients

Model	b	Std. Error	Beta	T-Statistics	P	Pearson r	sr^2	Structure coefficient
(Constant)	0.588	0.067		8.729	0			
MC	0.859	0.018	0.795	46.551	0	0.795	0.632025	1
(Constant)	0.847	0.082		10.361	0			
MC	0.947	0.024	0.877	38.861	0	0.795	0.430336	0.99375
	SL		-0.123	-5.463	0	0.458	0.008464	0.5725
(Constant)	0.686	0.086		7.964	0			
MC	0.918	0.025	0.85	37.149	0	0.795	0.3844	0.986352357
SL		0.031	-0.166	-7.026	0	0.458	0.013689	0.568238213
SB	0.13	0.024	0.111	5.429	0	0.446	0.008281	0.553349876
(Constant)	0.543	0.091		5.989	0			
MC	0.914	0.025	0.846	37.278	0	0.795	0.380689	0.982694685
SL	-0.241	0.031	-0.183	-7.71	0	0.458	0.016384	0.566131026
SB	0.085	0.026	0.073	3.306	0.001	0.446	0.003025	0.551297899
SP	0.115	0.025	0.094	4.689	0	0.362	0.006084	0.447466007
(Constant)	0.51	0.096		5.304	0			
MC	0.913	0.025	0.845	37.232	0	0.795	0.380689	0.982694685
SL	-0.247	0.032	-0.188	-7.765	0	0.458	0.016641	0.566131026
SB	0.081	0.026	0.069	3.114	0.002	0.446	0.002704	0.551297899
SP	0.107	0.026	0.087	4.137	0	0.362	0.004761	0.447466007
STM	0.03	0.029	0.021	1.033	0.302	0.329	0.000289	0.406674907
(Constant)	0.525	0.105		5.013	0			
MC	0.913	0.025	0.845	37.218	0	0.795	0.380689	0.981481481
SL	-0.243	0.034	-0.185	-7.189	0	0.458	0.014161	0.565432099
SB	0.083	0.026	0.071	3.123	0.002	0.446	0.002704	0.550617284
SP	0.106	0.026	0.087	4.115	0	0.362	0.004624	0.44691358
STM	0.031	0.029	0.022	1.069	0.285	0.329	0.000324	0.40617284
TTM	-0.012	0.032	-0.008	-0.358	0.72	0.329	0.000036	0.40617284
(Constant)	0.523	0.105		5.003	0			
MC	0.919	0.025	0.851	37.172	0	0.795	0.378225	0.981481481

SL	-0.255	0.034	-0.194	-7.41	0	0.458	0.015129	0.565432099
SB	0.076	0.027	0.065	2.842	0.005	0.446	0.002209	0.550617284
SP	0.097	0.026	0.079	3.672	0	0.362	0.003721	0.44691358
STM	0.019	0.03	0.013	0.622	0.534	0.329	0.0001	0.40617284
TTM	-0.014	0.032	-0.009	-0.45	0.653	0.329	0.000049	0.40617284
IQA	0.037	0.02	0.038	1.81	0.07	0.258	0.0009	0.318518519
(Constant)	0.565	0.107		5.295	0			
MC	0.916	0.025	0.848	37.017	0	0.795	0.374544	0.98027127
SL	-0.246	0.035	-0.187	-7.067	0	0.458	0.013689	0.564734895
SB	0.07	0.027	0.06	2.627	0.009	0.446	0.001849	0.549938348
SP	0.099	0.026	0.08	3.753	0	0.362	0.003844	0.446362515
STM	0.029	0.03	0.021	0.963	0.336	0.329	0.000256	0.40567201
TTM	-0.013	0.032	-0.009	-0.416	0.677	0.329	0.000049	0.40567201
IQA	0.048	0.021	0.049	2.253	0.024	0.258	0.001369	0.318125771
FM	-0.043	0.022	-0.037	-1.918	0.055	0.115	0.001024	0.141800247

The study further used stepwise multiple regression analysis using students' perception, mathematics connection, students' background, mathematics facility, instructor quality and availability, teachers teaching methods, student and teacher motivation, and student and teacher motivation to predict students' interest in mathematics. The correlation analysis of the predictor variables with respect to students' interest in mathematics were statistically significant as shown in Table 50 to Table 52, the prediction model contained six of the eight predictors and this was reached in three steps with two variables removed. The model was statistically significant (6, 1256) =400.719, $p<0.05$. The final model accounted for approximately 66% of the students' interest in mathematics $\left(R^2 = 0.657, Adjusted\ R^2 = 0.655\right)$. Students' interest in mathematics is primary predicted by the teachers' ability to connect or link mathematics to real-life situation rather than abstractly teaching mathematics without any linkage or case studies and to lower extent predicted by mathematics facility availability. The unstandardized and the standardized regression coefficients of the predictors together with their correlation with students' interest in mathematics, their squared semi partial correlation as well as their structural coefficient are shown in Table 52 mathematics connection received the strongest weight in the model followed by school leadership and students' perception but mathematics facilities availability was the lowest. Although sizable correlation existed between the predictor variables, the unique variance explained by each of the predictor variables indexed by the squared semi partial correlation was relatively low with the exception of mathematics connection to real-life problem. Mathematics connection and school leadership accounted for 37.8% and approximately 2%, respectively of the total variation in students' interest. However, the remaining predictor variables accounted for less than 1% of the variance of students' interest in mathematics, although their contributions were statistically significant.

4.4.2 Structural Equation Modelling

The study employed the partial least square (PLS) structural equation model (SEM) - (PLS-SEM) as part of the data analysis technique to statistically test the prior conceptual assumptions against the empirical data. The ability of SEM to assess the scales used for the measure of the conceptual constructs and further estimates the existence of the hypothesized relationships among the constructs mentioned justifies its inclusion into the pool of statistical techniques used in this study. The use of SEM for data analysis is very crucial since it is able to answer simultaneously number of interrelated research questions using both measurement and structural model.In addition to the above mentioned reason for the choice of PLS-SEM, while other SEM tools exist, PLS-SEM is able to handle both formative and reflective indicators but other SEM techniques do not permit the use of both. This ability exhibited by PLS-SEM enables researchers describe the type of relationship existing between latent variables and their manifest variables. It was further found that PLS-SEM is rather suitable for prediction and exploration of probable causality, although it is not suitable for confirmatory testing(Hair, Ringle, & Sarstedt, 2016).

4.4.3 Partial Least Square –SEM Analysis

In the analysis of PLS-SEM, usually there are two stages of analysis and interpretation that occurs sequentially. The first part of the analysis is the assessments and modification of adequacy of the measurement model and further followed by the assessment and evaluation of the structural model. These stages are used to ascertain the construct measurement reliability and validity for further conclusion on the structural model.

4.4.5 Combined Model of Student Interest in Mathematics

In the combined model, the study used the assessment of the structural models, both the student-oriented model and the teacher-oriented model to finally obtain the constructs needed for the final model construction. The study finally used seven (7) constructs, namely, mathematics facility, teacher motivation, mathematics connection, pedagogy, instructor quality and availability as well as students' perception and students' interest in mathematics.

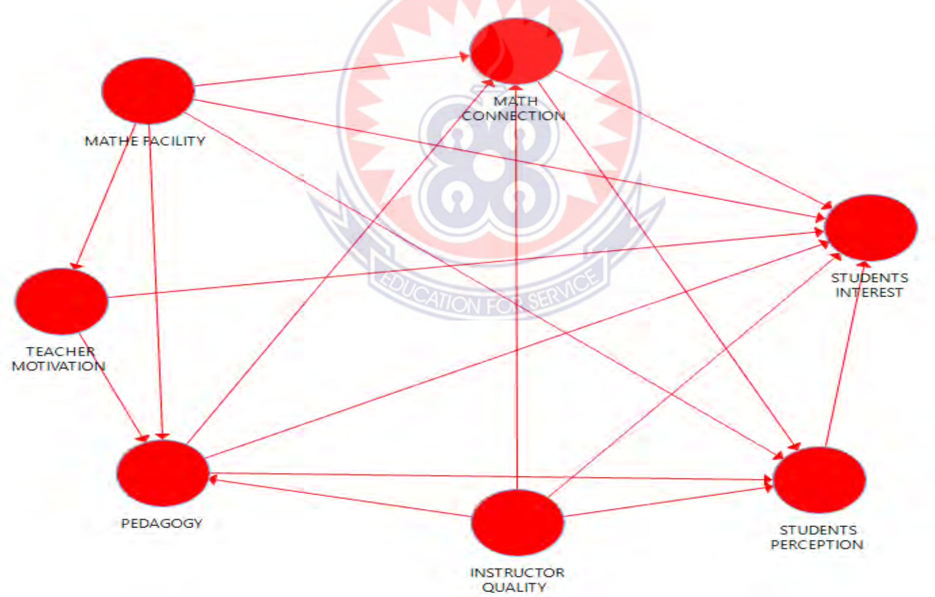

Figure 9 Conceptual Student Mathematics Interest Model (CSMIM)

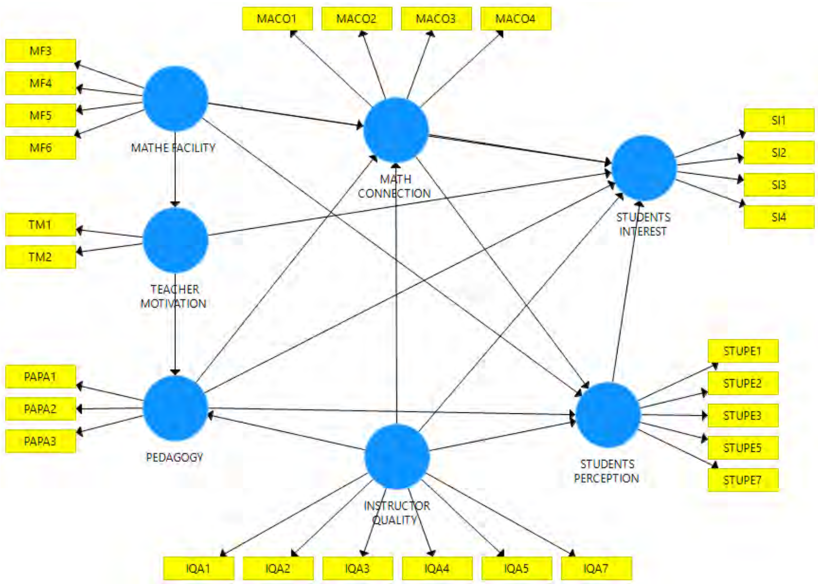

Figure 10 Conceptual Student Mathematics Interest Model (CSMIM)

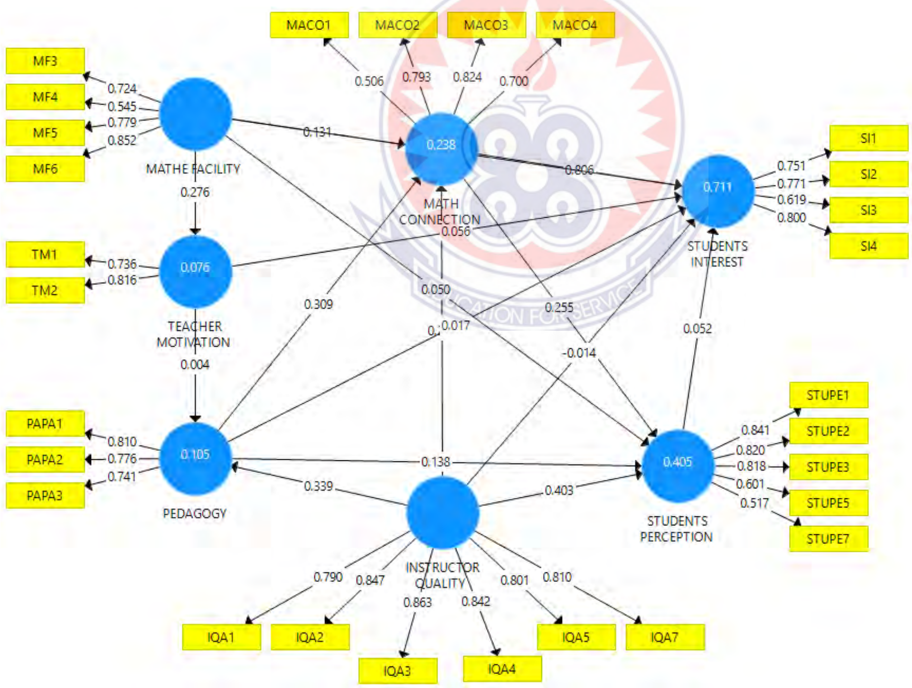

Figure 11 Empirical Students' Mathematics Interest Model

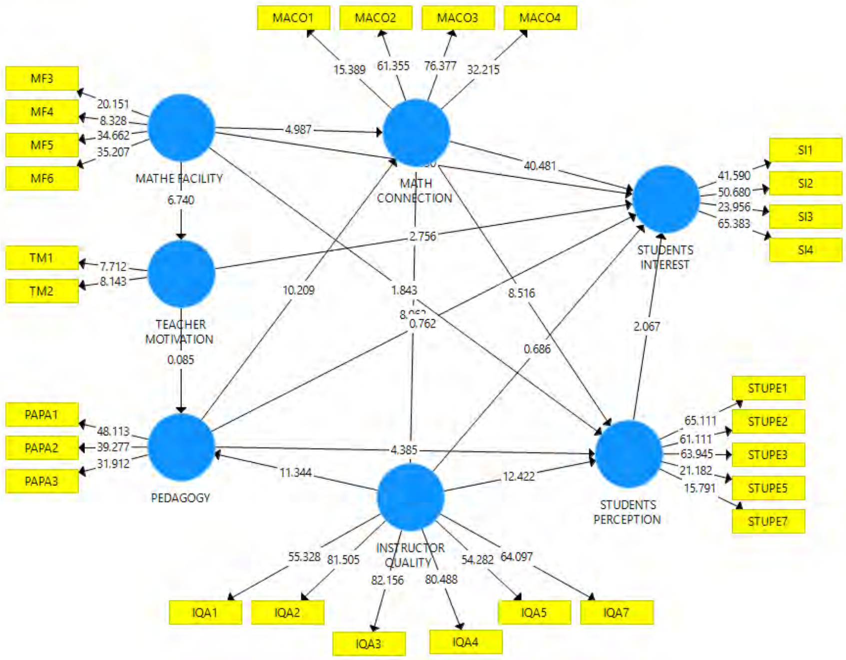

Figure 12 Empirical Students' Mathematics Interest Model (ESMIM)

Table 54 Path coefficients for Extracted Teacher and Students Oriented SEM

CONSTRUCT PATH	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
INSTRUCTOR QUALITY -> MATH CONNECTION	0.248	0.249	0.031	8.062	0.000
INSTRUCTOR QUALITY -> PEDAGOGY	0.339	0.339	0.030	11.344	0.000
INSTRUCTOR QUALITY -> STUDENTS INTEREST	-0.014	-0.014	0.020	0.686	0.493
INSTRUCTOR QUALITY -> STUDENTS PERCEPTION	0.403	0.403	0.032	12.422	0.000
MATH CONNECTION -> STUDENTS INTEREST	0.806	0.807	0.020	40.481	0.000
MATH CONNECTION -> STUDENTS PERCEPTION	0.255	0.255	0.030	8.516	0.000
MATH FACILITY -> MATH CONNECTION	0.131	0.132	0.026	4.987	0.000
MATH FACILITY -> PEDAGOGY	-0.136	-0.134	0.033	4.129	0.000
MATH FACILITY -> STUDENTS INTEREST	-0.036	-0.036	0.019	1.890	0.059
MATH FACILITY -> STUDENTS PERCEPTION	0.050	0.050	0.027	1.843	0.065
MATH FACILITY -> TEACHER MOTIVATION	0.276	0.280	0.041	6.740	0.000
PEDAGOGY -> MATH CONNECTION	0.309	0.309	0.030	10.209	0.000
PEDAGOGY -> STUDENTS INTEREST	0.017	0.017	0.022	0.762	0.446
PEDAGOGY -> STUDENTS PERCEPTION	0.138	0.139	0.031	4.385	0.000
STUDENTS PERCEPTION -> STUDENTS INTEREST	0.052	0.052	0.025	2.067	0.039
TEACHER MOTIVATION -> PEDAGOGY	0.004	0.003	0.050	0.085	0.933
TEACHER MOTIVATION -> STUDENTS INTEREST	0.056	0.056	0.020	2.756	0.006

The path coefficients of the combined models constructs together with their corresponding t-values coupled with their significant values are indicated in Table 53 The results from the analyzed data indicate that, the path coefficient from pedagogy to students' interest (0.017, P>0.05), teacher motivation to pedagogy (0.004, p>0.05), mathematics facility to students interest (0.05, p>0.05), mathematics facility to students' perception (-0.036, p>0.05), instructor quality to students' interest (-0.014, p>0.05) were found not significant at 5%. The path coefficient with exception of the above mentioned path coefficients, all other path coefficients were found to be significant with p<0.05.

Table 55 Endogenous Variables Explained Variance of Students Interest

CONSTRUCT	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
MATH CONNECTION	0.238	0.242	0.027	8.728	0.000
PEDAGOGY	0.105	0.109	0.018	5.767	0.000
STUDENTS INTEREST	0.711	0.714	0.019	37.790	0.000
STUDENTS PERCEPTION	0.405	0.409	0.025	15.940	0.000
TEACHER MOTIVATION	0.076	0.080	0.022	3.397	0.001

For the prediction of the endogenous variables, the study predicted and explained 71.1% of the total variance in students' interest in mathematics, predicted and explained 7.6%% of the total variance of teacher motivation for teaching mathematics, predicted and explained 23.8% of the total variance of teachers' ability to connect mathematics to real-life and social environment, predicted and explained 10.5 % of the total variance of pedagogy and finally predicted and explained 40.5% of the total variance of students' perception of mathematics. In all the total variance explained by all endogenous constructs were significant at 5% as shown in Table 54.

Table 56 Total Effect of PLS-SEM Path Model

CONSTRUCT PATH	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
INSTRUCTOR QUALITY -> MATH CONNECTION	0.065	0.067	0.017	3.737	0.000
INSTRUCTOR QUALITY -> PEDAGOGY	0.111	0.113	0.022	5.052	0.000
INSTRUCTOR QUALITY -> STUDENTS INTEREST	0.000	0.001	0.002	0.234	0.815
INSTRUCTOR QUALITY -> STUDENTS PERCEPTION	0.207	0.209	0.037	5.624	0.000
MATH CONNECTION -> STUDENTS INTEREST	1.564	1.583	0.180	8.705	0.000
MATH CONNECTION -> STUDENTS PERCEPTION	0.084	0.085	0.020	4.094	0.000
MATH FACILITY -> MATH CONNECTION	0.020	0.021	0.008	2.373	0.018
MATH FACILITY -> PEDAGOGY	0.018	0.018	0.009	2.042	0.041
MATH FACILITY -> STUDENTS INTEREST	0.004	0.005	0.004	0.881	0.378
MATH FACILITY -> STUDENTS PERCEPTION	0.004	0.005	0.004	0.849	0.396
MATH FACILITY -> TEACHER MOTIVATION	0.082	0.087	0.027	3.096	0.002
PEDAGOGY -> MATH CONNECTION	0.112	0.114	0.025	4.477	0.000
PEDAGOGY -> STUDENTS INTEREST	0.001	0.002	0.003	0.279	0.780
PEDAGOGY -> STUDENTS PERCEPTION	0.026	0.028	0.012	2.074	0.038
STUDENTS PERCEPTION -> STUDENTS INTEREST	0.005	0.007	0.006	0.931	0.352
TEACHER MOTIVATION -> PEDAGOGY	0.000	0.002	0.004	0.004	0.997
TEACHER MOTIVATION -> STUDENTS INTEREST	0.009	0.010	0.006	1.412	0.158

Table 57 Average Variance Extracted (AVE)

CONSTRUCT	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
INSTRUCTOR QUALITY	0.682	0.682	0.011	61.179	0.000
MATH CONNECTION	0.514	0.514	0.013	39.172	0.000
MATH FACILITY	0.539	0.537	0.023	23.894	0.000
PEDAGOGY	0.603	0.603	0.015	40.961	0.000
STUDENTS INTEREST	0.545	0.546	0.013	42.075	0.000
STUDENTS PERCEPTION	0.535	0.536	0.012	45.178	0.000
TEACHER MOTIVATION	0.604	0.600	0.019	32.346	0.000

Table 58 Composite Reliability Test of Significance

CONSTRUCT	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
INSTRUCTOR QUALITY	0.928	0.928	0.003	268.242	0.000
MATH CONNECTION	0.804	0.804	0.009	90.153	0.000
MATH FACILITY	0.820	0.818	0.016	50.752	0.000
PEDAGOGY	0.820	0.819	0.009	89.081	0.000
STUDENTS INTEREST	0.826	0.826	0.008	107.274	0.000
STUDENTS PERCEPTION	0.848	0.848	0.007	127.295	0.000
TEACHER MOTIVATION	0.753	0.746	0.023	32.269	0.000

Table 59 Cronbach's Alpha Test of Reliability and Significance

CONSTRUCTS	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Instructor Quality	0.907	0.907	0.005	188.739	0.000
Math Connection	0.677	0.677	0.018	38.442	0.000
Math Facility	0.747	0.747	0.013	55.868	0.000
Pedagogy	0.679	0.678	0.018	36.883	0.000
Students Interest	0.724	0.724	0.014	50.711	0.000
Students Perception	0.774	0.774	0.011	67.409	0.000
Teacher Motivation	0.348	0.347	0.043	8.063	0.000

4.4.5.1 Test of convergent validity

The study examined both descriminant and convergent validity for construct and the extent to which the indicators measures the construct. The study used the, cronbach's alpha, composite reliability and the average variance extracted for the test of convergent validity. The results from the study showed that using the cronbach's alpha test school leadership, mathematics connection, pedagogy, and teacher motivation had a cronbach's alpha value (0.348) below the acceptable value above 0.7, while students' background, interest and instructor quality, mathematics facility and students' interest had cronbach values above 0.7. Thus, per the cronbach's alpha criteria only three constructs were reliable and meet the convergent validity conditionality. Although not all construct had cronbach's alpha value above 0.7, all constructs conbach's alpha values were significnat at 5%.

The use of composite reliablity is assumed to be a better measure of composit reliablity as compared to the cronbach's alpha due to the conservative nature of the cronbach's alpha. The assessement of the composite alpha reliability values showed that all constructs proved reliable with composite alpha values above 0.7. Finally, the AVE was used to assess the convergent validity. It was found that, with exception of school leadership which had AVE value of 0.385 below the cut-off value of above 0.5, the remaining constructs: Instructor qualaity, mathematics connection, pedagogy, student interest mathematics facility and teacher motivation had AVE values above the recommended cut-off of 0.5 as a proof of convergent validity.

Table 60 Heterotrait-Monotrait Ratio (HTMT) and Significance

CONSTRUCT PATH	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
MATH CONNECTION -> INSTRUCTOR QUALITY	0.472	0.473	0.037	12.720	0.000
MATH FACILITY -> INSTRUCTOR QUALITY	0.396	0.397	0.034	11.734	0.000
MATH FACILITY -> MATH CONNECTION	0.221	0.233	0.031	7.013	0.000
PEDAGOGY -> INSTRUCTOR QUALITY	0.362	0.362	0.039	9.251	0.000
PEDAGOGY -> MATH CONNECTION	0.564	0.565	0.042	13.520	0.000
PEDAGOGY -> MATH FACILITY	0.109	0.128	0.027	4.051	0.000
STUDENTS INTEREST -> INSTRUCTOR QUALITY	0.383	0.384	0.038	10.196	0.000
STUDENTS INTEREST -> MATH CONNECTION	1.120	1.121	0.023	48.255	0.000
STUDENTS INTEREST -> MATH FACILITY	0.182	0.194	0.023	7.764	0.000
STUDENTS INTEREST -> PEDAGOGY	0.469	0.470	0.043	10.789	0.000
STUDENTS PERCEPTION -> INSTRUCTOR QUALITY	0.663	0.663	0.029	22.892	0.000
STUDENTS PERCEPTION -> MATH CONNECTION	0.624	0.626	0.036	17.453	0.000
STUDENTS PERCEPTION -> MATH FACILITY	0.252	0.256	0.032	7.819	0.000
STUDENTS PERCEPTION -> PEDAGOGY	0.447	0.448	0.042	10.664	0.000
STUDENTS PERCEPTION -> STUDENTS INTEREST	0.570	0.571	0.038	15.106	0.000
TEACHER MOTIVATION -> INSTRUCTOR QUALITY	0.450	0.454	0.059	7.673	0.000
TEACHER MOTIVATION -> MATH CONNECTION	0.544	0.547	0.066	8.281	0.000
TEACHER MOTIVATION -> MATH FACILITY	0.548	0.555	0.063	8.686	0.000
TEACHER MOTIVATION -> PEDAGOGY	0.392	0.399	0.065	6.028	0.000
TEACHER MOTIVATION -> STUDENTS INTEREST	0.538	0.544	0.062	8.628	0.000
TEACHER MOTIVATION -> STUDENTS PERCEPTION	0.743	0.749	0.069	10.709	0.000

In assessing discriminant validity as means of validating the constructs and a measure of how unique is the constructs dimension and simply not reflecting other variables, although each dimension reflects a portion of other construct. The AVE has been the most common method used for the determination of discriminant validity. Although the cross loadings can be used, this study used the AVE. The result indicated that the square root of AVE for all factors is greater that the correlations between the constructs and other constructs as indicated in Table 60. Furthermore, assessments of discriminant validity can be done better using the Heterotrait-Monotrait ratio (HTMT) since the use of Fornell-Larcker criteria is known to have some shortcomings. Using the HTMT method of assessing discriminant validity showed the existence of discriminant validity between the pair of constructs since the HTMT ratio for each pair of constructs have a value below 0.85 and significant except the path students' interest -> mathematics Connection which had HTMT value above 1.0 as shown in Table 59.

Table 61 Standardized Root Means Square Residual Test of Significance

CONSTRUCT	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Saturated Model	0.079	0.041	0.001	83.065	0.000
Estimated Model	0.109	0.042	0.001	90.768	0.000

The study further measured the approximate fit of the model using the standardized root mean square residual (SRMR). The SRMR measures the difference between the observed correlation matrix and the model-implied correlation matrix. The lower the SRMR value the better. The study result showed that it meets the cut-off point and concludes that the model has a good fit since the value is less than 0.8.

4.5 Research Question 4: To what extent does career interest influence students'

Interest in Mathematics?

The section presents the findings on the investigation that future career interest influence students' interest in mathematics. The results are presented below.

Table 62 indicates career influence on students' interest in mathematics. The examination of career influence on students' interest in learning mathematics revealed that 83.4% of the valid respondents were learning mathematics because it will influence their future career while 16.6% of the valid respondents were of learning not because of the influence of mathematics on their future career.

Table 62 Respondents'' Future Career Influence of Mathematics

Response Categories	Frequency	Percentage
Yes	1044	82.7
No	208	16.5
No Response	11	0.9
Total Respondents	1263	100

The study further investigated the effect of future influence of mathematics on future career of the students and their interest in mathematics. The results of the study revealed that of the 1,040 respondents' who were of the view that mathematics will influence their future career, 865 of the respondents' were interested in mathematics while 175 of them were not interested in mathematics. Out of the 206 respondents' who were of the view that mathematics will not influence their career, 115 of the respondents' were not interested in mathematics while 91 of them were not interested in mathematics. The study found that though majority of the respondents were found to have interest in mathematics based on the influence of mathematics on future career prospect, some students who are not interested in mathematics and also believe that mathematics will have influence on their future career. The total effect of mathematics on future career of students was investigated to see if its affects student interest in mathematics with p <0.05 as shown in Table 63. The study found that the students' interest in mathematics is influenced by their perception that mathematics will have influence on their future career. Thus, the more high school students holds the views that mathematics is likely to influence their future career the more likely the students are interested in mathematics. This confirms the findings by Dewey, (1913b) and Dewey's (1913) theory of interest, which assumes that people will develop new interest in activity or subject if that subject or the activity will further their existing interest. The finding further extends the theory of selective attention by Anderson, (1982) indicating that students are attentive in lesson if they have future anticipation subjects will have influence on their future career. The attention given to the subject during lesions will keep the students focus and further impart on the recall rate hence the interest in the subject.

Table 63 Effect of Student Career Influence on Students' Interest in Mathematics

		CAREER INFLUENCE		Total	Test Statistics	P
		YES	NO		76.56	0.001
STUDENTS INTEREST	YES	865	115	980		
	NO	175	91	266		
Total		1040	206	1246		

4.6 Additional Findings from the Study

Apart from the research questions addressed some other findings came up in the course of the study and are presented in this section of the report.

4.6.1 Chi-Square Test of Independence

Chi-Square Test of independence was performed to examine the relationship between some variables and students' interest in mathematics. The sections below discusses the effect of these variables on students interest in mathematics

4.6.1.1 Effect of Gender on Students' Interest in Mathematics

The study investigated the effect of some demographic and interest-related factors on students' interest in mathematics. Using the chi-square test of independence, the study presents the following results. The effect of gender on students' interest was analyzed and out of 1,240 respondents', 449 respondents were males while 527 were females. It was also found that 100 male respondents' were not interested in mathematics and 164 female respondents' were also not interested in mathematics. The study further ascertained the effect of gender on interest and found that students' interest is influenced by the gender of the student with $p < 0.05$. This indicates that the students' interest in mathematics is gender dependent although the male's interest in mathematics is higher than female's interest. Table 64 shows the results on the effect of gender on students' interest in mathematics.

Table 64 Effect of Gender on Students' Interest in Mathematics

		GENDER	Total	Test Statistics	P
		Male	Female	5.56	0.021
STUDENT INTEREST	YES	449	527	976	
	NO	100	164	264	
Total		549	691	1240	

4.6.1.2 Effect of Students' Age on Mathematics Interest

In an attempt to have a very good over view of demographic factors that influence students' interest in mathematics the study investigated the effect of student's age on the interest in mathematics. The study reveals that 171, 445, 231 and 132 respondents' who were interested in mathematics were found within 14-16,17-19, 20-22 and 23 and above year age groups, respectively while 63, 115, 62 and 24 respondents' in the above respective age groups were not interested in mathematics. The study however revealed that the student interest in mathematics is independent on the age category of the student with $p > 0.05$. Table 65 presents the result on the effect of students' age categories on the students' interest in mathematics.

Table 65 Effect of Students Age on Mathematics Interest

		Age Categories				Total	Test Statistics	*P-value*
		14 – 16	17 - 19	20 - 22	23 and above			
STUDENTS' INTEREST	YES	171	445	231	132	979	7.882	0.056
	NO	63	115	62	24	264		
Total		234	560	293	156	1243		

4.6.1.3 Effect of Basic School Attended on Students Interest in Mathematics

The students' basic school attended was investigated to access the effect on their interest in mathematics. Out of the 690 respondents' who attended public basic schools, 542 and 148 respondents' were either interested and not interest in mathematics, respectively. Of the 517 respondents' who attended private basic schools, 401 and 116 of the respondents' were interested, whereas 116 were not interested in mathematics. However, the findings indicated that the type of basic school attended did not significantly influence the students' interest in mathematics. This suggests that a student's interest in mathematics is independent on the type of basic school he/she attended. The results on the effect of basic school attended on students' interest are presented in Table 65.

Table 66 Effect of Basic School Attended on Students Interest In mathematics

		BASIC SCHOOL ATTENDED		Total	Test Statistics	*P-value*
		Public School	Private School			
STUDENT INTEREST	YES	542	401	943	0.16	0.366
	NO	148	116	264		
Total		690	517	1207		

4.6.1.4 Effect of School Grading on Student Interest in mathematics

The Senior High Schools in Ghana are classified into grades ranging from grade A to grade C schools. The study determined the effect of this grading system on students' interest in mathematics. Of the 551 respondents' drawn from the grade A schools, 390 were interested in mathematics, while 161 were not interested in mathematics. There were 538 respondents' from the grade B schools of which 479 were interest in mathematics while 59 were not interest in mathematics. The study sampled 156 students from the grade C schools. The result of the study revealed that 107 respondents' were interested in mathematics while 30 respondents' were not interested in mathematics. To demonstrate whether the data collected is consistent with the hypothesis that the students' interest is independent on the grade of secondary schools attended, it was revealed otherwise that students' interest in mathematics depends on the grade of secondary school attended. The results of the effect of grade of school attended and students' interest in mathematics are presented in Table 67.

Table 67 Effect of School Grading on Student Interest In mathematics

		GRADE OF SECONDARY SCHOOL			Total	Test Statistics	*P-value*
		Grade A	Grade B	Grade C			
STUDENTS INTEREST	YES	390	479	112	981	59.51	0.003
	NO	161	59	44	264		
Total		551	538	156	1245		

4.6.1.5 Effect of Course Pursued on Student Interest in Mathematics

The effect of course pursued at the Senior High School can influence the interest of the student in mathematics. The study showed that of the 228 respondents' who were selected from the general art classes, 139 were interested in mathematics while 89 were not interested in mathematics. Respondents' from Visual Arts classes were 111 and out of these, there were 84 who were interested in mathematics while the remaining 27 were not interested in mathematics. Majority of the students were selected from those pursing Science programme (569), out of 569 respondents' selected from the general science programme, 489 were interested in mathematics while 80 of them were not interested in mathematics. There were 204 students selected from the Business classes, of these 163 were interested in mathematics and 41 were not interested in mathematics. Finally, there were 137 respondents' from the home economics classes, out of these respondents', 107 were interested in mathematics while 30 of them were not interested in mathematics as shown in Table 68.

Table 68 Effect of Course Pursued on Student Interest in Mathematics

		COURSE PURSUED					Total	Test Statistics	*P-value*
		General Art	Visual Art	Science	Business	Home Economics			
STUDENTS INTEREST	YES	139	84	489	163	107	982	61.21	0.001
	NO	89	27	80	41	30	267		
Total		228	111	569	204	137	1249		

4.6.1.6 Effect of Class Level on Students' Interest in mathematics

Given that duration of SHS could alter influence students' interest in mathematics, the study compared the interest of students at the various levels of SHS education (SHS 1, SHS 2 and SHS3). The study used 199 respondents' from SHS (1), 297 from SHS 2 and 707 from SHS 3. Out of the respondents' selected from SHS (1), 150 were interested in mathematics while 49 of the students were not interested in mathematics by their assertion. The study further showed that 574 third years students selected indicated they are interested in mathematics while 133 of the respondents' in the third year did not show interest in mathematics. The quest to investigate the effect of students' class levels on their interest in mathematics revealed that, the students' interest in mathematics is independent on students' class level. Thus, if the student will be interested in mathematics, it will not depend on the current class of the students. The chi-square test of independence showed statistically not significant with $p > 0.05$ as indicated in Table 69

Table 69 Effect of Class Level on Student Interest In mathematics

		CLASS LEVEL			Total	Test Statistics	P-value
		S H S 1	S H S 2	S H S 3			
STUDENTS INTEREST	YES	150	242	574	966	3.663	0.16
	NO	49	55	133	237		
Total		199	297	707	1203		

4.6.1.6 Effect of Fear Imposed on Student on Student Interest in Mathematics

The study of mathematics over the years seems to be getting better on the face value of some teachers' strategies. In the past, 'mental', which used to be mathematics teacher asking you question and student were expected to give answers in seconds. If a student failed to provide the needed answer the student is caned. This practice and among other practices that existed and still exist in the past seem to put fear in the students about the subject mathematics and their teachers. Out of the 1,243 respondents' who responded to the survey, 442 said they have been scared by the mathematics teachers before and 801 said they have not been scared by their mathematics teachers. Out of those who have been scared by their mathematics teachers before, 325 respondents are interested in mathematics and 117 are not interested in mathematics. Furthermore, from the 801 respondents' who have not been scared by their mathematics teacher, 652 are interested in mathematics while 149 were not interested in mathematics. To further investigate into the effect of the fear imposed on students by teachers on the students' interest in mathematics, the chi-square test of independence rejected the null hypothesis that students' interest is independent on the fear imposed by teachers and accepted the claim that students' interest in mathematics depends on the whether the student has been scared by mathematics teachers before or not with $p < 0.05$ as indicated in Table 70.

Table 70 Effect of Fear Imposed on Students' Interest In Mathematics

		FEAR OF MATHS TEACHER		Total	Test Statistics	P-value
		YES	NO			
STUDENTS INTEREST	YES	325	652	977	10.49	0.001
	NO	117	149	266		
Total		442	801	1243		

4.6.1.7 Effect of Parents Educational Background on Student Interest in Mathematics

The effect of parents' educational background on students' interest in mathematics was investigated to ascertain its influence on mathematics interest. The study categorized the education background into four: uneducated, ordinary and advanced level certificates, graduate and others. Out of the 139 respondents' whose parents were uneducated, 87 of them showed interest in mathematics while 52 of the respondents were not interested in mathematics. From the 303 respondents' whose parents have ordinary and advanced level certificates, 250 of the respondents' were interested in mathematics while 53 were not interested in mathematics. From the 417 respondents' whose parents were graduates from tertiary institutions, 307 of the respondents' were interested in mathematics while 110 were not interested in mathematics but out of the 383 respondents' whose parents' level of education fell on the others categories 334 of the respondents' were interested in mathematics while 49 of them were not interested in mathematics. The study further investigated the effect of parental educational background on the students' interest in mathematics. The results from the study revealed that students' interest in mathematics depends on the level of education of any of the parents with $p<0.05$ as show in Table 71. The results further show that although the students' interest is dependent upon the level of education of the respondent, yet in some cases the students may not have their parents educated at all or to some level but may be interested in mathematics.

Table 71 Effect of Parents Educational Background on Students' Interest in Mathematics

		PARENTS EDUCATIONAL BACKGROUND				Total	Test Statistics	P-value
		Uneducated	'O' or 'A' Level	Graduate	Others			
STUDENTS INTEREST	YES	87	250	307	334	978	42.16	0.001
	NO	52	53	110	49	264		
Total		139	303	417	383	1242		

4.6.1.8 Effect of Parents' Interest on Students' Interest in Mathematics

The parents' interest in mathematics is an important factor that needs consideration. The like or dislikes for mathematics by parents influence students' interest in mathematics. The study constructed an item in the instrument that seeks to know whether the participant's parents are interested in mathematics. The respondents' were made to respond to category of options: YES, NO or DON'T KNOW, whether parents are interested in mathematics or not. Out of the 1,237 valid respondents, 648,116 and 473 respondents' responded that YES their parent like mathematics, NO their parent don't like mathematics and DON'T KNOW whether their parent like mathematics or not, respectively. It was further found that, out of the 648 respondents' whose parents are interested in mathematics, 527 were also interested in mathematics and 121 were not interested in mathematics. Furthermore, it was found that, out of the 116 respondents' who responded that their parents don't like mathematics had 78 of the respondents' interested in mathematics while 38 of them were not. In addition, from the 473 respondents' who did not know whether or not their parents were interested in mathematics, 370 were interested in mathematics and 103 were not interested in mathematics. The study explained further by the chi-square test of independence that, students' interest in mathematics is affected by the parent's interest in mathematics with $p < 0.05$ as shown in the Table 72.

Table 72 Effect of Parents Interest on Student Interest in Mathematics

		PARENTS INTEREST IN MATHEMATICS			Total	Test Statistics	P-value
		YES	NO	DON'T KNOW			
STUDENTS INTEREST	YES	527	78	370	975	11.85	0.003
	NO	121	38	103	262		
Total		648	116	473	1237		

4.6.1.9 Effect of Parental Motivation on Student Interest in Mathematics

The effect of parental motivation in the search of factors that contribute to building students' interest cannot be over looked. The study investigated the effect of parental motivation to study mathematics on the students' interest in mathematics. From the results available from the survey, 712 respondents' who were interested in mathematics were motivated by their parents to study mathematics while 191 respondents' whose parents motivate them to study mathematics are not interested in mathematics. The study further informs that from the 345 respondents' whose parents do not motivate them to study mathematics; 270 of the respondents' are interested in mathematics and 75 of the respondents' were not interested in mathematics. To answer the question of whether parental motivation influence students' interest in mathematics, the study used chi-square test of independence to investigate whether students' interest in mathematics is influenced by the parental motivation. The study revealed that the students' interest in mathematics is not influenced by the parental motivation demonstrated. With *p*

>0.05, the hypothesis that students' interest is independent on the parental motivation was accepted.

Table 73 Effect of Parental Motivation on Student Interest In mathematics

		PARENTAL MOTIVATION		Total	Test Statistics	P-value
		YES	NO			
STUDENTS INTEREST	YES	712	270	982	0.051	0.821
	NO	191	75	266		
Total		903	345	1248		

4.6.1.10 Effect of Discouragement by Teachers on Students' Interest in Mathematics

The teacher can encourage and discourage students in the interest development process. The encouragement may positively influence the interest in mathematics. The present study investigates the effect of discouragement by teacher on the students' interest development. The investigation into whether the respondents' have been discouraged by their previous mathematics teachers. The result of the study reveals that out, of 509 respondents' who have been discouraged previously by their teachers, 339 of these respondents' were interested in mathematics while 170 were not. The study further shows that there were 598 respondents' who were interested in mathematics and have not been discouraged by their mathematics teachers before but 97 respondents' who have been discouraged before by their teachers were not interested in mathematics. Furtherance to this descriptive analysis was the chi-square test of independence, conducted to ascertain the effect of discouragement by mathematics teachers on the students' interest in mathematics. The finding was that the students' interest in mathematics is influenced by the discouragement by the mathematics teachers with p <0.05. The result further explains that if teachers continue to discourage their students in their pursuit of mathematics it will influence the interest in the subject. This will also mean that the teacher who encourages a student in the pursuit of mathematics as a subject may influence the interest of the student in much better way. Thus, teachers are entreated to encourage their students to strive and they will succeed in their pursuit hence building interest in mathematics.

Table 74 Effect Discouragement by Teachers on Students Interest In mathematics

		DISCOURAGEMENT BY TEACHERS		Total	Test Statistics	P-value
		YES	NO			
STUDENTS INTEREST	YES	339	598	937	64.35	0.001
	NO	170	97	267		
Total		509	695	1204		

4.6.1.11 Effects of Students Agents of Motivation on Interest in Mathematics

A student needs motivation in order to ignite self-determination. The quest to understand the role of the agents of motivation namely: parents, teachers and friends were investigated to ascertain the effect of these agents of motivation on students' interest in mathematics. From 1,233 respondents. 349 were motivated by the parents; 277 of the respondents' who were of the views that parents are their agent of motivation were also interested in mathematics while 72 of them did not like mathematics. Out of the 640 respondents'' who saw teachers as their agent of motivation, 548 of the respondents were interested in mathematics while 92 were not interested in mathematics. From the 244 respondents' who saw friends as their agent of motivation, it was found 141 respondents' being interested in mathematics while 103 respondents' were not. The chi-square test of independence to investigate the effect of these agents of motivation on the student interest development process was found to be significant with $p < 0.05$ as presented in Table 75.The result suggests that the students' interest in mathematics depends on these agents of motivation. The study further showed that teachers remain the greater agent of motivation with the peers being the next agent of student motivation. The study, however, found the parents factor as the least of the agent of student motivation.

Table 75 Effects of Students Agents of Motivation on Interest in Mathematics

		AGENT OF STUDENTS MOTIVATION			Total	Test Statistics	P-value
		Parent	Teachers	Friends			
STUDENTS INTEREST	YES	277	548	141	966	80.99	0.0001
	NO	72	92	103	267		
Total		349	640	244	1233		

4.6.1.12 Effect of Compulsion on Students Interest in mathematics

In Ghana, mathematics is compulsory from basic school to the Senior High Schools (SHS). There is perception by students that compulsion has effects on their interest and the effect of compulsion in studying mathematics can be positive or negative. The current study of randomly sampled 1,242 respondents' helped to investigate into the effect of compulsion in studying mathematics on students' interest in mathematics. The students were asked 'if mathematics was not compulsory subject would they have still pursued it' 748 respondents' responded yes they would have still pursued it if mathematics was not compulsory. Of the 748, 700 were interested in mathematics, while 48 were not interested in mathematics. From the 494 respondents' who said they would not have pursued mathematics if it was not made compulsory, 275 of them were interested in mathematics although they would not have pursued it if not the compulsory nature of the subject, while 219 of the respondents' were not interested in mathematics. Further attempt by the study to ascertain the effect of compulsion on student interest in mathematics. The chi-square test of independence was used to access the effect of compulsion on student interest in mathematics, which showed that students' interest in mathematics depends on the compulsion nature of the subject with p <0.05 as shown Table 76. The finding indicates further that the students are compelled to learn and develop interest in the subject since there is no way out to choose between taking the course or not. It is interesting to note that students' interest in mathematics is depends on the fact that mathematics education at the SHS is made compulsory for students.

Table 76 Effect of Compulsion on Students' Interest In Mathematics

		COMPULSION IN STUDYING MATHEMATICS		Total	Test Statistics	P-value
		YES	NO			
STUDENTS INTEREST	YES	700	275	975	25.32	0.0001
	NO	48	219	267		
Total		748	494	1242		

4.6.2 Logistical Regression Analysis of Students' Interest in Mathematics

The study used standard binary logistic regression analysis to model the binary dependent variable, students' interest in mathematics, with gender using female as a focus category, fear imposed by teachers, discouragement by basic school teacher, the compulsion studying mathematics, career influence by mathematics and the students' interest rating.

Table 77 Logistic Regression Model Summary

Model Summary			
Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	747.303[a]	.324	.493

a. Estimation terminated at iteration number 6 because parameter estimates changed by less than .001.

Using 0.5 probability of target membership as predicted threshold, the results of the logistic regression analysis showed that the seven predictors model produced statistically significant prediction of students' interest, where

$\chi^2(7, N = 1096) = 429.742, p < 0.001$. The Nagelkerke pseudo R^2 showed that the model built is able to explain 49.3% of the total variance indicating a moderately high student's interest in mathematics.as shown in Table 77

Table 78 The coefficient Tables and Classification.

Classification Table					
Observed			Predicted: Do you like mathematics as a subject		Percentage Correct
			NO	YES	
Step 1	Do you like mathematics as a subject	NO	131	119	52.4
		YES	50	796	94.1
	Overall Percentage				84.6

a. The cut value is .500

Table 79 The intercept only model

Classification Table					
Observed			Predicted: Do you like mathematics as a subject		Percentage Correct
			NO	YES	
Step 0	Do you like mathematics as a subject	NO	0	250	.0
		YES	0	846	100.0
	Overall Percentage				77.2

a. Constant is included in the model.

b. The cut value is .500

The results indicate that 846 respondents approximately thrice as large as 250 (slightly below one fourth of the respondents' don't like mathematics while slightly above 75% of the respondents were interested in mathematics) as indicated in table 79.

Table 80 Variables in the Equation

Variables in the Equation							
		B	S.E.	Wald	Df	Sig.	Exp (B)
Step 0	Constant	1.219	.072	286.780	1	.000	3.384

The result in Table 78 is confirmed by the result in Table 41 as indicated in by the odd ratio presented by variable in the equation table under the column label Exp (B) =3.4.This further informs that, without any information about the study respondents', respondents are almost thrice as likely for the respondents' to be interested in mathematics as opposed to being uninterested in mathematics. Moreover, there was high overall prediction success of interest of 84.6% and correct prediction rate of 96.1% for students interested in mathematics and 52.4% for respondents' who were not interested in mathematics. The partial regression coefficients, the Wald test, odds ratios $[Exp(\beta)]$ and the 95% confidence interval for the odds ratios for each predictor are presented in Table 80.

Table 81 Evaluation of the Model that includes the Predictors

Omnibus Tests of Model Coefficients				
		Chi-square	Df	Sig.
Step 1	Step	429.742	7	.000
	Block	429.742	7	.000
	Model	429.742	7	.000

The Omnibus test of model coefficients test the null hypothesis that all model coefficients are zero The results indicated that the null hypothesis was rejected indicating that the set of independent variables significantly predicts students interest in mathematics as shown in Table 81.The Wald test indicated that, the fear imposed by teachers, discouragement by basic school teachers, the compulsion studying mathematics, career influence by mathematics and student interest rating significantly predicted students' interest in mathematics while the gender and the type of basic school attended were not statistically significant.

Table 82 Variables in the Equation

Variables in the Equation									
		B	S.E.	Wald	Df	Sig.	Exp(B)	95.0% C.I.for EXP(B) Lower	Upper
Step 1	Discouragement	-.809	.194	17.392	1	.000	.445	.305	.651
	Fear imposed	-.123	.196	.390	1	.532	.885	.602	1.300
	Gender	-.150	.202	.551	1	.458	.861	.580	1.279
	Type of basic school	-.171	.198	.745	1	.388	.843	.572	1.242
	Compulsion	1.782	.208	73.448	1	.000	5.942	3.953	8.932
	Career influence	.769	.226	11.543	1	.001	2.157	1.384	3.360
	Level of interest	.928	.092	101.130	1	.000	2.530	2.111	3.032
	Constant	-2.296	.472	23.705	1	.000	.101		

Variable(s) entered on step 1: DIPB12, DIPB8, DIPB1, DIPB3, DIPB14, DIPB15, and DIPB17.

Student Interest= -2.296+1.78DIPB14+0.77DIPB15+0.93DIPB17-0.81DIPB12-0.12DIPB8 -0.15DIPB1-0.17DIPB3

4.6.3 Principal Component Analysis

In this section, Principal Component Analysis (PCA) was used to help reduce the measurement variables needed by the various construct to carry on the structural equation modeling. This was the first stage of generating the second order construct for the structural equation modeling. For successful implementation, Exploratory Factor Analysis (EFA) was first conducted to check the existence of the proposed factor structures if it indeed consistent with the empirical data. The EFA was run using the principal components extraction method with Varimax rotation and the results of the exploratory factor analysis each of constructs are presented in the sections below

4.6.3.1 Exploratory Factor Analysis for mathematics Connectivity Construct

To be able to determine how many components (factors) to be extracted, the study considered some information provided in the out from the EFA. Using the KMO and Bartlett's test of sampling adequacy showed significant, hence passing the data test to run the PCA using the data. To determine the number of components in the six (6) items measuring mathematics teachers' ability to connect mathematics to immediate environment from the students' point of view, Kaiser's criterion using component with eigenvalues of 1 or more was used.

The final rotated component matrix maintained two factors and was extracted. These two components indicated that the six factors of mathematics connection can be further reduced to two. When the factors were rotated, the first factor accounted for 42.1% of the variance, the second factor accounted for 14.7%. Table 84 displays the items and factor loadings for the rotated factors with loading less than 0.4 omitted for clarity sake.

Table 83 KMO and Bartlett's Test of Sampling Adequacy

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.785
Bartlett's Test of Sphericity	Approx. Chi-Square	1184
	Df	15
	Sig.	0.00

Table 84 Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.527	42.123	42.123	2.527	42.123	42.123
2	0.884	14.738	56.862	0.884	14.738	56.862
3	0.825	13.746	70.607			
4	0.718	11.975	82.582			
5	0.61	10.164	92.746			
6	0.435	7.254	100			

Table 85 Two-Component Rotated Structure Matrix

Rotated Component Matrix		
	Component	
	1	2
Teachers connect Mathematical concept to real life problems	0.812	
Teachers link mathematics to other subject area		0.602
Teachers provides example and case studies	0.501	
Teachers dedicate quality time for practicing class exercise	0.695	
There is coordination between class work and assignment given by mathematics teacher	0.515	
Mathematics is abstractly taught		0.835

Figure 13 Scree plot Rotated structure component

4.6.3.2 Principal Component Analysis of Teachers Teaching Methods

The teachers' teaching method is crucial in shaping the interest culture of students. The study used ten (10) variables to measure the teachers' teaching method constructs. In order to carry out the Structure Equation Modeling using the teaching method construct, a principal component analysis was performed. To determine how many components (factors) to be extracted, the exploratory factor analysis of the ten (10) items of teachers' teaching methods construct was performed from 1,263 SHS students. Prior to the running of the analysis using with SPSS, the data were screened by examining the descriptive statistics on each item, inter-item correlation and possible violation of univariate and multivariate assumptions. The results from the initial assessment indicated that all variables were found to be interval like, variables pairs appear to be bivariate normally distributed and all cases were found to be independent of one another. Due to the large sample size, the variable-to-case ratio was deemed adequate. The Kaiser-Mayer-Olkin measure for sampling adequacy was 0.77, indicating that the survey data were suitable for principal component analysis. Similarly, Bartlett's test of sphericity was significant ($p<0.01$) as shown in Table 86.

Table 86 KMO and Bartlett's Test of Sampling Adequacy

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.771
Bartlett's Test of Sphericity	Approx. Chi-Square	1872
	Df	45
	Sig.	0

This suggests that there is sufficient correlation between the variables to reject the null hypothesis of lack of sufficient correlation between the variables and further proceed with the analysis. To determine the number of components from ten items measuring teachers' teaching methods construct, we used Kaiser's criterion by retaining component with eigenvalues of 1 or more. A total of three factors had their eigenvalues greater than 1.00 cumulatively accounting for 53.95% of the total variance. When the factors were rotated, the first factor accounted for 28.3% of the variance, the second factor accounted for 14.8% and the third factor explained 10.5% of the variance. Table 87 displays the items and factor loadings for the rotated factors with loading less than 0.4 omitted for clarity sake.

Table 87 Total Variance Explained

Total Variance Explained						
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.863	28.631	28.631	2.863	28.631	28.631
2	1.481	14.806	43.437	1.481	14.806	43.437
3	1.051	10.511	53.948	1.051	10.511	53.948
4	0.87	8.698	62.646			
5	0.809	8.092	70.738			
6	0.726	7.263	78.001			
7	0.669	6.692	84.693			
8	0.606	6.058	90.751			
9	0.534	5.345	96.096			
10	0.39	3.904	100			

Table 88 Three-Component Rotated Structure Matrix

Rotated Component Matrix			
	Component		
	1	2	3
Teachers meet course objectives	0.573		
Teachers develop the course systematically	0.68		
Teachers outline major points clearly	0.551		
Teachers provide example and case studies	0.734		
Teachers explain concepts clearly	0.775		
Teachers give deeper understanding of the concept	0.691		
Teachers do not have effective teaching materials		0.705	
There is coordination between what is taught in mathematics class and mathematics exercises given		0.624	
Teachers' focus on examination than content of syllabus		0.688	
Teachers use the traditional way of chalk and talk method to teach			0.885

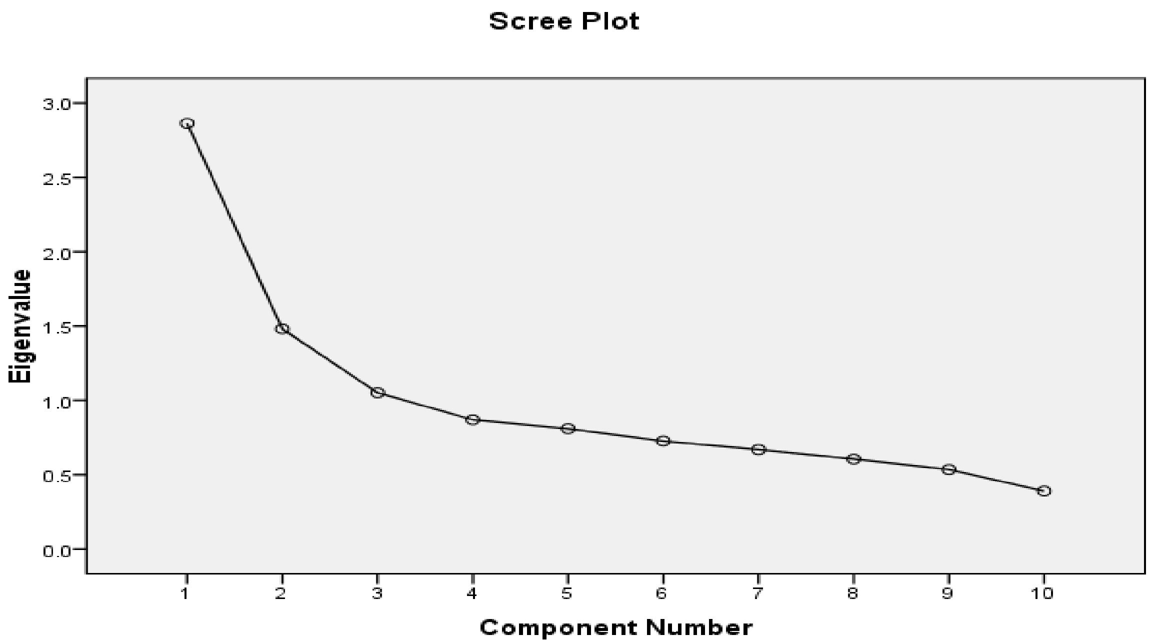

Figure 14 Scree plot Rotated structure component

4.6.3.4 Principal Component Analysis of Students Background Construct (SBC)

The students' background construct (SBC) was measured using eight (8) measurement items to assess the effect of students' background on the students' interest in mathematics. Due to the large number of measurement items by the students' background construct for structural equation modeling, the study carried out a PCA to further reduce the factors into principal component. To determine how many components (factors) to be extracted, an exploratory factor analysis of the eight (8) items of student background construct was performed from 1,263 SHS students. The initial stages of the analysis used SPSS for data screening to examine the descriptive statistics on each of the items, their inter-item correlation as well as checking for possible univariate and multivariate assumption violation. During the initial assessment, the results of the assessment indicate that all variables were found to be interval like, variables pairs appear to be bivariate normally distributed and all cases were found to be independent of one another. Due to the large sample size, the variable-to-case ratio was deemed adequate. The Kaiser-Mayer-Olkin measures for sampling adequacy was 0.83, indicating that the survey data were suitable for PCA. Similarly, Bartlett's test of sphericity was significant ($p<0.01$), indicating that there is sufficient correlation between the variables to reject the null hypothesis of lack of sufficient correlation between the variables and further proceed with the analysis.

Table 89 KMO and Bartlett's Test of Sampling Adequacy

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.829
Bartlett's Test of Sphericity	Approx. Chi-Square	2220
	Df	28
	Sig.	0.000

To determine the number of components in the eight (8) item measuring students' background construct using Kaiser's criterion by retaining component with eigenvalues of 1 or more. A total of three factors had their eigenvalues greater than 1.00 cumulatively accounting for 51.9% of the total variance. When the factors were rotated, the first factor accounted for 40.5% of the variance, and the second factor accounted for 11.4% of the variance. Table 87 displays the items and factor loadings for the rotated factors with loading less than 0.4 omitted for clarity sake.

Table 90 Total Variance Explained

Total Variance Explained						
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.244	40.545	40.545	3.244	40.545	40.545
2	0.916	11.447	51.991	0.916	11.447	51.991
3	0.89	11.126	63.117			
4	0.795	9.933	73.05			
5	0.714	8.923	81.972			
6	0.623	7.793	89.765			
7	0.48	5.998	95.763			
8	0.339	4.237	100			

Table 91 The Two-Component Rotated Structure Matrix

Rotated Component Matrix		
	Component	
	1	2
Previous educational background of the students affects their interest in mathematics	0.664	
Environment in which a student grew up affects his/her interest in mathematics		0.687
The use of canes on students when they make mistakes in class affect their interest in mathematics		0.6
Fear of making mistakes during mathematics lessons affect students' interest in mathematics as they move ahead in their education ladder		0.562
Fear imposed on students by previous mathematics teachers	0.641	
Negative impression on student from basic school	0.698	
Basic concepts in mathematics at the foundation level is taken for granted		0.682
The health condition of students may influence their interest in mathematics	0.679	

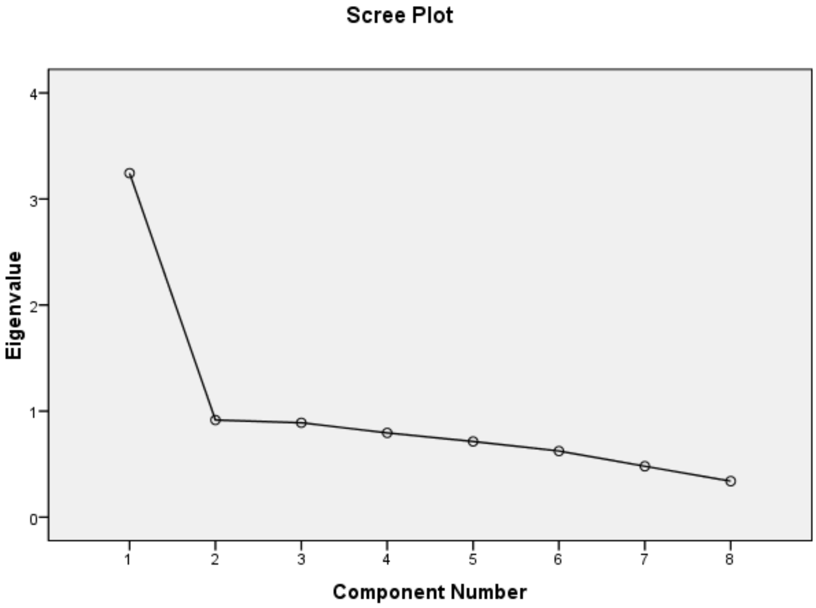

Figure 15 Scree plot Rotated structure component of Students Background Construct

4.6.3.4 Principal Component Analysis of School Leadership Construct (SLC)

The study used eight (8) measurement items to measure the construct, school leadership, to assess the effect of school leadership on students' interest in mathematics. In order to reduce the eight manifest variables to a sizable number to help perform the structural equation modelling, the study carried out a principal component analysis to reduce further the factors into principal components. To determine the number of components within the school leadership constructs, an exploratory factor analysis was performed. Descriptive statistics on each item of the items, their inter-item correlation as well as any possible assumption violation with regard to univariate or multivariate analysis was performed using SPSS. The results showed that all the variables pairs were found to be bivariate normally distributed and all cases were found to have independent relationship with others. The variable to case-ratio was found to be adequate due to the large sample size of the study. The measure of sampling adequacy using the Kaiser-

Mayer-Olkin was 0.74, indicating that the survey data was suitable for principal component analysis. Similarly, Bartlett's test of sphericity was significant ($p<0.01$), indicating that there is sufficient correlation between the variables to reject the null hypothesis of lack of sufficient correlation between the variables and further proceed with the analysis.

In addition to determining the number of components in the eight (8) school leadership measurement variables, the study used Kaiser's criterion for component with eigenvalue of 1 or more. The study found a total of two factors with eigenvalues greater than 1.00 which cumulatively accounting for 42.7 % of the total variance. When the factors were rotated, the first factor accounted for 28.5% of the variance and the second factor accounted for 14.3% of the variance. Table 89 displays the items and factor loadings for the rotated factors with loading less than 0.4 omitted for clarity sake

Table 92 KMO and Bartlett's Test of Sampling Adequacy

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.741
Bartlett's Test of Sphericity	Approx. Chi-Square	802.403
	Df	28
	Sig.	0

Table 93 Total Variance Explained

Total Variance Explained						
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.279	28.487	28.487	2.279	28.487	28.487
2	1.14	14.253	42.74	1.14	14.253	42.74
3	0.961	12.008	54.749			
4	0.826	10.328	65.077			
5	0.8	10.002	75.079			
6	0.74	9.244	84.323			
7	0.685	8.563	92.886			
8	0.569	7.114	100			

Table 94 The Two-Component Rotated Structure Matrix

Rotated Component Matrix		
	Component	
	1	2
Teachers give deeper understanding of the concept	0.661	
Teachers do not have effective teaching materials		0.688
There is coordination between what is taught in mathematics class and mathematics exercises given	0.511	
Teachers' focus on examination than content of syllabus		0.8
Problems of getting text books affects student interest in mathematics	0.569	
Reading book and solving problems related to mathematics affect students' interest	0.371	
School leadership ensures teachers deliver quality in their instruction	0.727	
Frequent change of mathematics teachers by school leadership is problematic to my interest in mathematics	0.585	

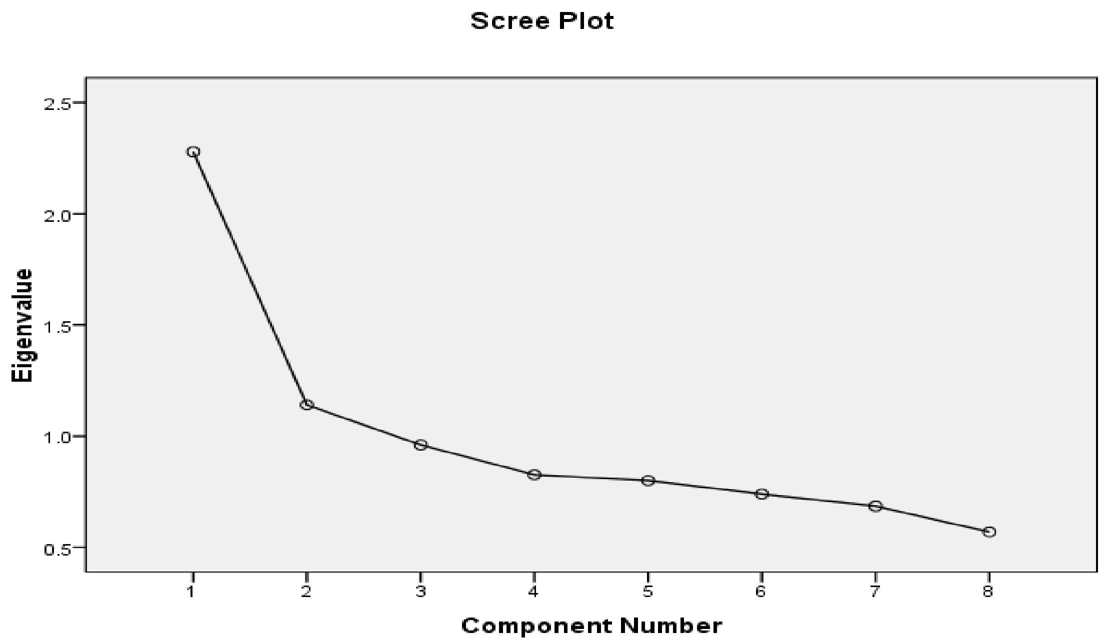

Figure 16 Scree plot Rotated structure component of Students Background Construct

4.6.3.5 Principal Component Analysis of Instructor Quality and Availability Construct (IQAC)

The study used eight (8) items to measure the construct, instructor quality and availability, to assess the effect of instructor quality and availability on students' interest in mathematics. In order to reduce the eight manifest variables to a sizable number to help perform the structural equation modeling, the study carried out a principal component analysis to reduce further the factors into principal components. To determine the number of components within the instructor quality and availability constructs, an exploratory factor analysis was performed. Descriptive statistics on each item, their inter-item correlation as well as any possible assumption violation with regard to univariate or multivariate analysis was performed using SPSS. The results showed that all the variables pairs were found to be bivariate normally distributed and all cases were found to have independent relationship with others. The variable to case-ratio was found to be adequate due to the large sample size of the study. The measure of sampling adequacy using the Kaiser-Mayer-Olkin was 0.74, indicating that the survey data was suitable for principal component analysis. Similarly, Bartlett's test of sphericity was significant ($p<0.01$), indicating that there is sufficient correlation between the variables to reject the null hypothesis of lack of sufficient correlation between the variables and further proceed with the analysis.

Table 95 KMO and Bartlett's Test of Sampling Adequacy

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.859
Bartlett's Test of Sphericity	Approx. Chi-Square	2507
	Df	28
	Sig.	0

In determining the number of components in the eight (8) instructor quality and availability construct, the study used Kaiser's criterion for component with eigenvalue of 1 or more. The study found a total of two factors with eigenvalues greater than 1.00 which cumulatively accounting for 42.7 % of the total variance. When the factors were rotated, the first factor accounted for 28.5% of the variance and the second factor accounted for 14.3% of the variance. Table 96 displays the items and factor loadings for the rotated factors with loading less than 0.4 omitted for clarity sake.

Table 96 Total Variance Explained

Total Variance Explained						
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.332	41.651	41.651	3.332	41.651	41.651
2	1.024	12.805	54.456	1.024	12.805	54.456
3	0.908	11.347	65.803			
4	0.812	10.151	75.954			
5	0.644	8.046	84			
6	0.568	7.099	91.099			
7	0.391	4.888	95.988			
8	0.321	4.012	100			

Table 97 Two-Component Rotated Structure Matrix

Rotated Component Matrix		
	Component	
	1	2
Shortage of qualified mathematics teachers affects students interest in mathematics	0.666	
Bad teaching methods adopted by teachers affects students interest in mathematics	0.547	
Poor illustration methods adopted by teachers affects students interest in mathematics	0.847	
Lack of patience on the part of teachers affects students interest in mathematics	0.672	
Lack of trained mathematics teachers affects students interest in mathematics	0.801	
Large students to teacher ratio affects students interest in mathematics		0.744
Students are refreshed on their previous knowledge in mathematics		0.65
Poor teaching strategies adopted by teachers	0.802	

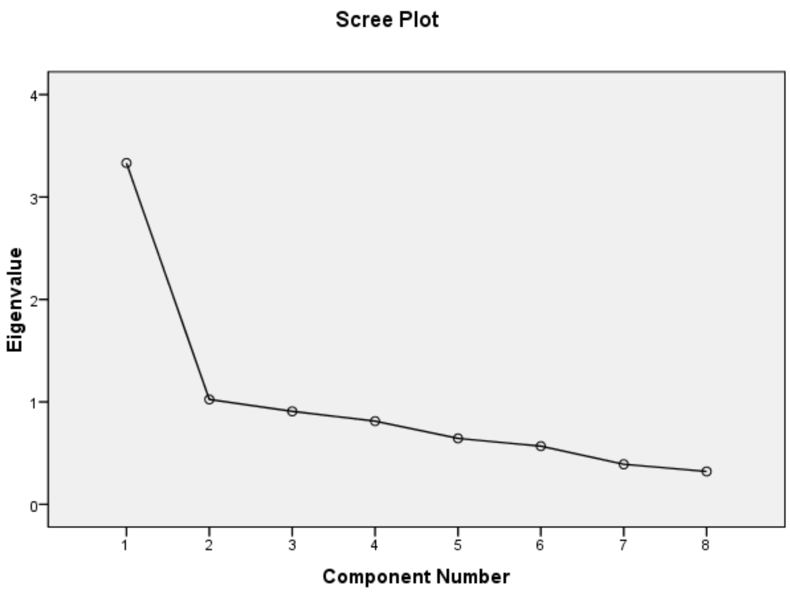

Figure 17 Scree plot Rotated structure component Instructor Quality and Availability.

4.6.3.6 Principal Component Analysis of mathematics Facility Availability Construct (MFAC)

The mathematics Facility Availability Construct (MFAC) was measured using six (6) measurement items to assess the effect of mathematics Facility Availability Construct on the students' interest in mathematics. Due to the large number of measurement items by the mathematics Facility Availability Construct, the study carried out a PCA to further reduce the factors into principal component. To determine how many components (factors) to be extracted, an exploratory factor analysis of the six (6) items of Mathematics Facility Availability Construct was performed from 1,263 SHS students. The initial stages of the analysis used SPSS for data screening to examine the descriptive statistics on each of the items, their inter-item correlation as well as checking for possible univariate and multivariate assumption violation. During the initial assessment, the results of the assessment indicate that all variables were found to be interval like, variables pairs appear to be bivariate normally distributed and all cases were found to be independent of one another. Due to the large sample size, the variable-to-case ratio was deemed adequate. The Kaiser-Mayer-Olkin measures for sampling adequacy was 0.703, indicating that the survey data were suitable for PCA. Similarly, Bartlett's test of sphericity was significant ($p<0.01$), indicating that there is sufficient correlation between the variables to reject the null hypothesis of lack of sufficient correlation between the variables and further proceed with the analysis

Table 98 KMO and Bartlett's Test of Sampling Adequacy

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.703
Bartlett's Test of Sphericity	Approx. Chi-Square	1627
	Df	15
	Sig.	0.000

The study further determined the number of components in the six (6) Mathematics Facility Availability Construct, the study used Kaiser's criterion for component with eigenvalue of 1 or more. The results showed that a total of two factors with eigenvalues greater than 1.00 which cumulatively accounting for 65% of the total variance. When the factors were rotated, the first factor accounted for 41% of the variance and the second factor accounted for 24.% of the variance. Table 99 displays the items and factor loadings for the rotated factors with loading less than 0.4 omitted for clarity sake.

Table 99 Total Variance Explained

Total Variance Explained						
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.46	41.005	41.005	2.46	41.005	41.005
2	1.441	24.018	65.023	1.441	24.018	65.023
3	0.666	11.101	76.124			
4	0.559	9.315	85.439			
5	0.447	7.447	92.886			
6	0.427	7.114	100			

Table 100 The Two-Component Rotated Structure Matrix

Rotated Component Matrix		
	Component	
	1	2
There is library facility with relevant mathematics books		0.843
The school provides the needed instructional materials for the study of mathematics		0.862
The school lacks of mathematics teaching equipment	0.706	
The school lacks ICT facilities	0.679	
There is inadequate access to resource	0.84	
Teachers do not have effective teaching materials	0.759	

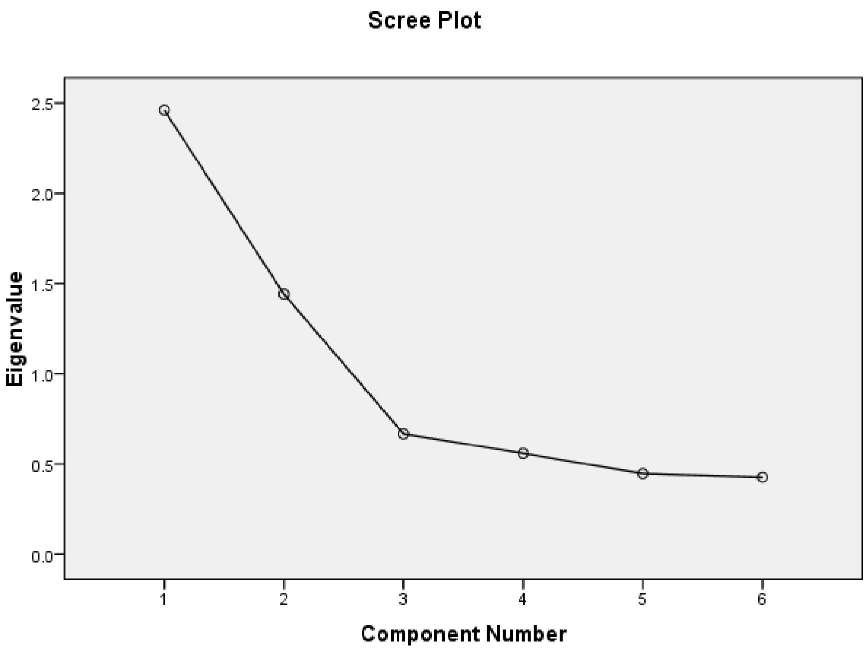

Figure 18 Scree plot Rotated structure component of mathematics Facility Availability Construct

4.6.3.7 Principal Component Analysis of Student Teacher Motivation Construct (STMC)

The Student Teacher Motivation Construct (STMC) was measured using thirteen (13) measurement items to assess the effect of Student Teacher Motivation Construct (STMC) on the students' interest in mathematics. Due to the large number of measurement items by the Student Teacher Motivation Construct (STMC) the study carried out a PCA to further reduce the factors into principal component. To determine how many components (factors) to be extracted, an exploratory factor analysis of the thirteen (13) items of Student Teacher Motivation Construct (STMC) was performed from 1,263 SHS students. The initial stages of the analysis used SPSS for data screening to examine the descriptive statistics on each of the items, their inter-item correlation as well as checking for possible univariate and multivariate assumption violation. During the initial assessment, the results of the assessment indicate that all variables were found to be interval like, variables pairs appear to be bivariate normally distributed and all cases were found to be independent of one another. Due to the large sample size, the variable-to-case ratio was deemed adequate. The Kaiser-Mayer-Olkin measures for sampling adequacy was 0.703, indicating that the survey data were suitable for PCA. Similarly, Bartlett's test of sphericity was significant ($p<0.01$), indicating that there is sufficient correlation between the variables to reject the null hypothesis of lack of sufficient correlation between the variables and further proceed with the analysis

Table 101 KMO and Bartlett's Test of Sampling Adequacy

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.758
Bartlett's Test of Sphericity	Approx. Chi-Square	2445
	Df	78
	Sig.	0

The study further determined the number of components in the thirteen (13) Student Teacher Motivation Construct (STMC), the study used Kaiser's criterion for component with eigenvalue of 1 or more. The results showed that a total of two factors with eigenvalues greater than 1.00 which cumulatively accounting for 54.5 % of the total variance. When the factors were rotated, the first factor accounted for 23.9% of the variance, the second factor accounted for 13.9.% of the variance. the third factor accounted for 8.8. % of the variance and the second factor accounted for 7.9 % of the variance Table 102 displays the items and factor loadings for the rotated factors with loading less than 0.4 omitted for clarity sake

Table 102 Total Variance Explained

Total Variance Explained						
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.119	23.989	23.989	3.119	23.989	23.989
2	1.805	13.888	37.876	1.805	13.888	37.876
3	1.139	8.763	46.639	1.139	8.763	46.639
4	1.021	7.853	54.492	1.021	7.853	54.492
5	0.937	7.207	61.699			
6	0.832	6.403	68.102			
7	0.791	6.081	74.183			
8	0.755	5.808	79.991			
9	0.627	4.822	84.813			
10	0.555	4.272	89.085			
11	0.548	4.213	93.298			
12	0.447	3.436	96.734			
13	0.425	3.266	100			

Table 103 The Two-Component Rotated Structure Matrix

Rotated Component Matrixa			
	Component		
	1	2	3
Students are motivated to have sense of control	0.719		
Students are given challenging activities during and after lessons	0.661		
Students are made to understand the importance of topic being taught	0.76		
Students' curiosity is provoked by teachers or academic mentors			0.534
Teachers are not motivated by school leadership			
Government policy in education does not motivate teachers			
Students develop self-concept and motivation during lessons	0.662		
Students spend less time solving Mathematical problem during or after lessons			
Students are motivated to work extra after mathematics class		0.569	

Low level of interest in mathematics by students does not motivate them to work hard in mathematics	0.772	
Students are not motivated by their mathematics teachers		0.816
Teachers are not accessible to students out of class		0.785
Teachers teach well their private lesson as compared to normal classes	0.682	

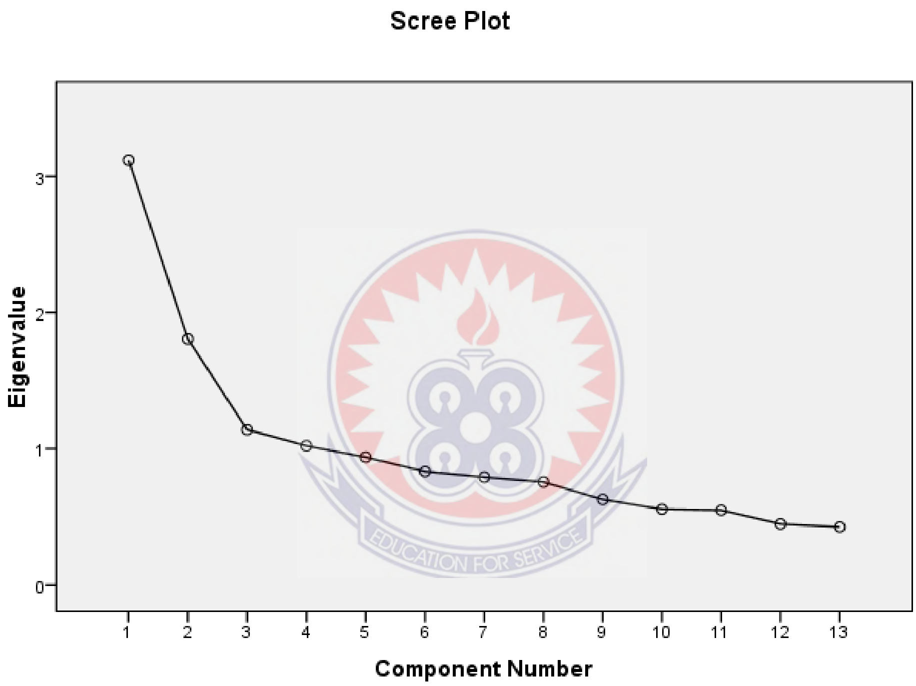

Figure 19 Scree plot Rotated structure component for Students Teacher Motivation

4.6.3.8 Principal Component Analysis of Students Perception Construct (SPC)

The study used eight (8) items to measure the Students Perception Construct (SPC), to assess the effect of Students Perception Construct (SPC) on students' interest in mathematics. In order to reduce the eight manifest variables to a sizable number to help perform the structural equation modeling, the study carried out a principal component analysis to reduce further the factors into principal components. To determine the number of components within Students Perception Construct (SPC), an exploratory factor analysis was performed. Descriptive statistics on each item, their inter-item correlation as well as any possible assumption violation with regard to univariate or multivariate analysis was performed using SPSS. The results showed that all the variables pairs were found to be bivariate normally distributed and all cases were found to have independent relationship with others. The variable to case-ratio was found to be adequate due to the large sample size of the study. The measure of sampling adequacy using the Kaiser-Mayer-Olkin was 0.87, indicating that the survey data was suitable for principal component analysis. Similarly, Bartlett's test of sphericity was significant ($p<0.01$), indicating that there is sufficient correlation between the variables to reject the null hypothesis of lack of sufficient correlation between the variables and further proceed with the analysis.

Table 104 KMO and Bartlett's Test of Sampling Adequacy

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.865
Bartlett's Test of Sphericity	Approx. Chi-Square	3511
	Df	45
	Sig.	0

The study further determined the number of components in the eight (8) Students Perception Construct (SPC), the study used Kaiser's criterion for component with eigenvalue of 1 or more. The results showed that a total of two factors with eigenvalues greater than 1.00 which cumulatively accounting for 63.3 % of the total variance. When the factors were rotated, the first factor accounted for 40.3% of the variance, the second factor accounted for 12.3% of the variance and the third factor accounted for 10.5. %

of the variance. Table 105 displays the items and factor loadings for the rotated factors with loading less than 0.4 omitted for clarity sake

Table 105 Total Variance Explained

Total Variance Explained						
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulativ %
1	4.052	40.517	40.517	4.052	40.517	40.517
2	1.226	12.259	52.776	1.226	12.259	52.776
3	1.053	10.531	63.307	1.053	10.531	63.307
4	0.828	8.28	71.587			
5	0.627	6.271	77.858			
6	0.568	5.68	83.538			
7	0.48	4.796	88.334			
8	0.455	4.553	92.887			

Table 106 the Two-Component Rotated Structure Matrix

Rotated Component Matrix			
	Component		
	1	2	3
Negative impression of students from basic schools affects students interest in mathematics	0.847		
Misconception about mathematics affects students interest in mathematics	0.83		
The time of the day in which mathematics is taught affect student interest in mathematics	0.676		
Students with bad perception about mathematics affects student interest in mathematics	0.758		
There are so many formulae in mathematics and that affect student interest in mathematics		0.776	
The complex nature of mathematics affects students' interest in mathematics		0.715	

The student's perception that mathematics is not enjoying affects students interest in mathematics	0.523		
Students feel they are not involved in the teaching and learning process		0.505	
Students attaché personal significance to the study of mathematics			0.801
The students perception that only bright student can perform well in mathematics affects students' interest in mathematics			0.703

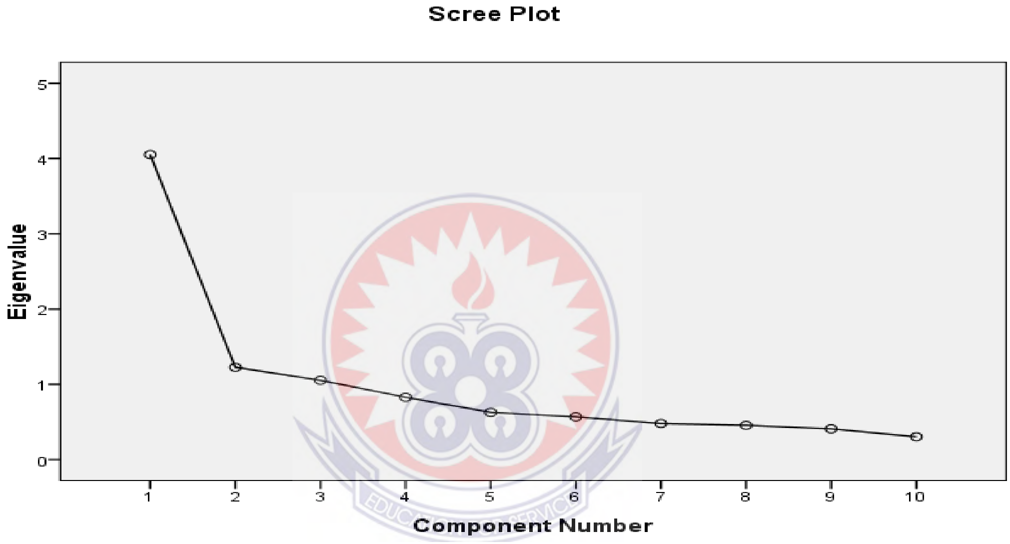

Figure 20 Scree plot Rotated structure component for Students Perception Construct

4.6.3.9 Summary of Principal Component Analysis

Constructs	Construct identifier	Total number of initial items	Principal component	Cronbach's Alpha
MATHEMATICS CONNECTIONS	MC	6	2	0.692
TEACHERS TEACHING METHODS	TTM	10	3	0.59
STUDENTS BACKGROUND	SB	8	2	0.765
SCHOOL LEADERSHIP	SL	8	2	0.599
INSTRUCTOR QUALITY AND AVAILLABILITY	IQA	8	2	0.699
MATHEMATICS FACILITIES	MF	6	2	0.701
STUDENT AND TEACHER MOTIVATION	STM	13	4	0.676
STUDENTS PERCEPTION	SP	10	3	0.823

This section summarizes the results obtained from the principal component analysis. The number of factors emanated from the Principal Component Analysis together with initial number of factors and their respective Cronbach's alpha values were summarized

4.7 Chapter Conclusions

The chapter presented the results obtained from the study. The results generated from the study were presented based on the research questions; however, other findings which were not captured in these research questions were presented under other findings. Students' interest in mathematics was modelled using logistic regression model, multiple linear regression models, and structural equation model. Three separate models were developed using the structural equation model. The models are students' oriented model, Teacher oriented model and combined model. The students' oriented factors predicted 28.9% of variation in students' interest in mathematics. The teacher oriented factors also predicted 71.8% of the variability in the students' interest in mathematics. Finally the combined student oriented factors and teacher oriented factors predicted 71.1% of the variability in students interest in mathematics.

CHAPTER FIVE

DISCUSSION

5.0 Overview

The chapter presents the discussion of the findings of the study. The discussion begins with the results from the cross tabulations, followed by the results from the logistic regression and multiple linear regression., results from the structural equation model are discussed and finally other findings emanating from the study was discussed.

5.1 Extent to which Students'-Oriented Factors Influence Students' Interest in Mathematics

5.1.1 The Influence of School Leadership on Students Interest in Mathematics

The test results based on the hypothesis stated that, the variable school leadership significantly influences and affects the students' interest in mathematics. The path coefficient value (0.151) for the variable school leadership is significant ($p < 0.05$) toward students' interest in mathematics. This indicates that, the hypothesis that school leadership significantly affects students' interest in mathematics is true and acceptable. The result further explains that school leadership has a close relationship with students' interest in mathematics. This indicates that, as school leadership are up to their responsibility of managing and providing what is needed by students and teachers for the smooth teaching and learning of mathematics, the better students show interest in the subject. The result is consistent with the finding by Li & Adamson, (1995) which indicated the teacher motivation affect students interest in mathematics. The study further confirm the results by Leithwood & Jantzi, (2006) which revealed significant impact of leadership on teachers classroom practices that influences students interest mathematics. This can further be explained that school leadership influences on students interest in mathematics is cannot be undermined since the school leadership act as a reference point for both students and other staff of the institution.

5.1.2 The Influence of School Leadership on Students' Motivation

Based on the results obtained by the study through the examination of path coefficient value (0.375) for school leader on student motivation to study mathematics, it can be stated that students' motivation is significantly influenced by the school leadership. The hypothesis that, school leadership has significant effects on students' motivation in learning mathematics is thus true and acceptable. The positive and significant value of the path coefficient ($p < 0.05$) is an indication of proportionality between school leadership and students' motivation. This further affirms that, there is a close relationship between school leadership and students' motivation in learning mathematics. This implies that the higher the level of leadership exhibited by the state or the agents of the state, the better the students are motivated to learn mathematics as a subject.

5.1.3 The Influence of School Leadership on Students' Perception

The study investigated the effect of school leadership on the student perception about mathematics. Based on the test of hypothesis, the path coefficient value (0.177) for the school leadership is significant towards the students' perception about teaching and learning of mathematics. The significant ($p < 0.05$) path coefficient value is an indication that, school leadership has proportional effect on students' perception about mathematics and close relationship exist between school leadership and students' perception about mathematics. The school leadership exhibited will have direct effect on the students' perception about mathematics. The study is consistent with findings by Leithwood & Jantzi,(2006) as revealed significant impact of leadership on teachers classroom practices which influences students interest in mathematics. The study theoretically explains that, the more school leadership improves in their supervisory role as well as providing the needed teaching and learning resource, the better perception students have about mathematics.

5.1.4 The Influence of Students Motivation on Students Interest in Mathematics

The study found out that the effect of students' motivation on the student interest in mathematics. This was done through the test of hypothesis: student motivation affects students' interest in mathematics significantly. The path coefficient (0.045) result generated showed a positive and significant ($p < 0.05$) effect between students' motivation and students' interest in mathematics. This result accepts the hypothesis stated and confirms that students' interest in mathematics is significantly influenced by the students' motivation. The result further explains that, there is direct relationship between students' interest in mathematics and students' motivation in learning mathematics. The higher the level of motivation the students have in studying mathematics, the higher their interest in learning mathematics. These results support the findings from (Tella, 2007) that students' motivation has impact on students' interest in mathematics.

5.1.5 The Influence of Students' Background on Students Interest in Mathematics

The study examined the effect of students' background on the students' interest in mathematics, using the path coefficient as basis for assessment of whether the hypothesis stated will be accepted or rejected. The study results showed a significant

($p < 0.05$) path coefficient value of 0.260 for the variable of student background towards student interest in mathematics. This means that the hypothesis that, students' background affects students' interest in mathematics significantly is accepted and confirms that there is a direct and proportional relationship between students' interest and students' background. Thus, the students' background experiences influence the students' interest in mathematics. Students with pleasant background where mathematics is cordially taught and fear of making mistakes does not exist and even if it does, it is minimal; have brighter chance of developing interest in mathematics. It is also worth noting that students with background where parents provide what is needed for the study of mathematics also tend to develop interest in mathematics but the opposite may be true although the final determinant is the student when all that is needed is provided for smooth learning of mathematics. It was further observed that children with background where parent's education is high may have higher and brighter chance of becoming interested in mathematics since parents can monitor their performance and provide the needed guidance for higher interest in mathematics.

5.1.6 The Influence of Students Perception on Students' Interest in Mathematics

The influence of students' perception on students' interest in mathematics was investigated to ascertain its effect and the extent to which students' perception does influence the students' interest in mathematics. The study tested the hypothesis that students' perception about mathematics do not significantly affects the students' interest in mathematics. This claim was rejected as the path coefficient value (0.214) obtained by the results showed positive and significant ($p<0.05$). The positive and significant path coefficient value shows that there is direct proportionality between students' perception and students' interest in mathematics. This means that, if the students have good perception about mathematics it will translate into developing interest in mathematics; however, if the perception of the students is negative then it will translate into lower level of interest in mathematics.

5.1.7 The Influence of Students' Background on Perception about Mathematics

The effect of students' background on students' perception about mathematics was investigated through the use of hypothesis testing. The hypothesis that, students' background do not significantly affect students' perception about learning of mathematics. The hypothesis was found to be false and rejected after having a path coefficient value (0.494) to be positive and significant ($p < 0.05$). The positive path model indicates a direct relationship between students' background and students' perception about mathematics. The results can further be explained that, students with good background have a fair and better perception of about mathematics. Thus, if the students have educated parents, attended schools where teaching and learning of mathematics takes place in more congenial atmosphere, then these students are more likely to have good perception about mathematics as compared to students with background where parents are uneducated and not motivational, low financial assistance and where mathematics is taught in an environment where there is no cordial relationship between students and teachers.

5.1.8 The Influence of Students' Background on Motivation for Mathematics

The study investigated the effect of students' background on the students' motivation for learning mathematics. The results reveal that students' background has strong effect on the students' motivation for learning mathematics. The study tested the hypothesis that students' background do not significantly influences students' interest in learning mathematics. The study rejected the claim based on the path coefficient result that showed significant ($p < 0.05$) relationship between students' motivation and students' background. The positive and significant path coefficient shows direct proportionality between students' background and students' motivation in mathematics. This result suggests that, students with good family background in terms of education and wealth, good basic schools, well to do home may have some sort of motivation in learning mathematics.

5.1.9 The Influence of Students' Perception on Students' Motivation

The influence of students' perception on students' motivation in learning mathematics was investigated to determine its effect and to what extent does a student's perception influence motivation in learning mathematics. The study tested the hypothesis that a student's perception about mathematics do not significantly affects the student motivation for learning mathematics. This claim was rejected as the path coefficient value (0.45) obtained by the results was positive and significant. The positive and significant ($p < 0.05$) path coefficient shows that there is direct proportionality between students' perception and students' motivation in learning mathematics. This means that, if the students have good perception about mathematics it will have direct effect on their motivation. Thus, if students have bad perception about mathematics then it will lead to low motivation for learning mathematics while positive perception of student about mathematics may also translate to high motivation for learning mathematics. The result supports the study by Siegle et al., (2014) which suggested that positive perception held by students about mathematics would automatically raise their motivation to learn mathematics and consequently their performance

5.2 Extent to which Teacher-Oriented Factor Affect Students' Interest in Mathematics

5.2.1 The Influence of School Leadership on Teacher Motivation

The influence of school leadership on teacher motivation is the subject of investigation in this section. The hypothesis that school leadership has significant influence on the teacher motivation was verified. It was observed that the path coefficient is positive (0.262) and a significant ($p < 0.05$) relationship between school leadership and teacher motivation. This result indicates a direct proportionality between the school leadership and teacher motivation and further suggests that school leaders has the potential to influence teacher motivation. This result can be sustained since the school leadership have direct influence and has the needed resources to carry out activities that can intrinsically or extrinsically motivate the teachers to perform in their line of responsibility. The school leadership should provide the needed educational materials, the infrastructure for teaching and learning as well as tackling remuneration issues in the best interest of teachers. This will directly motivate the teachers for high performance.

5.2.2 The Influence of School Leadership on Instructor Quality and Availability

This section of the study investigates the effect of school leadership on instructor quality and availability. The results were based on the hypothesis stated that, the variable school leadership significantly influences and affects the instructor quality and availability in teaching and learning of mathematics. The path coefficient value (0.443) from the variable school leadership to instructor quality and availability in mathematics was found to be statistically significant ($p < 0.05$). This indicates that, the hypothesis that school leadership significantly affects instructor quality and availability in mathematics is true and accepted. The result further explains that school leadership has a close relationship with instructor quality and availability in mathematics. The result shows that school leadership has the responsibility to provide quality teachers and make them available to the various schools. The result also indicates that the school leadership directly influences the quality of instructors the schools get and the quantity of instructors in a particular school to make teaching and learning of mathematics smoothly. The result supports the finding from the studies of (Fullan, 2001; Hallinger & Heck, 1996; Marks & Printy, 2003) as they pointed out that effective school leadership can create the needed support for effective teaching and learning process and further builds professional capacities.

5.2.3 The Influence of School Leadership on Pedagogy

Having assessed the effect of school leadership on instructor quality and availability, the study next examined whether school leadership significantly influence pedagogy. The study thus tested the hypothesis that, the school leadership variable significantly influence pedagogy was tested. The path coefficient value (0.558) shows a direct and significant relationship between school leadership and pedagogy as indicated in Table 89. The result led to a rejection of the hypothesis that school leadership does not significantly influences pedagogy. Additionally, the result shows that though school leadership has direct responsibility of providing the needed teaching and learning materials as well as providing the needed environment for smooth delivery of mathematics but the delivery lies with the teachers' competence and teaching strategies adopted by the teacher. The results of from this study is consistent with the findings by

Leithwood & Jantzi, (2006) that revealed significant impact school leadership has on teachers classroom practices. Thus, teacher quality is very important because no matter how school leadership provides the materials and environment for teaching and learning of mathematics, the teachers' quality is what will be needed for smooth delivery.

5.2.4 The Influence of School Leadership on Students' Interest in Mathematics

The test results based on the hypothesis that, the variable school leadership does not significantly influence students' interest in mathematics. The path coefficient value (-0.054) variable school leadership is significant toward student interest in mathematics. This indicates that, the hypothesis that school leadership does not significantly ($p < 0.05$) affect students' interest in mathematics is false and rejected. The result further explains that school leadership has an inverse relationship with students' interest in mathematics since the path coefficient is negative. This result indicates that, as school leadership are up to their responsibility of managing and providing what is needed by student and teacher for the smooth teaching and learning of mathematics, the students' interest student in the mathematics reduces. This result may be attributable to the fact that students interest in mathematics is independent on school leadership ability provide the needed infrastructure and other teaching and learning materials provided by the school leadership.

5.2.6 The Influence of Mathematics Facility on Teacher Motivation

The study examined the influence of mathematics facility on teacher motivation. The test result was based on the hypothesis that availability of mathematics facilities does not significantly influence teachers' motivation. The path coefficient value (0.147) for the mathematics facilities was significant ($p < 0.05$) toward teacher motivation in teaching mathematics. This indicates that, the hypothesis that mathematics facility availability significantly affects teacher motivation is false and rejected. This result further suggests that, mathematics teachers are motivated if school leadership provides the needed facilities for the teaching and learning of mathematics. Thus, there is positive relationship and proportionality between provision of mathematics facilities or mathematics teaching and learning materials (MTLMs) and mathematics teacher's motivation (MTM).The results supports the findings by Leithwood, Harris, & Hopkins, (2008) suggesting that school leadership exerts great influence on teacher's capacities, motivations and beliefs regarding their working conditions. This further suggests that the school leadership has stronger influence in providing the needed facilities for smooth teaching and learning.

5.2.7 The Influence of Mathematics Facility on Pedagogy

To further assess the importance of mathematics facility construct, the study further examined the influence of mathematics facility on pedagogy. The result of the path coefficient value (-0.137) suggests a negative relationship between the mathematics facility and pedagogy. The hypothesis that, mathematics facility does not significantly ($p<0.05$) influence pedagogy is false and rejected. The result, however, suggest that, as more facilities are provided and made available for the teaching and learning of mathematics, the teachers' pedagogy decreases. This finding may be true for this study in Ghana because the teaching of mathematics in most senior high schools has been done without the use of mathematics teaching and learning materials. Thus, the students may not appreciate the relevance of MTLMs in the instruction process in mathematics. The students are exposed to only the traditional chalk and talk method where teachers are seen as bank of mathematical knowledge and the students are only seen as receivers of their abundant knowledge. The finding can be attributable to perception of students that mathematics is not practical and abstract, unlike other parts of the world where mathematics can be demonstrated in the laboratory. The result can be reversed if teaching and learning of mathematics is integrated with some laboratory work coupled with the needed facilities to influence pedagogy and student interest.

5.2.8 The Influence of Mathematics Facility on Instructor Quality and Availability

The influence of mathematics facility on instructor quality and availability was investigated by examining the extent to which mathematics facility affects instructor quality and availability. The study result reveals that there is positive relationship and direct proportionality between mathematics facility and instructor quality as evidenced by the path coefficient value (0.269). This finding shows that as the mathematics facility is made available the more it enhances the instructor quality. The study tested the hypothesis that mathematics facility does not significantly ($p > 0.05$) influence instructor quality and availability. The hypothesis was rejected and concluded that mathematics facility significantly ($p < 0.05$) influence instructor quality and availability. The result suggests further that as the school leadership provides the needed teacher supports materials as well as student support materials, the instructor quality will be improved to have good effect on the students' interest for better performance.

5.2.9 The Influence of Mathematics Facility on Student Interest in Mathematics

The study further examined the effect of mathematics facility on students' interest in mathematics. This was done by testing the hypothesis that mathematics facility does not significantly affect student interest in mathematics. The result of the path coefficient value (-0.037) suggested a negative relationship between the mathematics facility and students interest in mathematics. The hypothesis that, mathematics facility do not significantly affect students interest in mathematics was found to be false and rejected since ($p < 0.05$). The result, however, suggest that, as more facilities are provided and made available for the teaching and learning of mathematics, the students' interest in mathematics decreases. This finding may be true for some peculiar reason in Ghana because the teaching of mathematics in most senior high schools has been done without the use of mathematics teaching and learning materials (MTLM's), so the students do not see the perhaps the relevance of MTLMs in the instruction process in mathematics. The student only know about the traditional chalk and talk method where teachers are seen as bank of mathematical knowledge and the students are only seen as receivers of their abundant knowledge. The finding can be attributable to perception of students that mathematics is not practical and abstract, unlike other parts of the world where mathematics can be demonstrated in the laboratory.

5.2.10 The Influence of Pedagogy on Mathematics Connection

The influence of pedagogy on mathematics connection was also investigated by testing the hypothesis that, pedagogy does not significantly affect teachers' ability to connect mathematics to real-life problems and their social environment. The path coefficient value (0.288) indicates a positive and direct proportionality between pedagogy and mathematics connection. The study findings made a discovery that, teachers pedagogical strategies adopted during instruction in mathematics affects significantly ($p<0.05$) the teachers' ability to connect mathematics to other subject areas, real-life situations and our social and immediate environments. The finding was in line with the study by (Palm, 2008) which indicated some level of disconnection between the students' Mathematics learning and how it applied to real world problems. This disconnect does not help students in their mathematics learning outcomes and hence makes them uninterested in mathematics.The results further shows that improved pedagogy by mathematics teachers will enhance their ability to connect mathematics to other subject areas and our social environment.

5.2.11 The Influence of Pedagogy on Student Interest in Mathematics

The pedagogical strategies adopted by mathematics teachers were investigated to determine its influence on the students' interest in mathematics. The study tested the hypothesis that, pedagogical strategies by the teacher do not significantly predict students' interest in mathematics. The path coefficient (0.040), suggests a positive relationship between pedagogy and students' interest in mathematics. However, the relationship between pedagogy and interest was not significant at 5% ($p > 0.05$) as in Table 89. The result suggests that as a teacher teaches well, students' interest in mathematics will be enhanced, hence a direct proportionality between teachers' teaching methods and students' interest in mathematics.

5.2.12 The Influence of Teacher Motivation on Pedagogy

The effect of teacher motivation on pedagogical strategies of the teacher was investigated using the hypothesis that teachers' motivation does not significantly influence the pedagogical strategies adopted by the mathematics teacher. The path coefficient value (-0.017) indicates that there is inverse proportionality between teachers' motivation and their pedagogical strategies. The result further implies that teachers' motivation has no significant ($p > 0.05$) effect on the pedagogy, hence the hypothesis is true and accepted. This indicates that though motivation is good and needed in any field of work but the absence of teachers' motivation does not influence their teaching style or method of instruction.

5.2.13 Influence of Mathematics Connection on Student Interest in Mathematics

The study further examined whether mathematics connection has influence on students interest in mathematics. The outcome shows that, its influence was significant ($p < 0.05$) on students' interest in mathematics. The path analysis result indicated a positive path coefficient value (0.824) for the variables mathematics connections and student interest in mathematics. This shows that, the relationship between mathematics connection and students' interest was significant in affecting student interest in mathematics. Thus, the teacher's ability to connect mathematics to real-life problems as well as other subject areas influence students' interest in mathematics positively and significantly. The finding which is consistent with the study by (Rakes, Valentine, McGatha, & Ronau, 2010) asserting that teachers inability to connect mathematics to real life problems negatively affect students interest and compound students' struggle with mathematical problems.The finding suggests that students' interest in mathematics could be efficiently predicted by the teachers' ability to connect mathematics to real-life problem, immediate environment and other subject areas. The scarely nature of mathematics as seen by most Ghanaian student will support this finding, connecting mathematics to real life problems will alleviate students fear to the barest minimum and encourage students to learn mathematics.

5.2.14 The Influence of Instructor Quality and Availability on Student Interest in Mathematics

The study investigated the effect of instructor quality and availability on students' interest in mathematics by testing the hypothesis that instructor quality and availability does not significantly affect students' interest in mathematics. The path coefficient value (0.018) suggests a positive relationship between quality mathematics instructors and students' interest in mathematics. However, the hypothesis was rejected and concluded that instructor quality and availability significantly affect students' interest in mathematics. The result indicates that, quality instructors significantly ($p<0.05$) influences and affects students' interest in mathematics is factual and accepted. The result, however, suggests that more quality mathematics instructors for the teaching and learning of mathematics are needed to motivate students to have interest in mathematics. This result is consistent with the study by (Voss & Gruber, 2006), where students showed preference for quality instructors who are knowledgeable, friendly and approachable to deliver quality of instruction in mathematics. The result further agrees with the study by(Arthur, Asiedu-addo, & Assuah, 2017; Klassen, 2010) which indicated that mediocre teachers who are inexperienced negatively affect students interest in mathematics

5.3 Influence of Student-Teacher Oriented Factors on Students' Interest in Mathematics

The study discussed the chapter the findings from the influence of student-teacher oriented factors on students' interest in mathematics. The discussion begun with the findings from the multiple linear regression analysis and followed by the findings from the structural equation model.

5.3.1 Findings from Multiple Linear Regression Model

The section focused on the contributions of student-teacher oriented variables to students' interest using correlation and multiple linear regression analysis. The study found teachers' ability to connect mathematics to real life problem was the major predictor of students' interest in mathematics. The result suggests that as mathematics teachers are able to connect mathematics to real life problems and experiences students will more likely to develop interest in mathematics. This result might have been influenced by the fact that the teacher's teaching method was not significant in predicting students' interest in mathematics. The students' perceived teachers' teaching methods as not significant to influence their interest because the teaching of mathematics has always been done with the old 'talk and chalk method'.

The instructor quality and availability was found to influence student interest in mathematics significantly. Mathematics as content specific subject requires qualified personnel with in-depth knowledge in the subject matter. This means that availability of qualified personnel is crucial for smooth delivery to ensure students' understanding and interest in mathematics. The result supports the finding of (Siegle et al., 2014) which indicated that students interest is influenced by teachers' classroom management strategies Thus, lack of qualified mathematics personnel will negatively influence students' interest and performance in mathematics. If qualified mathematics personnel can integrate real life problems during mathematics lesson then school leadership should provide mathematics teaching facility to help connect mathematics to real life experiences. This makes the role of school leadership very crucial in providing the enabling environment for smooth teaching and learning of mathematics. Mathematics teaching and learning materials as well as software packages that aid understanding and interest of students need to be provided. The negative perception of students about mathematics negatively affects their interest in mathematics. This means that when students develop positive attitude and perception toward learning mathematics and mathematics classroom experiences it goes the long way to improve students' interest and performance. This result is consistent with the study by Mata et al. (2012) in that students who hold positive attitude and perception towards mathematics affect their mathematics grade and achievement positively

5.3.2 The Influence of Mathematics Facility on Teacher Motivation

The study examined the influence of mathematics facility on teacher motivation in teaching mathematics. The test result was based on the hypothesis that the variable mathematics facilities positively and significantly influence and affect teacher motivation in teaching mathematics. The path coefficient value (0.276) for the variable mathematics facilities is significant ($p<0.05$) toward teacher motivation in teaching mathematics. This indicates that, the hypothesis that mathematics facility availability significantly affects teacher motivation is true and accepted. This result further suggests that, mathematics teachers are motivated if school leadership provides the needed facilities for the teaching and learning of mathematics. Thus, there is a positive relationship and proportionality between provision of mathematics facilities or mathematics teaching and learning materials (MTLM's) and mathematics teacher's motivation (MTM).

5.3.3 The Influence of Students Perception about Mathematics on Pedagogy

The study assed further access whether students' perception about mathematics is influenced by pedagogical approach adopted by the mathematics teachers. The results showed a positive and significant ($p<0.05$) path coefficient (0.138) indicating that, students' perception of mathematics is positively affected by the pedagogical strategies adopted by the mathematics teacher. The result suggested a positive relationship between the students' perception and pedagogy. The hypothesis that, students' perception is not significantly influenced by pedagogical strategies adopted by the mathematics teacher is false and rejected. The results, suggest that, as more facilities are provided and made available for the teaching and learning of mathematics, the pedagogical skills of the teacher improves.

5.3.4 The Influence of Mathematics Facility on Mathematics Connection

The influence of mathematics facility on mathematics connection to real-life problems was investigated by examining the extent to which mathematics facility affects mathematics teachers' ability to connect mathematics to real-life and our immediate environment. The study tested the hypothesis that mathematics facilities do not significantly influence mathematics teachers' ability to connect mathematics to real life problems. The hypothesis was found to be false and rejected since ($p<.005$).The result indicates a reveals a positive relationship and direct proportionality between mathematics facility availability and the teachers' ability to connect mathematics to real-life as shown by the path coefficient value of 0.131. This finding shows that, as mathematics facility is made available for teaching and learning mathematics, the more it enhances the mathematics teachers' ability to connect mathematics to the immediate environment, other subject areas and real-life problems. The result suggests further that as the school leadership provides the needed teacher support materials as well as student support materials, it will likely improve mathematics connection to real-life problems and our immediate environment and it will further affect students' interest for better performance.

5.3.5 The Influence of Mathematics Facility on Student Perception about Mathematics

The study further investigated the effect of mathematics facility on students' perception in mathematics. This was accomplished by testing the hypothesis that mathematics facilities do not significantly influence students' perception in mathematics. The result yielded path coefficient of (0.05) suggesting a positive relationship between mathematics facility and students perception in mathematics. The hypothesis that, mathematics facility does not significantly ($p > 0.05$) influence students' perception in mathematics is true and accepted. The results however, suggests that, as more facilities are provided and made available for the teaching and learning of mathematics the better the perception students have about mathematics. This finding could be true for some peculiar reason in Ghana because the teaching of mathematics in most senior high schools has been done without the use of mathematics teaching and learning materials (MTLM's), so to the students they don't see the perhaps the relevance of MTLM's in the instruction process in mathematics. The traditional chalk and talk method where teachers are seen as bank of mathematical knowledge and the students are only seen as receivers of their abundant knowledge. The finding can be attributable to perception of students that mathematics is not practical and abstract, unlike other parts of the world where mathematics can be demonstrated in the laboratory. The result can be reversed if teaching and learning of mathematics is integrated with some laboratory work and the mathematics laboratory with the needed facilities to influence pedagogy and students' interest.

5.3.6 The Influence of Teacher Motivation on Pedagogy.

The influence of mathematics teacher motivation on the pedagogical strategies of the teacher was also investigated by testing the hypothesis that, teacher motivation does not significantly affect pedagogical strategies of the teacher. The path coefficient of 0.004 shows a positive and direct proportionality between pedagogy and teacher motivation. The hypothesis was accepted and concluded that the pedagogical strategies of mathematics teachers' are not influenced significantly by teacher motivation. The result is arguably true because pedagogy depends mostly on the content knowledge base of the teacher although some brilliant teacher may have problem communicating what they know.

5.3.7 The Influence of Pedagogy on Student Interest in Mathematics

The pedagogical strategies adopted by mathematics teachers were investigated to determine its influence on the students' interest in mathematics. The study tested the hypothesis that, pedagogical strategies by the teacher significantly predict students' interest in mathematics. Considering a path coefficients of 0.017, a positive relationship between pedagogy and student interest in mathematics was observed. However, the relationship between pedagogy and interest was not significant ($p>0.05$). The result suggests that as teachers adopts positive teaching strategies in teaching mathematics, the more students get interested in learning mathematics, hence a direct proportionality between teachers teaching methods and students interest in mathematics.

5.3.8 The Influence of Teacher Motivation on Students' Interest

The effect of teacher motivation on students' interest was investigated using the hypothesis that teachers' motivation does not significantly influence the students' interest in mathematics. The path coefficient value of 0.056 indicates that there is direct proportionality between teacher motivation and their students' interest. The result further implies that teacher motivation does not significantly ($p>0.05$) affect students' interest in mathematics. This indicates that though motivation is good and needed in any field of work but the absence of teacher motivation does not significantly influence their teaching style or method of instruction. The result was contrary to the result obtained by Li & Adamson, (1995) which showed that teacher motivation significantly influences students' interest. This can further be explained that school leadership influences motivation and interest

5.3.9 The Influence of Instructor Quality on Mathematics Connection

The study examined whether instructor quality positively and significantly influences teachers' ability to connect mathematics to real-life problems. The result from the study proves that there exists a positive and significant relationship ($p<0.05$) between the instructor quality and his/her ability to connect mathematics to real-life problems. The result from the path analysis confirms a positive path coefficient value (0.248) for the variables mathematics connections and instructor quality. This shows that the relationship between mathematics connection and instructor quality was significant. The study further reveals that the quality of instructors available for the teaching of mathematics will influence their ability to connect mathematics to their immediate environment as well as other subject areas and real-life problems.

5.3.10 The Influence of Instructor Quality and Availability on Student Interest in Mathematics

With respect to whether instructor's quality and availability has any influence on students' interest in mathematics, the study tested the hypothesis that students' interest in mathematics is influenced by instructor quality and availability. The path analysis produced a coefficient value of -0.014, which suggests a negative relationship between quality of mathematics instructors and students interest in mathematics. The hypothesis results further indicate that, quality of instructors does not significantly ($p>0.05$) influence students' interest in mathematics which leads to the rejection of the hypothesis. The results, however, suggest that the more quality mathematics instructors available for the teaching and learning of mathematics, the less motivated are students in learning mathematics.

5.3.11 The Influence of Mathematics Connection on Student Perception in Mathematics

The study further considered the effect of mathematics connection on students' perception about mathematics. This was done by testing the hypothesis that mathematics connection does not significantly affect students' perception in mathematics. The result from the path analysis conducted provided a path coefficient value (0.225) which suggested a positive relationship between the mathematics connection and students' perception about mathematics. The hypothesis that, mathematics connection does not significantly influence students' perception about mathematics is false and therefore rejected. The result further suggests that the more mathematics teacher connect mathematics to real life and immediate environment of students' the more improved perception students have about mathematics by correcting the already existing unpleasant perception of students about mathematics.

5.3.12 The Influence of Instructor Quality and Availability on Student Perception in

Mathematics

The study further sought to find out whether students' perception about mathematics could be influenced by instructor's quality and availability. The study tested the hypothesis that instructor quality and availability significantly affect students' perception in mathematics. The path analysis results yielded a path coefficient value (0.403) suggesting a positive relationship between quality mathematics instructors as well as their availability and students perception about mathematics. The hypothesis that quality instructors significantly ($p<0.05$) influences students' perception about mathematics is thus true and accepted. The results, however suggest that more quality mathematics instructors for the teaching and learning of mathematics will likely have impact on students' perception about mathematics.

5.3.13 The Influence of Students Perception on Students Interest in Mathematics

The effect of students' perception on students' interest in mathematics was investigated using the hypothesis that students' perception influences students' interest. The path analysis yielded a path coefficient value of 0.052 between students' perception and their in mathematics. The result indicates a direct proportionality between students' perception and students' interest. The result further implies that students perception has a significant ($p<0.05$) effect on the students' interest. The more students build a positive perception about mathematics the more interested mathematics will be for them. That is, positive students' perception about mathematics produces higher interest in mathematics. The result is consistent with the study by (Siegle et al., 2014; Tapia & Marsh, 2004) which revealed the influence of students' perception on students' mathematics interest in Kenya.

5.3.14 The Influence of Mathematics Connection on Students Interest

The study also investigated the extent to which teachers' ability to connect mathematics to real-life problems affects students' interest in mathematics. The result reveals that there is positive relationship and direct proportionality between mathematics connection and student interest in mathematics as shown by the path coefficient value (0.806). This finding means that as teachers are able to connect mathematics to real-life problems, the better for students' interest in mathematics. The result from the study lead to acceptance of the hypothesis that mathematics connection positively and significantly ($p<.001$) influences students' interest in mathematics. The result suggests that as the school leadership provides the needed teacher support materials as well as student support materials, the mathematics connection will be improved to further influence on the students' interest for better performance.

5.3.15 The Influence of Instructor Quality on Pedagogy

The study investigated the influence of instructor quality and availability of mathematics teachers on pedagogical strategies adopted during mathematics instruction. The results obtained from the study revealed a positive and significant relationship between instructor quality and the pedagogical strategies of the teacher. The path coefficient value (0.339) shows a positive and direct proportionality between pedagogy and instructor quality. The findings from this study show that the quality of instructions received by the students from their instructors depends on the quality of instructors in terms of training. The result further suggests that improved instructor quality enhances pedagogical strategies adopted for the teaching of mathematics. The result agrees with studies by Paswan & Young, (2002) and Abrantes et al., (2007) which suggested that instructor quality and instructor responsiveness to students' need leads to high level of students interest.

5.3.16 The Influence of Pedagogy on Mathematics Connection

This study examined whether the pedagogical strategies positively and significantly affect teachers' ability to connect mathematics to real-life problems. The study tested the hypothesis that pedagogy has influence on mathematics connections. The outcome of the study shows that, the influence of mathematics connection on pedagogy was significant ($p<0.05$) which leads to the acceptance of the hypothesis that pedagogy has significant influence on mathematics connections. The path analysis result indicated a positive path coefficient value (0.309) for the variables mathematics connections and pedagogy in mathematics. This shows that the relationship between mathematics connection and Pedagogy was significant in affecting pedagogy in mathematics. The result means that a teacher's ability to connect mathematics to real-life problems as well as other subject areas is influenced by the pedagogical strategies adopted by the teacher. The findings further suggest that students' interest in mathematics could be efficiently predicted by the teachers' ability to connect mathematics to real-life problems, immediate environment and other subject areas, However, it is worth noting that mathematics connection can effectively take place when the facilities needed for the teaching of mathematics as well as quality instructors are provided.

5.4 Extent to which Future Career Interest Influence Students' Interest in Mathematics

The effect of course pursued in the secondary school was also found to influence students' interest in mathematics. This result may partly be true due to the fact that the future career anticipation may influence the courses pursued. If the future career anticipation requires further knowledge or particular grade in mathematics, then students are likely to show interest because career influences mathematics interest. The result further affirms the results by Asiedu-Addo, Assuah, & Arthur, 2016; and Watt et al.(2017) indicating that inadequate career guidance in schools affect their interest in mathematics.

The fear imposed on students before, during and after mathematics lesson influence their interest in mathematics although it does not significantly predict student interest in mathematics. Mathematics has been seen as a difficult subject especially among the female dominated subjects so the relationship between mathematics teachers and students matter for building interest and developing confidence in the subject matter.

5.6 Discussion of other findings

The section discusses the results generated from the cross tabular analysis aside the major findings indicated in the research questions. It starts with how gender affects students' interest in mathematics. The effect of students' gender on students' mathematics interest was found to be significant. The results suggest that, the gender of the students influence their interest in mathematics. However, the gender of the student does not significantly predict students' interest in mathematics. Although mathematics is seen as male dominated, the trend is changing which suggests that both gender categories can perform based on their personal disposition towards mathematics.

The investigation into the effect of students' age on students' interest in mathematics revealed that students' interest in mathematics is independent on students' age. This suggests that students' interest in mathematics is not age dependent, however, the level of students' maturity in mathematics increases as their class level increases. This result deviate from the study by Köller et al., (2001a) that suggest that student age influence their interest in mathematics.

The result on the effect of basic school attended on students' interest in mathematics suggested that students' interest in mathematics is independent on the type of basic school attended. The result clarifies the perception that mathematics interest is not dependent on whether you attended private or public school and that the type of basic school students attended does not significantly influence students' interest in mathematics.

The grade of school determines the performance of the school; the study based on this assertion examined the influence of school grading on students interest in mathematics. The students' interest in mathematics was found to be dependent on the grade of school the students attended. This result may be due to the fact that most students who perform exceptionally eventually find themselves in grade A and B schools while those who do not perform so well are mostly offered schools within the grade C. It is worth noting that the mode of placement is performance based and mathematics performance from the basic school is key.

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The fear imposed on students before, during and after mathematics lesson influence their interest in mathematics although it does not significantly predict student interest in mathematics. Mathematics has been seen as a difficult subject especially among the female dominated subjects so the relationship between mathematics teachers and students matter for building interest and developing confidence in the subject matter.

The parents' involvement in students' academic career was investigated and found to affect students' interest in mathematics. The results suggested that the parent educational background as well as parents interest in mathematics influences students interest in mathematics. The results imply that as parents show interest in mathematics their children are also likely to demonstrate interest in mathematics. Moreover, the higher the level of education of the parents, the more likely children will be interested in mathematics. Parents with high level of formal education will wish their children progress because they mostly appreciate the role mathematics plays in academic progression of their children. This makes parents who are educated go extra mile to get their children the needed materials and support for better understanding of mathematics. It should be noted that some parents without good educational background also show interest in their children education. Furthermore, the students' interest in mathematics was found to be independent on parental motivation for their children in mathematics. However, the findings from the study showed that students' interest in mathematics depends on the teacher, peers and parents which represents the agents of students' motivation. The teacher as agent of student motivation is the most important motivator for their academic interest in mathematics. This result was also consistent with the study by Mata et al., (2012) which suggested that teachers and peer support influence students attitude and interest towards mathematics.

The study modeled students' interest in mathematics using logistic regression techniques with students' interest as dependent variable. The independent variables were fear imposed on students', gender, the type of basic school attended, discouragement by teachers, and compulsion in studying mathematics, career influence, and student level interest in mathematics. The result of the study suggested that discouragement compulsion in studying mathematics, career influence, and student level interest significantly predict students' interest in mathematics while the gender, fear imposed on students, and type of basic school attended do not significantly predict students interest in mathematics. Similar studies recommended to mathematics teachers to be friendly and sensitive to students needs as a means to improve students' satisfaction in learning mathematics which will lead to high level of interest and performance (Dyer et al., 2004; Keong et al., 2005; Putnam, 1992). Additionally, the result explains the facts that though students' interest in mathematics depends on the gender as indicated in the study by Arthur et al.,(2014), it is however, worth noting that the students' gender does not significantly predict student interest in mathematics. This may be due to the fact that students of both genders are likely to be interested in mathematics as well as not show interest in mathematics. The study noted that the gender of the student do not significantly predict whether the student will be interested in mathematics or not. The type of basic school attended by the students was also found not to predict students' interest in mathematics significantly. The type of basic school attended is known to influence students' interest in mathematics and was found to be statistically insignificant in predicting student interest. The results from the current study show that although the performance of students from these two school categories may differ, interest cannot be predicted by it. This indicates that no matter which type of school the students may find themselves, they may like mathematics or dislike mathematics as long as personnel needed, material needed and other things necessary for smooth study of mathematics are provided. The compulsion nature of the mathematics subject was found to influence students' interest in mathematics significantly. The study results indicate that as the subject is made compulsory, it keeps students interest in the subject and further suggests that the more we keep mathematics as a compulsory subject in the basic and high schools, the more students' interest is sustained in the subject. The factor of career influence by mathematics was found to predict students' interest in mathematics. The study posits that as students anticipate the importance of mathematics to their future career, they will attach special importance, hence its impact on their interest. Anecdotal evidence suggests that most people in the computationally dominated courses are interested in mathematics and others showed less interest.

The result further explains the reason behind students' interest in learning mathematics although they have difficulty with the subject. The teachers' influence in building students' interest may not be measurable since it is enormous. The teacher factors like the fear imposed and discouragement by mathematics teachers were also found to predict student interest significantly.

5.7 Contribution to Interest Theory

In this study, the three approaches to interest research was extended by identifying factors which make of the characteristics of the person (individual interest as a disposition) and the characteristics of the learning context environmental factors that influence student interest in mathematics. The study proposed the models that looks into student interest in mathematics, the teacher-oriented factor model, teacher-oriented factor model and combined student teacher-oriented factor model. The student-oriented factor model which contributed approximately 29% of students' interest in mathematics had factors such as school leadership, student background and students' perception significantly influencing student interest in mathematics. The teacher-oriented factor model which contributed approximately 72% of students' interest in mathematics had factors construct such as school leadership, teacher motivation, mathematics facility, and teachers' ability to connect mathematics to real life problems as constructs that significantly predict students' interest in mathematics.

The combined model used both teacher and students' oriented construct that passed the both discriminant and convergent validity test .The constructs such as mathematics connection, students' perception and teacher motivation contributed significantly to students' interest in mathematics.

CHAPTER SIX

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

6.0 Chapter Overview

The section summarized the findings based on the statistical techniques used in obtaining the results. The chapter begins with the descriptive statistical analysis, the chi-square test of independent, logistic regression analysis, multiple linear regression models and finally the structural equation modelling. The chapter also presented conclusions and recommendations inferred from the results. Teacher oriented factors were the most significant factors that contribute to students' interest in mathematics. Among the teacher oriented factors, it was concluded that students' interest in mathematics was significantly predicted by mathematics teachers' ability to connect mathematics to real life problems. Finally, Ghanaian senior high school students' performance in mathematics is dependent on their interest in mathematics, therefore, educational leadership should seek first students' interest in mathematics and all performance and achievement shall be added to them.

6.1 Descriptive Statistical Analysis

The descriptive statistical analyses of the various variables in this study indicate that the frequent changes of mathematics teachers affect students' interest in mathematics. The findings from this study show that the school leadership ability to provide the necessary teaching and learning materials for teachers and students respectively increases students' interest in mathematics. This suggests that the school' leadership ability to provide mathematics laboratory for the practice of mathematics will improve substantially students' interest in mathematics. Furthermore, the findings suggest that if students develop positive perception about mathematics and abhor negatives perception and impressions about mathematics they are likely to improve their interest in mathematics.

6.2 Chi-Square Test of Independence

The study used the chi-square test of independence for assessing the effect of gender, grade of school, course of study, fear imposed by mathematics teachers, parental educational background, parents' interest in mathematics, discouragement by mathematics teachers, agent of students' motivation, compulsion, future career influence, basic school attended, class level of students and parental motivation on students interest in mathematics. The study concluded that students' interest in mathematics is independent on the basic school attended, class level of students and parental motivation for students. The study further suggests that, irrespective of the basic school students attended (private or public basic school), the student interest can be developed in mathematics. Although motivation from parents is very important, however, this study on the contrary suggests that irrespective of the parental motivation, student can develop interest in mathematics at all levels in their academic career.

However, the study concluded further that students' interest in mathematics depends on gender, grade of school, course of study, fear imposed by mathematics teachers, parental educational background, parents' interest in mathematics, discouragement by mathematics teachers, agent of students' motivation, compulsion and future career influence by mathematics. The categories of secondary school attended by the student influence their interest in mathematics significantly, the higher the grade of secondary school attended the better the interest. The fear imposed by mathematics teachers negatively affect students interest in mathematics indicating that the more teaching and learning of mathematics is made fun without fear ,discouragement and intimidation the more interest student develop in in mathematics.

6.3 Logistics Regression Analysis

Two statistical techniques were adopted to help investigate the stated objectives. The results from the logistics regression model provided enough evidence to conclude that students' interest in mathematics is influenced significantly by the gender, fear imposed by basic school teachers, discouragement by mathematics teachers, compulsion in studying mathematics, career influence by mathematics as well as the students level of interest. The study concluded that 49.3% of students interest in mathematics can be explained by gender, fear imposed by basic school mathematics teachers, discouragement by mathematics teachers, compulsion in studying mathematics, career influence by mathematics as well as the students level of interest.

6.4 Multiple Linear Correlation and Regression Analysis

The multiple linear regression analysis presented model to predict students' interest in mathematics based on students' perception, students' background, mathematics facility, instructor quality and availability, teacher student motivation, mathematics connection, and school leadership. The results revealed that although students' perception, students' background, Mathematics facility, and instructor quality and availability were statistically significant in predicting the students' interest in Mathematics, the contributions of these predictor variables in explaining the variation in students' interest were less than 1%. The study also showed that Mathematics connection and school leadership were statistically significant in predicting students' interest in Mathematics, while Mathematics connection contributes 37.8% of the variation in the student interest in Mathematics; school leadership on the other hand contributed approximately 2% of the total variation in students' interest in Mathematics. The study finally concludes that students' interest in Mathematics can best be predicted by Mathematics connection, school leadership, students' background, instructor quality and availability, Mathematics facility and student perception. In the attempt to verify the effect of independent variables on students interest in mathematics , the data collected were analyzed using multiple linear regression and structural equation models to ascertain the extent to which students' perception, motivation, background, teacher motivation, pedagogy, teaching aid availability and school leadership effects students' interest in mathematics.

The multiple linear regression analysis results revealed that students' interest in mathematics is highly influenced by a teacher's ability to connect mathematics to real-life problems or their immediate environment. The mathematics connectivity to real-life problems or their environments was found to explain 37.8% of students' interest in mathematics. This finding suggests that the more mathematics teachers are able to connect mathematical concepts to real-life problem, the better their students' interest in mathematics is enhanced. Teachers need to be given enough training to help them connect mathematics to real life. Furthermore, school leadership was found to contribute to the building of students' interest, however, school leadership constructs only explained 2% of the total variation explained. Although, the remaining predictor variables significantly predicted students' interest in mathematics, their contributions to the prediction was, however, less than 1% of the total variation explained.

6.4 Structural Equation Model Results

The study concluded as follows based on the structural path analysis and the hypothesis tests against these paths.

6.4.1 Conclusion from Student Oriented Model

The study made the following conclusions based on the student oriented structural equation model

i. The study concluded that school leadership, students' perception and students' background have positive significant effects on students' interest in mathematics. However, students' motivation although have positive and direct effect on students' interest, it is not significant in predicting students' interest in mathematics.

ii. The study also concluded that school leadership; students' perception and students' background positively and significantly affects students' motivation in learning mathematics.

iii. The study further concluded that students' perception about mathematics is positively and significantly influenced by students' background and school leadership.

6.4.2 Conclusion from Teacher Oriented Model

The following conclusions were drawn from the teacher-oriented model.

i. The study concluded that mathematics connection, teacher motivation, pedagogy, and instructor quality and availability have positive effects on students' interest in mathematics. The quality of teacher we put into the mathematics classroom influences their teaching pedagogical efficiency and their ability to connect mathematics to real life problem

ii. Teacher's ability to connect mathematics to real life problems positively influence students' interest in mathematics and further predict students' interest in mathematics significantly. The motivation from educational leadership to provide the needed facility for mathematics teachers to connect mathematics to real life problems the more students' develops interest in mathematics.

iii. The school leadership ability to provide the needed mathematics facility for the teaching and learning mathematics improves students' interest in mathematics significantly.

iv. The quality of mathematics instruction in the senior high schools will be improved significantly if school leadership provides the needed facilities for teaching and learning of mathematics.

v. Adequate provision of teaching and learning aid by school leadership for the teaching mathematics motivates mathematics teachers significantly to deliver quality instruction.

vi. The study concluded that, pedagogy and instructor quality and availability positively and significantly affect the prediction of how mathematics teachers will connect mathematics to real life problem, other subject areas and their immediate environment.

6.4.3 Conclusion from the Combined Model

The study made the following conclusions from the study findings.

i. The teacher motivation, pedagogy, student's perception and mathematics teachers' ability to connect mathematics to real life problems positively affect students' interest in mathematics

ii. Teacher motivation, students' perception and mathematics teachers' ability to connect mathematics to real life problems significantly predict students' interest in mathematics. However, the pedagogy as well as instructor quality and availability do not predict students' interest in mathematics significantly.

iii. Students develops positive perception about mathematics when school leadership provide necessary facilities for teaching and learning of mathematics as well as quality mathematics teachers who can connect mathematics to real life problems.

iv. Qualified of mathematics teachers with adequate mathematics facility positively and significantly predicts improves the teachers' ability to connect mathematics to real-life problems, other subject areas and our immediate environment.

6.5 Recommendations

The study having gone through rigorous analyses from different statistical perspectives recommended the following to mathematics teachers, school leadership and all stakeholders in education in Ghana.

i. Mathematics teachers together with school leadership should discuss career guidance and counseling for students on the importance of mathematics in their future career. This will help students build interest in mathematics especially because the students' interest in mathematics is dependent on the future anticipation of the students that mathematics will influence their future career.

ii. School leadership should partner GES to provide the needed facilities for the teaching and learning of mathematics at the Senior High Schools.

iii. Mathematics teachers must connect and apply the teaching and learning of mathematics to other subject areas, the immediate environment and real-life problems since do so will increase students' interest in mathematics.

iv. Teachers should not only focus only on examination rather include application of mathematics to help students understand the connection between mathematics, other subject areas and our immediate environment.

v. School leadership should take teachers-oriented factors of students' interest serious since the students'-oriented factors like students' perception, students' motivation, and students' background are all dependent on teacher-oriented factor such as teacher motivation, mathematics facility, instructor quality, pedagogy and teachers' ability to connect mathematics to real life problems.

vi. Teachers and School leadership should seek to improve factors that contribute to building students interest in mathematics.

vii. Mathematics teachers should make teaching and learning of mathematics activity based in a more cordial atmosphere to alleviate students from fear of making mistakes.

viii. The ministry of education should make teaching of Mathematics preserve of qualified trained teachers at all levels of education especially at the basic school to ensure quality mathematical content knowledge since the quality of instructor influences the interest of the student in mathematics.

ix. The ministry of education should institute mathematics mentorship programme for mathematics teachers in the basic and secondary schools to help them acquire understanding from veteran mathematics educators on new methods of teaching mathematics.

x. The Ministry of education should continuously make mathematics a compulsory subject both at the basic and senior high schools since students' interest in mathematics depend on the compulsion nature of the subject.

REFERENCE

Abrantes, J. L., Seabra, C., & Lages, L. F. (2007). Pedagogical affect, student interest, and learning performance. *Journal of Business Research*, *60*(9), 960–964. http://doi.org/10.1016/j.jbusres.2006.10.026

Ainley, M., & Ainley, J. (2011). Student engagement with science in early adolescence: The contribution of enjoyment to students' continuing interest in learning about science. *Contemporary Educational Psychology*, *36*(1), 4–12. http://doi.org/10.1016/j.cedpsych.2010.08.001

Ainley, M., Hidi, S., & Berndorff, D. (2002). Interest, learning, and the psychological processes that mediate their relationship. *Journal of Educational Psychology*, *94*(3), 545–561. http://doi.org/10.1037/0022-0663.94.3.545

Ainley, M., Hidi, S., & Berndorff, D. (2002). Interest, learning, and the psychological processes that mediate their relationship. *Journal of Educational Psychology*. Retrieved from http://psycnet.apa.org/journals/edu/94/3/545/

Alf, C., & Lohr, S. (2007). Sampling assumptions in introductory statistics classes. *The American Statistician*, *61*(1), 71–77. http://doi.org/10.1198/000313007X171098

Ali, H. O. (2013). Factors Affecting Students' Academic Performance in Mathematical Sciences Department in Tertiary Institutions in Nigeria. *US-China Education Review A*, *3*(12), 905–913.

Ali, M. S., & Awan, A. S. (2013). Attitude Towards Science and Its Relationship With Students ' Achievement in Science. *Interdisciplinary Journal of Contemporary Research In Business*, *4*(2003), 707–718.

Ames, C. (1984). Achievement attributions and self-instructions under competitive and individualistic goal structures. *Journal of Educational Psychology*, *76*, 478–267.

Ampadu, E. (2012). Students ' Perceptions of their Teachers ' Teaching of Mathematics : The Case of Ghana, *4*(2), 351–358.

An, S., Kulm, G., & Wu, Z. (2004). The pedagogical content knowledge of middle school, mathematics teachers in china and the U.S. *Journal of Mathematics Teacher Education*, *7*, 145–172. http://doi.org/10.1023/B:JMTE.0000021943.35739.1c

Anderson, R. C. (1982). *Allocation of attention during reading*. New York: North Holland Publishing Company.

Andriessen, I., Phalet, K., & Lens, W. (2006). Future goal setting, task motivation and learning of minority and non-minority students in Dutch schools. *The British Journal of Educational Psychology*, *76*(Pt 4), 827–850. http://doi.org/10.1348/000709906X148150

Anthony, D. (2010). Discovering Statistics Using SPSS. *Nurse Researcher*. Retrieved from http://go.galegroup.com/ps/i.do?id=GALE%7CA219831374&sid=googleScholar&v=2.1&it=r&linkaccess=fulltext&issn=13515578&p=AONE&sw=w

Aronson, E. (1960). The effect of effort on the attractiveness of rewarded and unrewarded stimuli. *Psychology, Journal of Abnormal and Social*, *63*, 375–380.

Aronson, E., & Mills, J. (1959). The effect of severity of initiation on linking for a group. *Journal of Abnormal and Social Psychology*, *59*, 177–181.

Arthur, Y. D., Aseidu-Addo, S., & Annan, J. (2015). Student mathematics interest in Ghana: The role of parent interest, gender, basic school attended and fear of basic school mathematics teacher. *Advances in Research*, *5*(5), 1–8. http://doi.org/10.9734/AIR/2015/19889

Arthur, Y. D., Asiedu-addo, S., & Assuah, C. (2017). Connecting Mathematics to Real Life Problem using Instructor Quality and Availability , Mathematics Facility and Teacher Motivation for Prediction. *International Journal of Scientific Research in Education*, *10*(3), 311–324.

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*(6), 661–670.

Asiedu-addo, S., Assuah, C., & Arthur, Y. D. (2016). Compulsion in Studying Mathematics and Career Influence by Mathematics on Student Interest in Mathematics. *Asian Research Journal of Arts & Social Sciences*, *1*(2), 1–8. http://doi.org/10.9734/ARJASS/2016/27543

Atkinson, J. W. (1957). Motivational determinants of risk-taking behavior. *Psychological Review*, *64*(6), 359–372. http://doi.org/10.1037/h0043445

Aunola, K., Viljaranta, J., Lehtinen, E., & Nurmi, J. (2013a). The role of maternal support of competence, autonomy and relatedness in children’s interests and mastery orientation. *Learning and Individual*. Retrieved from http://www.sciencedirect.com/science/article/pii/S1041608013000204

Aunola, K., Viljaranta, J., Lehtinen, E., & Nurmi, J. (2013b). The role of maternal support of competence, autonomy and relatedness in children’s interests and mastery orientation. *Learning and Individual*. Retrieved from http://www.sciencedirect.com/science/article/pii/S1041608013000204

Aunola, K., Viljaranta, J., Lehtinen, E., & Nurmi, J. E. (2013c). The role of maternal support of competence, autonomy and relatedness in children’s interests and mastery orientation. *Learning and Individual Differences*, *25*, 171–177.

Bagozzi, R. P., & Yi, Y. (2012). Specification, evaluation, and interpretation of structural equation models. *Journal of the Academy of Marketing Science*, *40*(1), 8–34. http://doi.org/10.1007/s11747-011-0278-x

Bagozzi, R. P., & Yi, Y. (2012). Specification, evaluation, and interpretation of structural equation models. *Journal of the Academy of Marketing Science*, *40*(1), 8–34.

Ball, D. L. (1988). Research on teaching mathematics: Making subject matter knowledge part of the equation. *Advances in Research on Teaching*, *2*, 1–48. Retrieved from http://proxying.lib.ncsu.edu/index.php?url=http://search.ebscohost.com/login.aspx?direct=true&db=eric&AN=ED301467&site=ehost-live&scope=site

Bargh, J. A., Gollwitzer, P. M., & Oettingen, G. (2010). Motivation. *Handbook of Social Psychology*, *2*, 268–316. http://doi.org/10.1007/978-90-481-3112-9

Becker, A., Woerner, W., Hasselhorn, M., Banaschewski, T., & Rothenberger, A. (2004). Validation of the parent and teacher SDQ in a clinical sample. *European Child and Adolescent Psychiatry, Supplement*, *13*(2). http://doi.org/10.1007/s00787-004-2003-5

Bedford, S. (2017). Growth mindset and motivation: a study into secondary school science learning. *Research Papers in Education*, *32*(4). http://doi.org/10.1080/02671522.2017.1318809

Benita, M., Roth, G., & Deci, E. L. (2014). When are mastery goals more adaptive? It depends on experiences of autonomy support and autonomy. *Journal of Educational Psychology*, *106*(1). http://doi.org/10.1037/a0034007

Berlyne, D. E. (1949). “Interest”as a psychological concept. *British Journal of Psychology. General Section*, *39*(4), 184–195.

Bhana, D. (2005). “I’m the best in maths. Boys rule, girls drool.” Masculinities, mathematics and primary schooling. *Perspectives in Education*, *23*(3), 1–10. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-28044447831&partnerID=tZOtx3y1

Bj∅rnebekk, G. (2008). Positive Affect and Negative Affect as Modulators of Cognition and Motivation: The rediscovery of affect in achievement goal theory. *Scandinavian Journal of Educational Research*, *52*(2), 153–170. http://doi.org/10.1080/00313830801915788

Björklund, C. (2010). Broadening the horizon: toddlers’ strategies for learning mathematics. *International Journal of Early Years Education*, *18*(1), 71–84. http://doi.org/10.1080/09669761003661246

Blaikie, N. (1993). *Approaches to social enquiry.* Cambridge: Polity Press.

Blank, R. K., & Alas, N. de las A. (2010). Effects of Teacher Professional Development on Gains in Student Achievement: How Meta Analysis Provides Scientific Evidence Useful to Education Leaders. *SREE Conference Abstract Template*, 1–24.

Blomhøj, M. (2008). Different perspectives in research on the teaching and learning mathematical modelling – Categorising the TSG21 papers. In *Mathematical applications and modelling in the teaching and learning of mathematics.*

Proceedings from Topic Study Group 21 at the 11th International Congress on Mathematical ducation in Monterrey, Mexico, July 6-13, 2008 (pp. 1–18).

Bohner, G., & Wänke, M. (2002). *Attitudes and attitude change*. East Sussex: Psychology Press Ltd. Retrieved from https://books.google.com/books?hl=en&lr=&id=IPTs8jrQufYC&oi=fnd&pg=PR9&dq=Attitudes+and+attitude+change+AND+Bohner&ots=KjrSNls_Qw&sig=2z_NZwhev2iywQjcXJ_dz_pY0Kc

Bong, M. (2004). Academic Motivation in Self-Efficacy, Task Value, Achievement Goal Orientations, and Attributional Beliefs. *The Journal of Educational Research*, *97*(6), 287–298. http://doi.org/10.3200/JOER.97.6.287-298

Bramlett, D. C., & Herron, S. (2005). A Study of African-American College Students ' Attitudes towards Mathematics. *Journal of Mathematical Sciences*, *4*(2), 43–51.

Bryman, A., & Bell, E. (2007). *Business Research Methods* ((2nd Ed.)). Oxford.: Oxford University Press.

Burnette, J. L., O'Boyle, E. H., VanEpps, E. M., Pollack, J. M., & Finkel, E. J. (2013). Mind-sets matter: A meta-analytic review of implicit theories and self-regulation. *Psychological Bulletin*, *139*(3). http://doi.org/10.1080.00131880802704764\rhttp://dx.doi.org/10.1037/a0029531

Burrell, G., & Morgan, G. (2017). *Sociological paradigms and organisational analysis: Elements of the sociology of corporate life.* Routledge.

Carter, G., & Norwood, K. (1997). The relationship between teacher and student beliefs about mathematics. *School Science and Mathematics*. Retrieved from http://onlinelibrary.wiley.com/doi/10.1111/j.1949-8594.1997.tb17344.x/full

Cave, A., & Brown, C. W. (2010). When Learning is at Stake : Exploration of the Role of Teacher Training and Professional Development Schools on Elementary Students ' Math Achievement. *National Forum of Teacher Education Journal*, *20*(3), 1–22.

Chen, A., & Darst, P. (2001). Situational interest in physical education: a function of learning task design. *Research Quarterly for Exercise and Sport*, *72*(2), 150–164. http://doi.org/10.1080/02701367.2001.10608945

Chen, A., Darst, P. W., & Pangrazi, R. P. (1999). What Constitutes Situational Interest? Validating a Construct in Physical Education. *Measurement in Physical Education and Exercise Science*, *3*(October 2014), 157–XXX. http://doi.org/10.1207/s15327841mpee0303_3

Chen, A., Ennis, C. D., & Ennis, C. D. (2004). Goals , Interests , and Learning. *The Journal of Educational Research*, *97*(6), 329–338. http://doi.org/10.3200/joer.97.6.329-339

Ciani, K. D., Middleton, M. J., Summers, J. J., & Sheldon, K. M. (2010). Buffering against performance classroom goal structures: The importance of autonomy support and classroom community. *Contemporary Educational Psychology*, *35*(1), 88–99. http://doi.org/10.1016/j.cedpsych.2009.11.001

Coelho, P., & Henseler, J. (2012). Creating customer loyalty through service customization. *European Journal of Marketing*, *46*(3), 331–356.

Cohen, L., Manion, L., & Morrison, K. (2000). *Research methods in education* (5th ed). New York, USA: Routledge Falmer.

Cohen, L., Manion, L., & Morrison, K. (2007). *Research Methods in Education*. *Education* (Vol. 55). http://doi.org/10.1111/j.1467-8527.2007.00388_4.x

Colquitt, J. a., & Simmering, M. J. (1998). Conscientiousness, goal orientation, and motivation to learn during the learning process: A longitudinal study. *Journal of Applied Psychology*, *83*(4), 654–665. http://doi.org/10.1037/0021-9010.83.4.654

Cook, D. A., & Artino, A. R. (2016). Motivation to learn: an overview of contemporary theories. *Medical Education*, *50*(10). http://doi.org/10.1111/medu.13074

Cooper, D. R., & Schindler, P. S. (2011). *Business Research Methods*. New York: McGraw-Hill.

Creswell, J. W. (2003). *Research design: Qualitative, Quantitative and mixed methods approaches* (2nd ed). New York,USA: Thousand Oaks, CA: Sage Publications, Inc.

Creswell, J. W. (2011). *Research Design: Qualitative, Quantitative and Mixed Research Approaches* (fourth edi). Washington DC: Sage Publications.

Creswell, J. W. (2012). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research*. *Educational Research* (Vol. 4). http://doi.org/10.1017/CBO9781107415324.004

Cronbach, L. . . (1951). Coefficient alpha and internal structure of test''. *Psychometrika*, *16*(3), 297–334.

Crosnoe, R., Morrison, F., Burchinal, M., Pianta, R., Keating, D., Friedman, S. L., & Clarke-Stewart, K. A. (2010). Instruction, teacher–student relations, and math achievement trajectories in elementary school. *Journal of Educational Psychology*, *102*(2), 407–417. http://doi.org/10.1037/a0017762

Crotty, M. (1998). *The foundations of social research*. London.: Sage.

Darling-Hammond, L., & Richardson, N. (2009). Teacher Learning: What Matters? *Educational Leadership*, *66*(5), 46–53. http://doi.org/10.1021/jp0466800

Darling-Hammond, L., & Snyder, J. (2000). Authentic assessment of teaching in context. *Teaching and Teacher Education*, *16*, 523–545. http://doi.org/10.1016/s0742-051x(00)00015-9

Daskalovska, N., Gudeva, L. K., & Ivanovska, B. (2012). Learner Motivation and

Interest. *Procedia - Social and Behavioral Sciences*, *46*, 1187–1191. http://doi.org/10.1016/j.sbspro.2012.05.272

de Volder, M. L., & Lens, W. (1982). Academic achievement and future time perspective as a cognitive-motivational concept. *Journal of Personality and Social Psychology*, *42*(3), 566–571. http://doi.org/10.1037/0022-3514.42.3.566

Deci, E. L., & Ryan, R. M. (2008). Self-determination theory: A macrotheory of human motivation, development, and health. *Canadian Psychology/Psychologie Canadienne*, *49*(3), 182–185. http://doi.org/10.1037/a0012801

Deci, E. L., Ryan, R. M., & Koestner, R. (1999). A Meta-Analytic Review of Eperiments Examining the Effects of Extrinsic Rewards on Intrinsic Motivation. *Psychological Bulletin*, *125*, 627–668. http://doi.org/10.1037/0033-2909.125.6.627

Deci, E., & Ryan, R. (1975). *Intrinsic motivation*. Retrieved from http://onlinelibrary.wiley.com/doi/10.1002/9780470479216.corpsy0467/full

Deci, E., & Ryan, R. (1985). The general causality orientations scale: Self-determination in personality. *Journal of Research in Personality*. Retrieved from http://www.sciencedirect.com/science/article/pii/0092656685900236

Decker, W. H., Calo, T. J., & Weer, C. H. (2012). Affiliation motivation and interest in entrepreneurial careers. *Journal of Managerial Psychology*, *27*(3), 302–320. http://doi.org/10.1108/02683941211205835

Dewey, J. (1913). *Interest and effort in education*. Boston,Riverside.

Dewey, J. (1913a). *Interest and effort in education*. Houghton Mifflin.

Dewey, J. (1913b). *Interest and effort in education*. New York: Houghton Mifflin.

Dewey, J. (1933). How we think: A restatement of the relation of reflective thinking to the educative process. *Book*, x, 301 . http://doi.org/10.1037/10903-000

Dickhauser, O., & Moschner, B. (2006). Selbstkonzept. *Handworterbuch Padagogische Psychologie*, 685–692.

Drath, W. H., McCauley, C. D., Palus, C. J., Van Velsor, E., O'Connor, P. M. G., & McGuire, J. B. (2008). Direction, alignment, commitment: Toward a more integrative ontology of leadership. *Leadership Quarterly*, *19*(6), 635–653. http://doi.org/10.1016/j.leaqua.2008.09.003

Dweck, C. S. (1986). Motivational processes affecting learning. *American Psychologist*, *41*(10), 1040–1048. http://doi.org/10.1037/0003-066X.41.10.1040

Dyer, C., Choksi, A., Awasty, V., Iyer, U., Moyade, R., Nigam, N., … Sheth, S. (2004). Knowledge for teacher development in India: The importance of "local knowledge" for in-service education. *International Journal of Educational Development*, *24*(1), 39–52. http://doi.org/10.1016/j.ijedudev.2003.09.003

Eagly, A., & Chaiken, S. (1993). *The psychology of attitudes.* Retrieved from http://psycnet.apa.org/psycinfo/1992-98849-000

Eccles, J. S., Adler, T., Futterman, R., Goff, S. B., Kaczala, C. M., Meece, J. L., & Midgley, C. (1983). Expectancies, Values, and Academic Behaviors. *Achievement and Achievement Motivation*. http://doi.org/10.1207/s15327752jpa8502

Eccles, J. S., & Roeser, R. W. (2009). Schools , Academic Motivation , and Stage – Environment Fit. In *Handbook of adolescent psychology* (pp. 404–434). http://doi.org/10.1002/9780470479193.adlpsy001013

Eccles, J. S., & Wigfield, A. (2002). Motivational beliefs, values and goals. *Annual Review of Psychology*, *53*, 109–132. http://doi.org/10.1146/annurev.psych.53.100901.135153

Edmonds, R. (1979). Effective Schools for the Urban Poor. *Educational Leadership*, *37*(1), 15–24.

Edward, D., & Ryan, R. (1985). Intrinsic Motivation and Self-Determination in Human Behavior. *New York: Pantheon*.

Eisenberger, R., Pierce, W. D., & Cameron, J. (1999). Effects of Reward on Intrinsic Motivation-Negative, Neutral, and Positive: Comment on Deci, Koestner, and Ryan (1999). *Psychoiogicai Buifetm*, *125*(6), 677–691. http://doi.org/10.1037/0033-2909.125.6.677

Elliot, A. J. (2005). A Conceptual History of the Achievement Goal Construct. In *Handbook of Competence and Motivation* (pp. 52–72).

Elliot, a J., & Harackiewicz, J. M. (1994). Goal setting, achievement orientation, and intrinsic motivation: a mediational analysis. *Journal of Personality and Social Psychology*, *66*(5), 968–980. http://doi.org/10.1037/0022-3514.66.5.968

Ernest, P. (1995). Values, gender and images of mathematics: a philosophical perspective. *International Journal of Mathematical Education in Science and Technology*, *26*(3), 449–462. http://doi.org/10.1080/0020739950260313

Etuk, E. N., Afangideh, M. E., & Uya, A. O. (2013). Students' perception of teachers' characteristics and their attitude towards mathematics in oron education zone, Nigeria. *International Education Studies*, *6*(2), 197–204. http://doi.org/10.5539/ies.v6n2p197

Fan, W., & Williams, C. M. (2010). The effects of parental involvement on students' academic self-efficacy, engagement and intrinsic motivation. *Educational Psychology*, *30*(1), 53–74. http://doi.org/10.1080/01443410903353302

Farooq, M. S., Chaudhry, a H., Shafiq, M., & Berhanu, G. (2011). Factors Affecting Students' Quality of Academic Performance: A Case of Secondary School Level. *Journal of Quality and Technology Management*, *VII*(II), 1–14.

Ferguson, R., & Ladd, H. (1996). How and why money matters: An analysis of

Alabama schools. In *Holding Schools Accountable: Performance-Based Reform in Education* (pp. 265–298).

Ferrer-Caja, E., & Weiss, M. R. (2000). Predictors of intrinsic motivation among adolescent students in physical education. *Research Quarterly for Exercise and Sport*, *71*(3), 267–79. http://doi.org/10.1080/02701367.2000.10608907

Finkelstien, M. A. (2009). Intrinsic vs. extrinsic motivational orientations and the volunteer process. *Personality and Individual Differences*, *46*(5–6), 653–658. http://doi.org/10.1016/j.paid.2009.01.010

Fishbein, M., & Ajzen, I. (1975). Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research. *Reading, MA: Addison-Wesley*. http://doi.org/10.1017/CBO9781107415324.004

Ford, M. (1994). Teachers' beliefs about mathematical problem solving in the elementary school. *School Science and Mathematics*. Retrieved from http://onlinelibrary.wiley.com/doi/10.1111/j.1949-8594.1994.tb15683.x/abstract

Fossey, E., Harvey, C., McDermott, F., & Davidson, L. (2002). Understanding and evaluating qualitative research. *Australian and New Zealand Journal of Psychiatry*, *36*(6), 717–732. http://doi.org/10.1046/j.1440-1614.2002.01100.x

Fox, L. (1982). The Study of Social Processes That Inhibit or Enhance the Development of Competence and Interest in Mathematics among Highly Able Young Women. Final Report,. Retrieved from http://eric.ed.gov/?id=ED222037

Franken, R. E. (1998). *Human motivation (4th ed.). Human motivation (4th ed.).* Retrieved from http://ezproxy.usherbrooke.ca/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=psyh&AN=1998-06428-000&site=ehost-live

Frenzel, A. C., Goetz, T., Pekrun, R., & Watt, H. M. G. (2010). Development of Mathematics Interest in Adolescence: Influences of Gender, Family, and School Context. *Journal of Research on Adolescence*, *20*(2), 507–537. http://doi.org/10.1111/j.1532-7795.2010.00645.x

Frenzel, A. C., Pekrun, R., & Goetz, T. (2007). Perceived learning environment and students' emotional experiences: A multilevel analysis of mathematics classrooms. *Learning and Instruction*, *17*(5), 478–493. http://doi.org/10.1016/j.learninstruc.2007.09.001

Frome, P. M., & Eccles, J. S. (1998). Parents' influence on children's achievement-related perceptions. *Journal of Personality and Social Psychology*. http://doi.org/10.1037/0022-3514.74.2.435

Fry, H., Ketteridge, S., & Marshall, S. (2009). *A Handbook for Teaching and Learning in Higher Education*. *A Handbook for Teaching and Learning in Higher Education*. http://doi.org/10.1080/03075079312331382498

Fullan, Mi. (2001). *Leading in a culture of change*. *Leading in a Culture of Change*. http://doi.org/10.1109/TPC.2002.801639

Gagné, M., & Deci, E. (2005). Self-determination theory and work motivation. *Journal of Organizational Behavior*. Retrieved from http://onlinelibrary.wiley.com/doi/10.1002/job.322/full

Gigliotti, E. (2007). Discovering statistics using SPSS. *Journal of Advanced Nursing*. Retrieved from http://onlinelibrary.wiley.com/doi/10.1111/j.1365-2648.2007.04270_1.x/abstract

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

Goldhaber, D. D., & Brewer, D. J. (2000). Does Teacher Certification Matter? High School Teacher Certification Status and Student Achievement. *Educational Evaluation and Policy Analysis*, *22*(2), 129–145. http://doi.org/10.3102/01623737022002129

Gonida, E. N., & Cortina, K. S. (2014). Parental involvement in homework: Relations with parent and student achievement-related motivational beliefs and achievement. *British Journal of Educational Psychology*, *84*(3), 376–396. http://doi.org/10.1111/bjep.12039

Graham, S. (1990). Communicating low ability in the classroom: Bad things good teachers sometimes do. In *Attribution theory: Applications to achievement, mental health, and interpersonal conflict.* (pp. 17–36). Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=psyh&AN=1990-98291-002&site=ehost-live

Gray, D. L. L. (2014). Understanding STEM-focused high school students' perceptions of task importance: THE role of "standing out" and "fitting in" in mathematics class. *Contemporary Educational Psychology*, *39*(1). http://doi.org/10.1016/j.cedpsych.2013.12.001

Gregory, P. J. (2011). Assessing the influence of organizational personality, applicants' need motivation, expectancy beliefs, and person-organization fit on applicant attraction. *Dissertation Abstracts International Section A: Humanities and Social Sciences*, *71*(12–A), 4585. Retrieved from http://gateway.proquest.com/openurl?url_ver=Z39.88-2004&rft_val_fmt=info:ofi/fmt:kev:mtx:dissertation&res_dat=xri:pqdiss&rft_dat=xri:pqdiss:3431298%5Cnhttp://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=psyc7&NEWS=N&AN=2011-99110-037

Gronn, P. (2002). Distributed leadership as a unit of analysis. *The Leadership Quarterly*, *13*(May), 423–451. http://doi.org/10.1016/S1048-9843(02)00120-0

Grootenboer, P., & Lowrie, T. (2002). Pre-service primary school teachers' views on mathematics and mathematics education. *Mathematics Education for a Knowledgebased Era. Proceedings of the Second Asian Regional Conference on Mathematics Education and the Ninth South East Asian Conference on*

Mathematics Education, 232–239.

Gutiérrez-Doña, B., Lippke, S., & Renner, B. (2009). Self-Efficacy and Planning Predict Dietary Behaviors in Costa Rican and South Korean Women: Two Moderated Mediation Analyses. *: Health and Well- …*. Retrieved from http://onlinelibrary.wiley.com/doi/10.1111/j.1758-0854.2009.01004.x/full

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2014). *A Primer on Partial Least Squares Structural Equation Mode ling (PLS - SEM).* Thousand Oaks: Sage.

Hair, J., Ringle, C., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *Journal of Marketing Theory and Practice*, *19*(2), 139–151.

Hair, J., Ringle, C., & Sarstedt, M. (2016). Annual Conference Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS 3. In *POST-CONFERENCE WORKSHOP 2016 Academy of Marketing Science (AMS)*.

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.

Hallinger, P., & Heck, R. H. (1996). Reassessing the Principal's Role in School Effectiveness: A Review of Empirical Research, 1980-1995. *Educational Administration Quarterly*, *32*(1), 5–44. http://doi.org/10.1177/0013161X96032001002

Hallinger, P., & Heck, R. H. (1998). Exploring the Principal's Contribution to School Effectiveness: 1980-1995∗. *School Effectiveness and School Improvement*, *9*(2), 157–191. http://doi.org/10.1080/0924345980090203

Hansson, Å. (2012). The meaning of mathematics instruction in multilingual classrooms: Analyzing the importance of responsibility for learning. *Educational Studies in Mathematics*, *81*(1), 103–125. http://doi.org/10.1007/s10649-012-9385-y

Harackiewicz, J. M., & Barron, K. E. (2004). Conducting Social Psychological Research in Educational Settings: "Lessons We Learned in School." *The Sage Handbook of Methods in Social Psychology*. http://doi.org/10.4135/9781412976190.n22

Harackiewicz, J. M., Durik, A. M., & Barron, K. E. (2005). Multiple goals, optimal motivation, and the development of interest. *Social Motivation Conscious and Unconscious Processes*, 21–39. http://doi.org/10.1017/CBO9780511735066.004

Harackiewicz, J., Rozek, C., & Hulleman, C. (2012). Helping parents to motivate adolescents in mathematics and science an experimental test of a utility-value intervention. *Science*. Retrieved from http://pss.sagepub.com/content/early/2012/07/02/0956797611435530.abstract

Harris, A. (2004). Distributed leadership and school improvement: Leading or misleading? *Educational Management Administration & Leadership*, *32*(1), 11–

24. http://doi.org/10.1080/00220270500038602

Harris, A., Day, C., Hopkins, D., Hadfield, M., Hargreaves, A., & Chapman, C. (2013). *Effective leadership for school improvement*. Routledge.

Harwell, M. R., Post, T. R., Maeda, Y., Davis, J. D., Cutler, A. L., Andersen, E., & Kahan, J. a. (2007). Standards-Based Mathematics Curricula and Secondary Students' Performance on Standardized Achievement Tests. *Journal for Research in Mathematics Education*, *38*(1), 71–101. http://doi.org/10.2307/30034928

Heck, R. H., & Hallinger, P. (2010). Testing a longitudinal model of distributed leadership effects on school improvement. *The Leadership Quarterly*, *21*(5), 867–885. http://doi.org/10.1016/j.leaqua.2010.07.013

Hemmings, B., Grootenboer, P., & Kay, R. (2011). Predicting mathematics achievement: The influence of prior achievement and attitudes. *International Journal of Science and Mathematics Education*, *9*(3). http://doi.org/10.1007/s10763-010-9224-5

Henseler, J., & Chin, W. W. (2010). A comparison of approaches for the analysis of interaction effects between latent variables using partial least squares path modeling. *Structural Equation Modeling*, *17*(1), 82–109. http://doi.org/10.1080/10705510903439003

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. (1990). Interest and its contribution as a mental resource for learning. *Review of Educational Research*, *60*(4), 549–571. http://doi.org/10.3102/00346543060004549

Hidi, S. (2000). An interest researcher's perspective: The effects of extrinsic and intrinsic factors on motivation. In *Intrinsic and Extrinsic Motivation* (pp. 309–339). http://doi.org/10.1016/B978-012619070-0/50033-7

Hidi, S., & Harackiewicz, J. M. (2000). Motivating the Academically Unmotivated: A Critical Issue for the 21st Century. *Review of Educational Research*, *70*(2), 151–179. http://doi.org/10.3102/00346543070002151

Hidi, S., & Renninger, K. (2006). The four-phase model of interest development. *Educational Psychologist*. Retrieved from http://www.tandfonline.com/doi/abs/10.1207/s15326985ep4102_4

Hill, H. C., Rowan, B., & Ball, D. L. (2005). Effects of teachers' mathematical knowledge for teaching on student achievement. *American Educational Research Journal*, *42*(2), 371–406. http://doi.org/10.3102/00028312042002371

Hill, P., & Rowe, K. (1996). Multilevel modelling in school effectiveness research. *School Effectiveness and School Improvement*. Retrieved from http://www.tandfonline.com/doi/abs/10.1080/0924345960070101

Ho, R. (2006). *H ANDBOOK OF U NIVARIATE AND MULTIVARIATE DATA ANALYSIS AND INTERPRETATION WITH SPSS*. New York: Taylor & Francis.

Howe, K. R. (2004). A Critique of Experimentalism. *Qualitative Inquiry*, *10*(1), 42–61. http://doi.org/10.1177/1077800403259491

Huitt, W., & Dawson, C. (2011). Social Development: Why It Is Important and How To Impact It. *Social Development*, (2006), 1–27.

Hulleman, C. S., Durik, A. M., Schweigert, S. A., & Harackiewicz, J. M. (2008). Task values, achievement goals, and interest: An integrative analysis. *Journal of Educational Psychology*, *100*(2), 398–416. http://doi.org/10.1037/0022-0663.100.2.398

Hyde, J. S., Fennema, E., Ryan, M., Frost, L. A., & Hopp, C. (1990). Gender comparisons of mathematics attitudes and effect. *Psychology of Women Quarterly*, *14*(3), 299–324. http://doi.org/10.1111/j.1471-6402.1990.tb00022.x

Ing, M. (2013). Can parents influence children's mathematics achievement and persistence in STEM careers? *Journal of Career Development*.

Jansen, M., Lüdtke, O., & Schroeders, U. (2016). Evidence for a positive relation between interest and achievement: Examining between-person and within-person variation in five domains. *Contemporary Educational Psychology*. http://doi.org/10.1016/j.cedpsych.2016.05.004

Kaiser, G., & Sriraman, B. (2006). A global survey of international perspectives on modelling in mathematics education. *ZDM - International Journal on Mathematics Education*, *38*(3), 302–310. http://doi.org/10.1007/BF02652813

Keong, C. C., Horani, S., & Daniel, J. (2005). A Study on the Use of ICT in Mathematics Teaching. *Malaysian Online Journal of Instructional Technology*, *2*(3), 43–51.

Kim, T., & Schallert, D. L. (2014). Mediating effects of teacher enthusiasm and peer enthusiasm on students' interest in the college classroom. *Contemporary Educational Psychology*, *39*(2). http://doi.org/10.1016/j.cedpsych.2014.03.002

Klassen, R. M. (2010). Effects on Teachers ' Self-Efficacy and Job Satisfaction : Teacher Gender , Years of Experience , and Job Stress, *102*(3), 741–756. http://doi.org/10.1037/a0019237

Klein, M. (2004). The premise and promise of inquiry based mathematics in pre-service teacher education : a poststructuralist analysis. *Asia-Pacific Journal of Teacher Education*, *32*(1), 35--47 ST-- The premise and promise of inquiry ba. http://doi.org/10.1080/1359866042000206008

Köğce, D., Yildiz, C., Aydin, M., & Altindağ, R. (2009). Examining elementary school students' attitudes towards mathematics in terms of some variables. *Procedia - Social and Behavioral Sciences*, *1*(1), 291–295. http://doi.org/10.1016/j.sbspro.2009.01.053

Köller, Olaf, Jürgen Baumert, and K. S. (2001). Does interest matter? The relationship between academic interest and achievement in mathematics. *Journal for Research in Mathematics Education*, 448–470.

Köller, O., Baumert, J., & Schnabel, K. (2001a). Does interest matter? The relationship between academic interest and achievement in mathematics. *Journal for Research in Mathematics Education*, *32*(5), 448– 470.

Köller, O., Baumert, J., & Schnabel, K. (2001b). Does interest matter? The relationship between academic interest and achievement in mathematics. *Journal for Research in Mathematics*. Retrieved from http://www.jstor.org/stable/749801

Köller, O., Baumert, J., & Schnabel, K. (2001c). Does Interest Matter? The Relationship Between Academic Interest and Achievement in Mathematics. *Journal for Research in Mathematics Education*, *32*(5), 448–470.

Komarraju, M., & Nadler, D. (2013). Self-efficacy and academic achievement: Why do implicit beliefs, goals, and effort regulation matter? *Learning and Individual Differences*, *25*. http://doi.org/10.1016/j.lindif.2013.01.005

Krapp, A. (1999). Interest, motivation and learning: An educational-psychological perspective. *European Journal of Psychology of Education*, *14*(1), 23–40. http://doi.org/10.1007/BF03173109

Krapp, A. (2002). 18: An Educational-Psychological Theory of Interest and Its Relation to SDT. *Handbook of Self-Determination Research*. Retrieved from https://books.google.com/books?hl=en&lr=&id=DcAe2b7L-RgC&oi=fnd&pg=PA405&dq=emotion+and+motivation+in+educational+psychology.+general+and+european+classroom&ots=dqAP-G24Xj&sig=9R9wqRpqkpjFN-va-zFk1zRJPg0

Krapp, A. (2005). Basic needs and the development of interest and intrinsic motivational orientations. *Learning and Instruction*, *15*(5), 381–395. http://doi.org/10.1016/j.learninstruc.2005.07.007

Krapp, A. (2007). An educational-psychological conceptualisation of interest. *International Journal for Educational and Vocational Guidance*, *7*(1), 5–21. http://doi.org/10.1007/s10775-007-9113-9

Krapp, A., Hidi, S., & Renninger, K. A. (1992). *The Role of Interest in Learning and Development*. *The Role of Interest in Learning and Development*. Retrieved from http://books.google.com/books?id=4mn96UQBxmUC&pgis=1%5Cnhttp://books.google.com/books?hl=en&lr=&id=4mn96UQBxmUC&oi=fnd&pg=PA3&dq=Interest,+Learning+and+Development&ots=d4NRJoNPI_&sig=-j8zayX3TIahv4hzIwniC3SNGhk

Krapp, A., & Prenzel, M. (2011). Research on Interest in Science: Theories, methods, and findings. *International Journal of Science Education*, *33*(1), 27–50. http://doi.org/10.1080/09500693.2011.518645

Krejcie, R.V. and Morgan, D. W. (1970). Determining Sample Size for Research Activities. *Educational and Psychological Measurement, 30*, 607–610.

Latham, G. P. (2004). The motivational benefits of goal-setting. *Academy of Management Executive*, *18*(4), 126–129. http://doi.org/10.5465/AME.2004.15268727

Leithwood, K., Harris, A., & Hopkins, D. (2008). Seven strong claims about successful school leadership. *School Leadership & Management*, *28*(1), 27–42. http://doi.org/10.1080/13632430701800060

Leithwood, K., & Jantzi, D. (2006). Transformational school leadership for large-scale reform: Effects on students, teachers, and their classroom practices. *School Effectiveness and School Improvement*, *17*(2), 201–227. http://doi.org/10.1080/09243450600565829

Leithwood, K., & Levin, B. (2010). Understanding how leadership influences student learning. In *International Encyclopedia of Education* (pp. 45–50). http://doi.org/10.1016/B978-0-08-044894-7.00439-5

Lepper, M. R., Greene, D., & Nisbett, R. E. (1973). Undermining children's intrinsic interest with extrinsic reward: A test of the "overjustification" hypothesis. *Journal of Personality and Social Psychology*, *28*(1), 129–137. http://doi.org/10.1037/h0035519

Li, A. K. F., & Adamson, G. (1995). Motivational patterns related to gifted students' learning of mathematics, science and English: An examination of gender differences. *Journal for the Education of the Gifted*.

Li, A. K. F., & Adamson, G. (1995). Motivational Patterns Related to Gifted Students' Learning of Mathematics, Science and English: An Examination of Gender Differences. *Journal for the Education of the Gifted*, *18*(3), 284–97.

Lightbody, P., Siann, G., Stocks, R., & Walsh, D. (1996). Motivation and attribution at secondary school: The role of gender. *Educational Studies*. Retrieved from http://www.tandfonline.com/doi/abs/10.1080/0305569960220102

Lin, C.-Y. (2008). Preservice teachers' beliefs about using technology in the mathematics classroom. *Journal of Computers in Mathematics and Science Teaching*, *27*(3), 341–360. Retrieved from http://www.editlib.org/p/24223

Lopez, F. G., Lent, R. W., Brown, S. D., & Gore, P. a. (1997). Role of social-cognitive expectations in high school students' mathematics-related interest and performance. *Journal of Counseling Psychology*, *44*(1), 44–52. http://doi.org/10.1037/0022-0167.44.1.44

Lorenz, A., Roth, A., Priese, C., Peukert, E., & Mertel, S. (2016). The interest of Bavarian primary school pupils in geographical topics and methods–selected results of an empirical survey. *Education 3-*. Retrieved from http://www.tandfonline.com/doi/abs/10.1080/03004279.2016.1140801

Luszczynska, A., & Gutiérrez-Doña, B. (2005). General self-efficacy in various domains of human functioning: Evidence from five countries. *International Journal of*. Retrieved from http://www.tandfonline.com/doi/abs/10.1080/00207590444000041

Ma, X. (1999). A Meta-Analysis of the Relationship Between Anxiety Toward Mathematics and Achievement in Mathematics. *Journal for Research in Mathematics Education*, *30*(5), 520–540. http://doi.org/10.2307/749772

Ma, X., & Kishor, N. (1997). Attitude Toward Self , Social Factors , and Achievement in Mathematics : A Meta-Analytic Review. *Educational Psychology Review*, *9*(2), 89-. http://doi.org/10.1023/A:1024785812050

Mackenzie, N., & Knipe, S. (2006). Research dilemmas : Paradigms , methods and methodology Research paradigms, *16*, 1–11.

Maddux, J. E., Norton, L. W., & Stoltenberg, C. D. (1986). Self-efficacy expectancy, outcome expectancy, and outcome value: Relative effects on behavioral intentions. *Journal of Personality and Social Psychology*, *51*(4), 783–789. http://doi.org/10.1037/0022-3514.51.4.783

Maio, G. R., & Haddock, G. (2010). *The psychology of attitudes and attitude change*. *Most*. http://doi.org/10.4135/9781446214299

Malecki, C. K., & Demaray, M. K. (2003). What Type of Support Do They Need? Investigating Student Adjustment as Related to Emotional, Informational, Appraisal, and Instrumental Support. *School Psychology Quarterly*, *18*(3), 231–252. http://doi.org/10.1521/scpq.18.3.231.22576

Malone, T. W. (1981). Toward a theory of intrinsically motivating instruction. *Cognitive Science*, *5*(4), 333–369. http://doi.org/10.1016/S0364-0213(81)80017-1

Marchis, I. (2011). Factors that influence secondary school students' attitude to mathematics. In *Procedia - Social and Behavioral Sciences* (Vol. 29, pp. 786–793). http://doi.org/10.1016/j.sbspro.2011.11.306

Marks, H. M., & Printy, S. M. (2003). Principal Leadership and School Performance: An Integration of Transformational and Instructional Leadership. *Educational Administration Quarterly*, *39*(JANUARY), 370–397. http://doi.org/10.1177/0013161X03253412

Marsh, H. W., Trautwein, U., Lüdtke, O., Köller, O., & Baumert, J. (2005). Academic self-concept, interest, grades and standardized test scores: Reciprocal effects models of causal ordering. *Child Development*, *76*, 397–416.

Martha, K. (2009). Factors affecting academic performance of undergraduate students at Uganda Christian University. *Educational Management*, (December), 1–92.

Maslow, A. H. (1943). A theory of human motivation. *Psychological Review*, *50*(13), 370–396. http://doi.org/10.1037/h0054346

Maslow, A. H. (1965). Religions, Values, and Peak-Experiences. *Journal for the Scientific Study of Religion*, *5*, 179. http://doi.org/10.2307/1384286

Maslow, a. H. (1943). A theory of human motivation. *Psychological Review*, *50*(13), 370–396. http://doi.org/10.1037/h0054346

Mata, M. D. L., Monteiro, V., & Peixoto, F. (2012). Attitudes towards Mathematics : Effects of Individual , Motivational , and Social Support Factors. *Child Development Research*, *2012*. http://doi.org/10.1155/2012/876028

Mata, M. de L., Monteiro, V., & Peixoto, F. (2012). Attitudes towards mathematics: Effects of individual, motivational, and social support factors. *Child Development Research*, *2012*.

McDougall, W. (1960). *An introduction to social psychology*. London: Methuen.

McQuiggan, S. W., & Lester, J. C. (2006). Diagnosing self-efficacy in intelligent tutoring systems: An empirical study. *Intelligent Tutoring Systems, Proceedings*, *4053*, 565–574.

Meelissen, M., & Luyten, H. (2008). The Dutch gender gap in mathematics: Small for achievement, substantial for beliefs and attitudes. *Studies in Educational Evaluation*, *34*(2), 82–93. http://doi.org/10.1016/j.stueduc.2008.04.004

Meissel, K., & Rubie-Davies, C. M. (2016). Cultural invariance of goal orientation and self-efficacy in New Zealand: Relations with achievement. *British Journal of Educational Psychology*, *86*(1). http://doi.org/10.1111/bjep.12103

Mensah, J. K., Okyere, M., & Kuranchie, A. (2013). Student attitude towards Mathematics and performance : Does the teacher attitude matter ? *Journal of Education and Practice*, *4*(3), 132–139.

Mesa, V. (2012). Achievement goal orientations of community college mathematics students and the misalignment of instructor perceptions. *Community College Review*, *40*(1), 46–74. http://doi.org/10.1177/0091552111435663

Middleton, J., & Spanias, P. (1999). Motivation for achievement in mathematics: Findings, generalizations, and criticisms of the research. *Journal for Research in Mathematics Education*. Retrieved from http://www.jstor.org/stable/749630

Mitchell, M. (1993). Situational interest: Its multifaceted structure in the secondary school mathematics classroom. *Journal of Educational Psychology*, *85*(3), 424–436. http://doi.org/10.1037/0022-0663.85.3.424

Mohamad, W., Bin, A., & Afthanorhan, W. (2014). Hierarchical Component Using Reflective-Formative Measurement Model In Partial Least Square Structural Equation Modeling (Pls-Sem). *International Journal of Mathematics and Statistics Invention (IJMSI)*, *2*(2), 55–71.

Mohd, N., Mahmood, T., & Ismail, M. (2011). Factors that influence students in mathematics achievement. *International Journal of*. Retrieved from https://www.researchgate.net/profile/Mohd_Nazri_Ismail/publication/228757092_Factors_that_influence_students_in_mathematics_achievement/links/00b7d52065cdcf1358000000.pdf

Möller, J., & Marsh, H. W. (2013). Dimensional Comparison Theory. *Psychological Review*, *120*(3). http://doi.org/10.1037/a0032459

Mott, B. W., & Lester, J. C. (2006). Narrative-centered tutorial planning for inquiry-based learning environments. In *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)* (Vol. 4053 LNCS, pp. 675–684). http://doi.org/10.1007/11774303_67

Mousoulides, N., Pittalis, M., Christou, C., Boytchev, P., Sriraman, B., & Pitta, D. (2006). Mathematical Modelling Using Technology in Elementary School.

Mulford, B., & Silins, H. (2003). Leadership for Organisational Learning and Improved Student Outcomes—What Do We Know? *Cambridge Journal of Education*, *33*(2), 175–195. http://doi.org/10.1080/03057640302041

Müller, F. H. (2006). Interesse und Lernen. *In: Report*, *1*(29), 48–62.

Mwangi, R. . (2009). *THE ROLE OF SCHOOL LEADERSHIP IN STUDENT ACHIEVEMENT IN KENYA*. CASE WESTERN RESERVE UNIVERSITY.

Nagy, G., Watt, H. M., Eccles, J. S., Trautwein, U., Lüdtke, O., & Baumert, J. (2010). The development of students' mathematics self-concept in relation to gender: different countries, different trajectories? *Journal of Research on Adolescence*, *20*(482–506).

Neuman, W. (1997). *Social Research Methods: Qualitative and Quantitative Approaches*. Needham Heights, CA.: Allyn & Bacon.

Newman, I., & Benz, C. R. (1998). *Qualitative-Quantitative Research Methodology: Exploring the Interactive Continuum*. Southern Illinois: Southern Illinois University Press.

Nicolaidou, M., & Philippou, G. (2003). Attitudes towards mathematics, self-efficacy and achievement in problem solving. *Education III. Pisa: University of Pisa*. Retrieved from http://fractus.uson.mx/Papers/CERME/TG2_draft/TG2_nicolaidou_corr.pdf

Niglas, K. (2010). *The Multidimensional Model of Research Methodology: An Integrated Set of Continua', In A. Tashakkori and C. Teddlie (Eds.), Sage Hand book of Mixed Methods in Social and Behavioural Research, second edition*. Washington, DC: Sage Publications.

Nunnally, J. C., & Lemond, L. C. (1973). Exploratory behaviour and human development. *Advances in Child Development and Psychology*, *8*, 59–109.

Odell, P., & Schumacher, P. (1998). Attitudes toward mathematics and predictors of college mathematics grades: Gender differences in a 4-year business college. *Journal of Education for Business*. Retrieved from http://www.tandfonline.com/doi/abs/10.1080/08832329809601658

Ogawa, R., & Bossert, S. (1995). Leadership as an organizational quality. *Educational Administration Quarterly*. Retrieved from http://eaq.sagepub.com/content/31/2/224.short

Okigbo, E., & Osuafor, A. (2008). Effect of using mathematics laboratory in teaching mathematics on the achievement of mathematics students. *Educational Research and Reviews*. Retrieved from http://search.proquest.com/openview/44783d3809512af2342105a0f3937dbf/1?pq-origsite=gscholar

Orpen, C. (1998). The effects of organizational centrality on employee career success and satisfaction. *Social Behaviour and Personality*, *26*(1), 85–88. http://doi.org/10.2224/sbp.1998.26.1.85

Pajares, F. (1996). Self-Efficacy Beliefs and Mathematical Problem-Solving of Gifted Students. *Contemporary Educational Psychology*, *21*(4), 325–44. http://doi.org/S0361476X96900259 [pii]

Palm, T. (2008). Impact of authenticity on sense making in word problem solving. *Educational Studies in Mathematics*, *671*(1), 37–58. http://doi.org/doi: 10.1007/s10649-007- 9083-3

Pantziara, M., & Philippou, G. N. (2014). Students' Motivation in the Mathematics Classroom. Revealing Causes and Consequences. *International Journal of Science and Mathematics Education*, pp. 1–27. http://doi.org/10.1007/s10763-013-9502-0

Papanastasiou, C. (2000). Effects of attitudes and beliefs on mathematics achievement. *Studies in Educational Evaluation*. Retrieved from http://www.sciencedirect.com/science/article/pii/S0191491X00000043

Papanastasiou, C. (2002). Effects of background and school factors on the mathematics achievement. *Educational Research and Evaluation*, *8*(1), 55–70. http://doi.org/10.1076/edre.8.1.55.6916

Parasuraman, A., Zeithaml, V. A., & Berry, L. L. (1985). Conceptual model of service quality and its implications for future research. *Journal of Marketing*, *49*(fall 1985), 41–50. http://doi.org/10.1016/S0148-2963(99)00084-3

Parker, P. D., Marsh, H. W., Ciarrochi, J., Marshall, S., & Abduljabbar, A. S. (2014). Juxtaposing math self-efficacy and self-concept as predictors of long-term achievement outcomes. *Educational Psychology*, *34*(1). http://doi.org/10.1080/01443410.2013.797339

Paswan, a. K., & Young, J. a. (2002). Student Evaluation of Instructor: A Nomological Investigation Using Structural Equation Modeling. *Journal of Marketing Education*, *24*(3), 193–202. http://doi.org/10.1177/0273475302238042

Patterson, M. P., Decker, C., Eckert, R., & Klaus, S. (2003). Wendling, L., and Papanastasiou, E. Factor associated with high school mathematics performance in the United States. *Studies in Educational Evaluation*, *29*, 91–108.

Patton, M. . (2002). *Qualitative research and evaluation methods*. London: Sage Publications.

Payle, J. FPayle, J. F. (1995). Humanism and positivism in nursing. *Journal of Advanced Nursing, 22*(5), 979–984.

Pepin, B. (2011). Pupils' attitudes towards mathematics: A comparative study of Norwegian and English secondary students. *ZDM - International Journal on Mathematics Education*, *43*(4), 535–546. http://doi.org/10.1007/s11858-011-0314-9

Phonapichat, P., Wongwanich, S., & Sujiva, S. (2014). An analysis of elementary school students' difficulties in mathematical problem solving. *Procedia - Social and Behavioral Sciences*, *116*(2012), 3169–3174. http://doi.org/10.1016/j.sbspro.2014.01.728

Pianta, R. C., Belsky, J., Vandergrift, N., Houts, R., & Morrison, F. J. (2008). Classroom effects on children's achievement trajectories in elementary school. *American Educational Research Journal*, *45*(2), 365–397. http://doi.org/10.3102/0002831207308230

Pimta, S., Tayruakham, S., & Nuangchale, P. (2009). Factors Influencing Mathematic Problem-Solving Ability of Sixth Grade Students. *Journal of Social Sciences*. http://doi.org/10.3844/jssp.2009.381.385

Pinxten, M., Marsh, H. W., De Fraine, B., Van Den Noortgate, W., & Van Damme, J. (2014). Enjoying mathematics or feeling competent in mathematics? Reciprocal effects on mathematics achievement and perceived math effort expenditure. *British Journal of Educational Psychology*, *84*(1). http://doi.org/10.1111/bjep.12028

Pittman, T. S., Emery, J., & Boggiano, A. K. (1982). Intrinsic and extrinsic motivational orientations: Reward-induced changes in preference for complexity. *Journal of Personality and Social Psychology*, *42*(5), 789–797. http://doi.org/10.1037/0022-3514.42.5.789

Porter, L. W. (1961). A study of perceived need satisfactions in bottom and middle management jobs. *Journal of Applied Psychology*, *45*(1), 1–10. http://doi.org/10.1037/h0043121

Pounder, D. G., Ogawa, R. T., & Adams, E. A. (1995). Leadership as an Organization-Wide Phenomena: Its Impact on School Performance. *Educational Administration Quarterly*, *31*(4), 564–588. http://doi.org/10.1177/0013161X9503100404

Prenzel. (1992). The selective persistence of interest. In *The role of interest in learning and development* (pp. 71–98).

Prenzel, M. (1988). Conditions for the Persistence of Interest. Retrieved from http://eric.ed.gov/?id=ED294903

Primi, C., Busdraghi, C., Tomasetto, C., Morsanyi, K., & Chiesi, F. (2014). Measuring math anxiety in Italian college and high school students: Validity, reliability and gender invariance of the Abbreviated Math Anxiety Scale (AMAS). *Learning and Individual Differences*, *34*.

http://doi.org/10.1016/j.lindif.2014.05.012

Putnam, R. T. (1992). Teaching the "Hows" of Mathematics for Everyday Life: A Case Study of a Fifth-Grade Teacher. *The Elementary School Journal*, *93*(2), 163–177. http://doi.org/10.1086/461720

Quimbo, S. (2010). Explaining math and science achievement of public school children in the Philippines. *Philippine Review of Economics*. Retrieved from http://www.econ.upd.edu.ph/pre/index.php/pre/article/view/21

Radford, M. (2011). Research methods for education. *Professional Development in Education*, *37*(3), 471–472. http://doi.org/10.1080/19415257.2010.498575

Rakes, C. R., Valentine, J. C., McGatha, M. B., & Ronau, R. N. (2010). Methods of instructional improvement in algebra: A systematic review and meta-analysis. *Review of Educational Research*, *80*(3), 372–400. http://doi.org/doi: 10.3102/0034654310374880

Renner, B., Kwon, S., Yang, B., Paik, K., & Kim, S. (2008). Social-cognitive predictors of dietary behaviors in South Korean men and women. *International Journal of*. Retrieved from http://link.springer.com/article/10.1007/BF03003068

Renninger, A., Hidi, S., & Krapp, A. (2014a). *The role of interest in learning and development*. Retrieved from https://books.google.com/books?hl=en&lr=&id=LubJAgAAQBAJ&oi=fnd&pg=PP1&dq=the+role+of+interest+in+learning+development&ots=zen6jsDiml&sig=0rNsip7tnJrtIWEJwYS4iHq7AcA

Renninger, A., Hidi, S., & Krapp, A. (2014b). *The role of interest in learning and development*. Retrieved from https://books.google.com/books?hl=en&lr=&id=LubJAgAAQBAJ&oi=fnd&pg=PP1&dq=S+Hidi&ots=zen6jqLfln&sig=6iMdAkroh9NzSJ7jhBX-NZtthJc

Renninger, K. a. (2000). Individual interest and its implications for understanding intrinsic motivation. In *Intrinsic and extrinsic motivation: The search for optimal motivation and performance* (pp. 373–404). http://doi.org/citeulike-article-id:1624036

Renninger, K. A. (2007). Interest and motivation in informal science learning. *Learning*, 45.

Renninger, K. A., & Hidi, S. (2011). Revisiting the Conceptualization, Measurement, and Generation of Interest. *Educational Psychologist*, *46*(3), 168–184. http://doi.org/10.1080/00461520.2011.587723

Rice, L., Barth, J. M., Guadagno, R. E., Smith, G. P. a, & McCallum, D. M. (2012). The Role of Social Support in Students' Perceived Abilities and Attitudes Toward Math and Science. *Journal of Youth and Adolescence*. http://doi.org/10.1007/s10964-012-9801-8

Riedl, M. O., & Stern, A. (2006). Believable Agents and Intelligent Scenario Direction for Social and Cultural Leadership Training. In *Proceedings of the*

15th Conference on Behavior Representation in Modeling and Simulation (BRIMS) (p. Paper 27). http://doi.org/10.1.1.136.8096

Ringle, C. M., Sarstedt, M., & Straub, D. (2012). A critical look at the use of PLS-SEM in MIS Quarterly. *MIS Quarterly (MISQ)*, *36*(1), iii–xiv. http://doi.org/10.3200/JOEB.79.4.213-216

Ringle, C. M., Wende, S., & Becker, J.-M. (2015). “SmartPLS 3.” Boenningstedt. Retrieved from http://www.smartpls.com.

Robinson, V. M. J., Lloyd, C. A., & Rowe, K. J. (2008). The Impact of Leadership on Student Outcomes: An Analysis of the Differential Effects of Leadership Types. *Educational Administration Quarterly*, *44*(5), 635–674. http://doi.org/10.1177/0013161X08321509

Robson, C. (2011). *Real World Research: A Resource For Users Of Social Research Methods In Applied Settings* (SecondEdit). Sussex: A. John Wiley and sons Ltd.

Roh, K. (2003). Problem-based learning in mathematics. *For Science Mathematics and Environmental Education*. Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.117.5280&rep=rep1&type=pdf

Role of teachers in motivating students’ interest in science and mathematics; IICBA newsletter; Vol.:3, 1; 2001. (2001), *3*(1).

Rotgans, J. I., & Schmidt, H. G. (2011). The role of teachers in facilitating situational interest in an active-learning classroom. *Teaching and Teacher Education*, *27*(1), 37–42. http://doi.org/10.1016/j.tate.2010.06.025

Rubinstein, M. F. (1986). *Tools for thinking and problem solving*. Prentice Hall.

Sam, L. C. (2002). Public images of mathematics. *Philosophy of Mathematics Education Journal*, *15*(15).

Schiefele, H., Krapp, A., & Prenzel, M. (1983). Principles of an educational theory of interest. In *Paper presented at the 7th Biennial Meeting of the International Society for the Study of Behavioral Development, Munich, West Germany, July 31 - August 4,1983 German*. Retrieved from https://www.researchgate.net/profile/Andreas_Krapp/publication/262535690_Principles_of_an_Educational_Theory_of_Interest/links/00b7d537f32fdc2e7f000000.pdf

Schiefele, U. (1990). The influence of topic interest, prior knowledge, and cognitive capabilities on text comprehension. *Learning Environments*. Retrieved from http://link.springer.com/chapter/10.1007/978-3-642-84256-6_25

Schiefele, U. (1991). Interest, Learning, and Motivation. *Educational Psychologist*, *26*(3&4), 299–323. http://doi.org/10.1207/s15326985ep2603

Schiefele, U. (1992). Topic interest and levels of text comprehension. *The Role of Interest in Learning and Development*. Retrieved from https://books.google.com/books?hl=en&lr=&id=LubJAgAAQBAJ&oi=fnd&pg=PA151&dq=schiefele+H.&ots=zen6jrMeog&sig=Kxp6sd3lcvqYYV3dA-gBTTbpWmA

Schiefele, U., & Krapp, A. (1996a). Topic Interest and free Reacal of expository text. *Learning and Individual Differnces*, *8*(2), 141–160. http://doi.org/10.1016/S1041-6080(96)90030-8

Schiefele, U., & Krapp, A. (1996b). Topic interest and free recall of expository text. *Learning and Individual Differences*, *8*(2), 141–160. http://doi.org/10.1016/S1041-6080(96)90030-8

Schiefele, U., Krapp, A., & Winteler, A. (1992). Interest as a predictor of academic achievement: A meta-analysis of research. *The Role of Interest in Learning and Development*, 183–212. Retrieved from http://opus.kobv.de/ubp/volltexte/2009/3352/pdf/schiefele1992_8.pdf

Schoenfeld, A. H. (1992). *Learning to think mathematically: Problem solving, metacognition, and sense making in mathematics*. *Handbook for Research on Mathematics Teaching and Learning*. Retrieved from http://gse.berkeley.edu/sites/default/files/users/alan-h.-schoenfeld/Schoenfeld_1992 Learning to Think Mathematically.pdf

Schunk, D. (1991). Self-Efficacy and Academic Motivation. *Educational Psychologist*, *26*(3), 207–231. http://doi.org/10.1207/s15326985ep2603&4_2

Schunk, D. H. (2003). Self-efficacy for reading and writing: Influence of modelling, goal setting and self-evaluation. *Reading Writing Quarterly*, *19*, 159. http://doi.org/10.1080/10573560308219

Schunk, D. H. (2005). Self-Regulated Learning: The Educational Legacy of Paul R. Pintrich. *Educational Psychologist*, *40*(2), 85–94. http://doi.org/10.1207/s15326985ep4002_3

Schunk, D. H., Meece, J. R., & Pintrich, P. R. (2012). *Motivation in education: Theory, research, and applications*. Pearson Higher Ed.

Senn, P. (2000). Mathematics and the social sciences at the time of the modern beginnings of the social sciences. *Journal of Economic Studies*. Retrieved from http://www.emeraldinsight.com/doi/abs/10.1108/01443580010341745

Sergiovanni, T. J. (2001). *The principalship: A reflective practice perspective*. ERIC.

Shand, A. F. (1914). *The foundations of character*. London: Macmillan.

Shen, B., & Chen, A. (2006). Examining the interrelations among knowledge, interests, and learning strategies. *Journal of Teaching in Physical Education*, *25*(1998), 182–199.

Sher-Censor, E., Parke, R. D., & Coltrane, S. (2011). Parents' Promotion of

Psychological Autonomy, Psychological Control, and Mexican-American Adolescents' Adjustment. *Journal of Youth and Adolescence*, *40*(5), 620–632. http://doi.org/10.1007/s10964-010-9552-3

Siann, G., Lightbody, P., Stocks, R., & Walsh, D. (1996). Motivation and Attribution at Secondary School: The role of ethnic group and gender. *Gender and Education*, *8*(3), 261–274. http://doi.org/10.1080/09540259621511

Siegle, D., Rubenstein, L. D., & Mitchell, M. S. (2014). Honors Students' Perceptions of Their High School Experiences: The Influence of Teachers on Student Motivation. *Gifted Child Quarterly*, *58*(1), 35–50. http://doi.org/10.1177/0016986213513496

Silins, H., & Mulford, B. (2004). Schools as Learning Organisations - Effects on Teacher Leadership and Student Outcomes. *School Effectiveness and School Improvement*, *15*(3–4), 43–466. http://doi.org/10.1080/09243450512331383272

Silvia, P. J. (2008). Interest - The curious emotion. *Current Directions in Psychological Science*, *17*(1), 57–60. http://doi.org/10.1111/j.1467-8721.2008.00548.x

Singh, K., Granville, M., & Dika, S. (2002). Mathematics and science achievement: effects of motivation, interest, and academic engagement. *The Journal of Educational Research*, *95*(6), 323–332. http://doi.org/10.1080/00220670209596607

Skinner, B. (1938). The behavior of organisms: an experimental analysis. Retrieved from http://psycnet.apa.org/psycinfo/1939-00056-000

Solmon, M. a. (1996). Impact of motivational climate on students' behaviors and perceptions in a physical education setting. *Journal of Educational Psychology*, *88*(4), 731–738. http://doi.org/10.1037/0022-0663.88.4.731

Soni, A., & Kumari, S. (2017). The Role of Parental Math Anxiety and Math Attitude in Their Children's Math Achievement. *International Journal of Science and Mathematics Education*, *15*(2). http://doi.org/10.1007/s10763-015-9687-5

Spillane, J. P., Halverson, R., & Diamond, J. B. (2004). *Toward a theory of Leadership Practice: A Distributed Perspective*. *Journal of Curriculum Studies* (Vol. 36). http://doi.org/10.3102/0013189X030003023

Stoll, L., & Fink, D. (1996). *Changing our schools : linking school effectiveness and school improvement*. *Changing education*.

Suárez Riveiro, J. M., Cabanach, R. G., & Arias, a V. (2001). Multiple-goal pursuit and its relation to cognitive, self-regulatory, and motivational strategies. *The British Journal of Educational Psychology*, *71*, 561–572. http://doi.org/10.1348/000709901158677

Sunders, D. and Mark, E. (2007). *Research methods: An advanced guide.* NY:

Wardswoths.

Tahar, N. F., Ismail, Z., Zamani, N. D., & Adnan, N. (2010). Students' attitude toward mathematics: The use of factor analysis in determining the criteria. In *Procedia - Social and Behavioral Sciences* (Vol. 8, pp. 476–481). http://doi.org/10.1016/j.sbspro.2010.12.065

Tanaka, A., & Murayama, K. (2014). Within-person analyses of situational interest and boredom: Interactions between task-specific perceptions and achievement goals. *Journal of Educational Psychology*, *106*(4). http://doi.org/10.1037/a0036659

Tapia, M., & Marsh, G. E. (2004). An Instrument to Measure Mathematics Attitudes. *Academic Exchange Quarterly*, *8*(2), 16–21.

Tapola, A., Veermans, M., & Niemivirta, M. (2013). Predictors and outcomes of situational interest during a science learning task. *Instructional Science*, *41*(6), 1047–1064. http://doi.org/10.1007/s11251-013-9273-6

Tashakkori, A. and Teddie, C. (1998). *Mixed methodology: Combining qualitative and quantitative approaches.* CA: Thousand Oaks, CA: Sage Publications.

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. *Journal of Educational Psychology*, *99*(1), 52–64. http://doi.org/10.1037/0022-0663.99.1.52

Tella, A. (2007). The Impact of Motivation on Student ' s Academic Achievement and Learning Outcomes in Mathematics among Secondary School Students in Nigeria. *Learning*, *3*(2), 149–156.

Tezer, M., & Karasel, N. (2010). Attitudes of primary school 2nd and 3rd grade students towards mathematics course. In *Procedia - Social and Behavioral Sciences* (Vol. 2, pp. 5808–5812). http://doi.org/10.1016/j.sbspro.2010.03.947

Thoman, D. B., Smith, J. L., Brown, E. R., Chase, J., & Lee, J. Y. K. (2013). Beyond Performance: A Motivational Experiences Model of Stereotype Threat. *Educational Psychology Review*. http://doi.org/10.1007/s10648-013-9219-1

Thomas, G. (2004). *Introduction: Evidence: Practice', In Thomas, G. and Pring, R. (Eds.), Evidence-based practice in education*. New York: Open University press.

Tobias, S. (1993). *Overcoming math anxiety*. WW Norton & Company.

Treasure, D. C., & Roberts, G. C. (2001). Students' perceptions of the motivational climate, achievement beliefs, and satisfaction in physical education. *Research Quarterly for Exercise and Sport*, *72*(2), 165–175. http://doi.org/10.1080/02701367.2001.10608946

Uba, E. G., & Lincoln, Y. S. (1994). *Competing paradigms in qualitative research. Handbook of qualitative research*.

Vandecandelaere, M., Speybroeck, S., Vanlaar, G., De Fraine, B., & Van Damme, J. (2012a). Learning environment and students' mathematics attitude. *Studies in Educational Evaluation*, *38*(3–4), 107–120. http://doi.org/10.1016/j.stueduc.2012.09.001

Vandecandelaere, M., Speybroeck, S., Vanlaar, G., De Fraine, B., & Van Damme, J. (2012b). Learning environment and students' mathematics attitude. *Studies in Educational Evaluation*, *38*(3–4), 107–120. http://doi.org/10.1016/j.stueduc.2012.09.001

Vansteenkiste, M., & Deci, E. L. (2003). Competitively Contingent Rewards and Intrinsic Motivation: Can Losers Remain Motivated? *Motivation and Emotion*. http://doi.org/10.1023/A:1026259005264

Vernadakis, N., Kouli, O., Tsitskari, E., Gioftsidou, A., & Antoniou, P. (2014). University students' ability-expectancy beliefs and subjective task values for exergames. *Computers and Education*, *75*, 149–161. http://doi.org/10.1016/j.compedu.2014.02.010

Voss, R., & Gruber, T. (2006). The desired teaching qualities of lecturers in higher education: a means end analysis. *Quality Assurance in Education*, *14*(3), 217–242. http://doi.org/10.1108/09684880610678540

Walliman, N. (2011). *Your Research Project; Designing and Planning Your Work* (Third Edit). London: Sage Publications.

Walsh, W., & Osipow, S. (2013). *Advances in vocational psychology: Volume 1: The assessment of interests*.

Wang, M.-T. (2012). Educational and career interests in math: A longitudinal examination of the links between classroom environment, motivational beliefs, and interests. *Developmental Psychology*, *48*(6), 1643–1657. http://doi.org/10.1037/a0027247

Wang, Z., Lukowski, S. L., Hart, S. A., Lyons, I. M., Thompson, L. A., Kovas, Y., Petrill, S. A. (2015). Is Math Anxiety Always Bad for Math Learning? The Role of Math Motivation. *Psychological Science* , *26*(12), 1863–1876. http://doi.org/10.1177/0956797615602471

Waters, T., Marzano, R. J., & Mcnulty, B. (2003). Balanced Leadership: What 30 years of research tells us about the effect of leadership on student achievement. *McREL Working Paper*, *5*, 21. http://doi.org/10.1080/09243450512331383272

Watt, H. M. G., Hyde, J. S., Petersen, J., Morris, Z. A., Rozek, C. S., & Harackiewicz, J. M. (2017). Mathematics—a Critical Filter for STEM-Related Career Choices? A Longitudinal Examination among Australian and U.S. Adolescents. *Sex Roles*, *77*(3–4). http://doi.org/10.1007/s11199-016-0711-1

Waugh, M., & Su-Searle, J. (2014). Student persistence and attrition in an online M.S. program: Implications for program design. *International Journal on E-Learning*, *13*(1), 101–121.

Wegner, C., Duck, A., Borgmann, A., & Weber, P. (2014). Interest, motivation and sdelf-concept: A study on how tutoring programs influence talented students. *European Journal of Educational Studies*, *6*(2), 52–59.

Wentzel, K. R. (1997). Student Motivation in Middle School: The Role of Perceived Pedagogical Caring. *Journal of Educational Psychology*, *89*(3), 411–419. http://doi.org/10.1037/0022-0663.89.3.411

Wigfield, A. (1994). Expectancy-value theory of achievement motivation: A developmental perspective. *Educational Psychology Review*, *6*(1), 49–78. http://doi.org/10.1007/BF02209024

Wigfield, A., & Cambria, J. (2010). Students' achievement values, goal orientations, and interest: Definitions, development, and relations to achievement outcomes. *Developmental Review*. http://doi.org/10.1016/j.dr.2009.12.001

Wigfield, A., & Eccles, J. S. (1992). The development of achievement task values: A theoretical analysis. *Developmental Review*, *12*(3), 265–310. http://doi.org/10.1016/0273-2297(92)90011-P

Wigfield, A., Eccles, J. S., Schiefele, U., Roeser, R. W., & Davis-Kean, P. (2006). *Development of Achievement Motivation*. *Handbook of Child Psychology, Vol 3: Social, Emotional and Personality Development* (Vol. 3). http://doi.org/10.1016/B978-012750053-9/50008-5

Williams, L. a, & DeSteno, D. (2008). Pride and perseverance: the motivational role of pride. *Journal of Personality and Social Psychology*, *94*(6), 1007–1017. http://doi.org/10.1037/0022-3514.94.6.1007

Wilson, J. W., Fernández, M. L., & Hadaway, N. (1993). Mathematical problem solving. In *Research Ideas for the Classroom: High School Mathematics* (pp. 57–78). Retrieved from http://jwilson.coe.uga.edu/emt725/PSsyn/Pssyn.html

Winheller, S., Hattie, J. A., & Brown, G. T. L. (2013). Factors influencing early adolescents' mathematics achievement: High-quality teaching rather than relationships. *Learning Environments Research*, *16*(1), 49–69. http://doi.org/10.1007/s10984-012-9106-6

Wisker, G. (2008). *The Post Graduate Research Handbook* (Second Edi). New York: Palgrave Macmillan.

Wong, R. M. F., Lawson, M. J., & Keeves, J. (2002). The effects of self-explanation training on students' problem solving in high-school mathematics. *Learning and Instruction*, *12*(2), 233–262. http://doi.org/10.1016/S0959-4752(01)00027-5

Xiang, P., Chen, A., & Bruene, A. (2005). Interactive impact of intrinsic motivators and extrinsic rewards on behavior and motivation outcomes. *Journal of Teaching in Physical …*, *24*, 179–197. Retrieved from http://libres.uncg.edu/ir/uncg/f/A_Chen_Interactive_2005.pdf

Yang, S., Allenby, G. M., & Fennel, G. (2002). Modeling Variation in Brand Preference: The Roles of Objective Environment and Motivating Conditions.

Marketing Science, *21*(1), 14–31. http://doi.org/10.1287/mksc.21.1.14.159

Yavuz, G., Ozyildirim, F., & Dogan, N. (2012). Mathematics motivation scale : validity and reliability, *46*(2002), 1633–1638. http://doi.org/10.1016/j.sbspro.2012.05.352

Zikmund, W. G., Babin, B. J., Carr, J. C. and Griffin, M. (2010). *Business Research Methods*. , South-Western: Cengage Learning. Mason, OH.

Appendix Questionnaire instrument

Indicate your level of agreement or disagreement to the following manifest variables as they contribute to building students interest Mathematics. Strongly Disagree (SD=1), Disagree (D=2), Neutral (N=3) Agree (A=4) Strongly Agree (SA=5)

SECTION A. STUDENT INTEREST

1. **MATHEMATICS INTEREST (MIV)**

Manifest Variables	1	2	3	4	5
The type of basic school student attended affects student interest in Mathematics					
Students likeness for Mathematics affects student interest in Mathematics					
Motivation of students by their teachers affects student interest in Mathematics					
The stage at which students enjoy Mathematics affects their interest in Mathematics					
Teaching method used by the teacher affects student interest in Mathematics					
Problems of getting text books affects student interest in Mathematics					
Reading books and solving problems related to Mathematics affects student interest in Mathematics					
Doing mathematics as favorite activities affects student interest in Mathematics					
Student finding out much more about some of the things taught in mathematics lessons affects student interest in Mathematics					
Student being curious about what they are going to do in the next lesson after a Mathematics class affects their interest in Mathematics					
Teachers having genuine interest in students affects student interest in Mathematics					

2. **STUDENTS INTEREST**

Manifest Variables	1	2	3	4	5
I love learning Mathematics					
Learning Mathematics is frustrating					
The hours I spend doing Mathematics are the ones I enjoy most					
I am highly motivated to learn Mathematics					

SECTION B MATHEMATICAL PEDAGOGY AND CONECTION TO OTHER SUBJECT AREAS

3. **MATHEMATICS CONECTIONS**

Manifest Variables	1	2	3	4	5
Teachers connect Mathematical concept to real life problems					
Teachers link Mathematics to other subject areas					
Teachers provide example and case studies					
Teachers dedicate quality time for practicing class exercise					
There is coordination between class work and assignment given by Mathematics teacher					
Mathematics is abstractly taught					

4. **TEACHERS' TEACHING METHODS (TTM)**

Manifest Variables	1	2	3	4	5
Teachers meet course objectives					
Teachers develop the course systematically					
Teachers outline major points clearly					
Teachers provide examples and case studies					
Teachers explain concepts clearly					
Teachers give deeper understanding of the concepts					
Teachers do not have effective teaching materials					
There is coordination between what is taught in Mathematics class and Mathematics exercises given.					
Teachers' focus on examination than content of syllabus					

Teachers use the traditional way of chalk and talk method to teach					

SECTION C ENVIRONMENTAL AND STUDENT BACKGROUND

5. STUDENTS' BACKGROUND (SB)

Manifest Variables	1	2	3	4	5
Previous educational background of the students' affects their interest in Mathematics					
Environment in which the student grew up affects his interest in Mathematics.					
The use of canes on students when they make mistakes in class affect their interest in Mathematics					
Fear of making mistakes during Mathematics lessons affect students' interest in Mathematics as they move ahead in their educational ladder.					
Fear imposed on student by previous Mathematics teachers affect students' interest in Mathematics					
Negative impression of student about Mathematics from basic schools affect students' interest in Mathematics					
Basic concepts in Mathematics at the foundation level is taken for granted					
Student attendance in class affects their student interest in Mathematics					

SECTION D TEACHERS INPUT AND LEADERSHIP

6. SCHOOL LEADERSHIP (SL)

Manifest Variables	1	2	3	4	5
School leadership provides guidance and counseling to students					
School leadership provides instructional Supervision to student					
School leadership provide needed environment for studying Mathematics.					
School leadership has not provided Mathematics workshops interaction during and after lessons.					

School leadership provides needed support for teachers and students.					
School leadership makes provision for instructional materials.					
School leadership ensures teachers deliver quality in their instruction.					
Frequent change of Mathematics teachers by school leadership is problematic to my interest in Mathematics					

7. INSTRUCTOR QUALITY AND AVAILABILITY (IQA)

Manifest Variables	1	2	3	4	5
Shortage of qualified Mathematics teachers affects student interest in Mathematics					
Bad teaching methods adopted by teachers affects student interest in Mathematics					
Poor illustration methods adopted by teachers affects student interest in Mathematics					
Lack of patience on the part of the teachers affects student interest in Mathematics					
Lack of trained Mathematics teachers affects student interest in Mathematics					
Large students to teacher ratio affects student interest in Mathematics					
Students are refreshed on their previous knowledge in Mathematics.					
Poor teaching strategies adopted by teachers affect students' interest in Mathematics					

8. MATHEMATICS FACILITIES (MF)

Manifest Variables	1	2	3	4	5
There is library facility with relevant Mathematics books					
The school provides the needed instructional materials for the study of mathematics					
The school lacks Mathematics teaching equipment					
The school lacks ICT facilities					

There is inadequate access to resource					
Teachers do not have effective teaching materials					

9. TEACHER AND STUDENT MOTIVATION (STM)

Manifest Variables	1	2	3	4	5
Students are motivated to have sense of control					
Students are given challenging activities during and after lessons					
Students are made to understand the importance of the topics being taught					
Students' curiosity is provoked by teachers or academic mentors					
Teachers are not motivated by school leadership					
Government policy in education does not motivate teachers					
Students develop self-concept and motivation during lessons					
Students spend less time solving Mathematics problems during or after lessons.					
Students are motivated to work extra after Mathematics class					
Low level of interest in Mathematics by students does not motivate them to work hard in Mathematics					
Students are not motivated by their Mathematics teachers					
Teachers are not accessible to students after Mathematics lessions					
Teachers teach well in their private lessons as compared to the normal classes					

10. STUDENTS PERCEPTION (SP)

Manifest Variables	1	2	3	4	5
Negative perception of student from basic schools affects student interest in Mathematics					

Misconception of about Mathematics affects student interest in Mathematics					
The time of the day in which Mathematics is taught affects student interest in Mathematics					
Students with bad perception about Mathematics affects student interest in Mathematics					
There are so many formulas in Mathematics and that affect student interest in Mathematics					
The complex nature of Mathematics affects student interest in Mathematics					
The students perception that mathematics is not enjoying affects student interest in Mathematics					
Students feel they are not involved in the teaching and learning process					
Student attaches personal significance to the study of Mathematics					
The students perception that only bright student can perform well in Mathematics affects student interest in Mathematics					

Please indicate your response by placing a tick [√] in the appropriate box

DEMOGRAPHIC INFORMATION AND PERSONAL BELIEVES

1. Gender:

Male [ ] Female [ ]

2. Age categories:

14-16 [ ] 17-19 [ ] 20-22 [ ] 23 and above [ ]

3. Type of basic school attended:

Public school [ ] Private school [ ]

4. Grade of secondary school

Grade A School [ ] Grade B School [ ] Grade C School [ ]

5. Which of the following Course are you pursuing

General Art. [ ] Visual Art [ ] Science [ ] Business [ ] Home Economics [ ]

6. Class Level

S H S 1 [ ] S H S 2 [ ] S H S 3 [ ]

7. Do you enjoy working Mathematics?

YES [ ] NO [ ]

8. Were you scared of your basic school Mathematics teachers?

YES [ ] NO [ ]

9. Highest qualification of any of your parents.

Uneducated [ ] O'or A Level [ ] Graduate [ ] Others [ ]

10. Are your parents interested in Mathematics?

YES [ ] NO [ ] DON'T KNOW [ ]

11. Do your parents motivate you to study Mathematics at home?

YES [ ] NO [ ]

12. Have you ever been discouraged by a Mathematics teacher?

YES [ ] NO [ ]

13. Who motivate you most in the study of Mathematics

Parent [ ] Teachers [ ] Friends [ ]

14. Would you have chosen Mathematics if it is not a compulsory subject?

YES [ ] NO [ ]

15. Do you think Mathematics as subject has any influence on your future carrier?

YES [ ] NO [ ]

16. Do you like Mathematics as a subject?

YES [ ] NO [ ]

1. Rate your level of interest in Mathematics as a subject on the scale 1-5 with 1-being the least and 5- being the highest.

1	2	3	4	5