AKENTEN APPIAH-MENKA UNIVERSITY
OF SKILLS TRAINING AND ENTREPRENEURIAL DEVELOPMENT

PREDICTING STUDENTS' MATHEMATICS ACHIEVEMENT THROUGH PEER-ASSISTED LEARNING AND MOTIVATION: THE MEDIATING ROLE OF STUDENTS' SELF-EFFICACY

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DECLARATION

STUDENT'S DECLARATION

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

Signature:……. Date: …….

SUPERVISOR'S DECLARATION

We hereby declare that the preparation and presentation of this work was supervised in accordance with the guidelines for supervision of thesis/dissertation/project as laid down by the Akenten Appiah-Menka University of Skills Training and Entrepreneurial Development.

Prof. Yarhands Dissou Arthur (Principal Supervisor)

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Signature:…… Date: ……

DEDICATION

This research work is dedicated to the Almighty Elohim Yahweh and His son Yahshua Messiah for their mercies and blessings. I also dedicate this work to my family for their love, encouragement and support.

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ABSTRACT

This study investigated the effects of peer-assisted learning and motivation on students' mathematics achievement and also the mediating role of students' self-efficacy. The study adopted a descriptive survey as the research design. A questionnaire was utilized to gather data for the study. A Senior High School in the Atwima-Mponua district of the Ashanti region was used to randomly choose a sample of 352 students from SHS1, SHS2, and SHS3. They comprised 155 boys and 197 girls respectively. Structural equation modeling was used for the analysis by using Amos (v.23) software. The findings led to the conclusion that motivation had a positive but statistically insignificant impact on students' mathematics achievement whereas peer-assisted learning had a significantly direct impact on mathematics achievement. The impact of peer-assisted learning on motivation was statistically significant. Additionally, it was found that neither the relationship between motivation and mathematics achievement nor the relationship between peer-assisted learning and mathematics achievement is mediated by students' self-efficacy. The study recommends that educational stakeholders should encourage students to participate in peer-assisted learning to improve their mathematics achievement.

CHAPTER ONE

INTRODUCTION

1.1 Introduction

This chapter addresses the study's background, problem statement, purpose, research objectives, research hypotheses, significance, delimitations, definition of terms and study organization.

1.2 Background to the Study

According to Kitta, (2004), mathematics is a language that aids in expressing ideas and connections derived from the outside world. In the eyes of the general public, mathematics is seen as a foundational subject for many accomplishments. There is a tremendous amount of applying mathematics in business, humanities and a variety of other fields of study (Tella, 2008). According to Lambdin (2009), mathematics empowers students to succeed in school, handle household responsibilities and find employment. Students need to have significant mathematical areas of strength in order to succeed in the mathematics fields. More than just memorizing formulas and rules is required for a strong foundation in mathematics. Mathematics enables one to solve problems that appear to be complex in a simple manner (Cofie, 2020). Mathematics is a fundamental subject component of primary school, senior high school, and tertiary education in Ghana, as it is in many other nations. At these levels, mathematics is an essential subject for every student. Fundamentally, mathematics is regarded as an indispensable pathway to long-term success in virtually every discipline (Tella, 2008). The skill of reasoning clearly, decisively and adequately is used in mathematics. A crucial component of the school curriculum is mathematics, and most countries require students to pass it in order to enroll in university institutions (Abreh et al., 2018).

Nevertheless, many strategies had been used by educational stakeholders and school administrators over the years to enable students to enhance their mathematical achievement, which has sparked scholarly interest in the subject (Arthur et al., 2017). Recently, some scholars have tried to identify variables that affect mathematics achievement. Peer-assisted learning, motivation, students' self-efficacy and other factors are included in some of the variables. Many students at all levels of training believe that mathematics is demanding and challenging because it is an abstract subject (Appiah et al., 2022). In order to assist students in overcoming these hurdles, mathematics teachers should work to create a mathematics-friendly classrooms. One method to do this is to provide students the opportunity to learn together. Peer-assisted learning is a type of instruction that emphasizes the formation of groups that are more closely related to one another and with a common objective (Arthur et al. 2021). Peer-assisted learning is an approach in which the learner adopts a mindset of commitment to speculate, reflect, and share ideas with others (Alzaabi et al. 2018).

According to Ngamskulrungroj et al. (2018), peer-assisted learning benefits both fast and slow learners. It enables quick learners to grasp the course content competently and successfully communicate to their friends. Slow students also develop their thinking capacities and have a deeper comprehension of the material in class, just as the quick students, through peer-assisted learning (Appiah et al.,2022). Students are equally empowered by peer-assisted learning to develop important qualities like self-confidence and sharing ideas at school. Peer-assisted learning is a type of cooperative learning that affects students' mathematics achievement, according to Arthur et al. (2022). Peer-assisted learning has been proven over time by research and experience among mathematics educators to be an effective method for assisting students in achieving their academic goals (Bozzi et al. 2021).

Ikhlas et al., (2021) stated that students' motivation has a significant impact on their mathematical ability. According to (Lin, 2012), motivation helps students learn new knowledge during their learning exercises. Students who are motivated to learn mathematics, carefully follow examples, participate wholly at group discussions, strive for higher scores, take school life seriously, understand the importance of mathematics in many topics, and consistently attend class for all mathematical lessons (Arthur et al. 2021). Mathematics achievement is significantly impacted by motivation (Kian et al. 2014). According to Howard et al. (2021), motivation has a big effect on how well students do in their exams.

Pajares (2002) stated that self-efficacy is described as an individual's confidence to carry out the tasks they set out to perform. Additionally, Ormrod (2006) defines students' self-efficacy as their confidence in their capacity to communicate certain purpose in their mind in order to attain those purposes. Students' self-efficacy improves their abilities to generate and carry out ideas that have positive impact on their future (Xu & Qi, 2019). In their disclosures, Appiah et al. (2022) revealed that students who have high levels of self-efficacy outperform the students with low levels of efficacy in terms of mathematics achievement. Self-efficacy plainly has positive impact on one's activity, efforts, and method of completing tasks, ensuring increased abilities and best outcomes. According to Bandura (2002), students planning ahead build their self-efficacy and achieve their best goals. Again, students who have high levels of self-efficacy are generally well-mannered.

They can develop close friendships with their peers because they can generally control their emotions and this behavior yields excellent results. The study by Haciomeroglu (2019) showed that students' emotional and physiological states predict their level of self-efficacy in mathematics, which has an impact on their achievement in mathematics. Effective learning techniques that improve students' achievement in mathematics are typically wanted and necessary. Gurney (2007), stated that when students are exposed to proper tuition, have access to enough study materials and have teachers with a high level of classroom expertise, mathematics instruction is very effective. According to Mtitu (2014), student-centered practices that need educators to actively involve students in the instruction times should be used for successful and effective studies. Peer-assisted learning, motivation, students' self-efficacy and other factors of mathematics education have all been studied by certain scholars over the years. It was acknowledged by Alegre et al. (2019), Rockinson-Szapkiw and Wendt (2020), and Thurston et al. (2020) that peer-assisted learning has significant influence on students' mathematics achievement.

Kian et al. (2014), Arthur et al. (2021), Ayub (2010) Hosen et al. (2021), Howard et al., 2021 and Ikhlas (2021), as well as others, have demonstrated that motivation has positive effect on mathematical achievement. Ikhlas et al., (2021) claim that students' motivation has a significant impact on their ability to study mathematics. According to Hosen et al. (2021), motivation increases students' performance in mathematics examinations.

According to Kim et al., (2015); Heyd-Metzuyanim and Graven, (2016); Karakis et al., (2016); Milman and Wessmiller, (2016); Hernandez-Martinez and Vos, (2018), peer-assisted learning has a direct effect on motivation.

Numerous studies have also been conducted on the impact of students' mathematics self-efficacy on mathematics achievement (Callaman & Itaas 2020; May & Glynn 2008; Bonne & Lawes 2016; Toropova et al. 2019). Anyone who typically has low mathematics self-efficacy will avoid mathematical problems and will also have low mathematics achievement, according to May and Glynn (2008). Callaman and Itaas (2020) reported that student self-efficacy is directly related to their success in mathematics. According to Toropova et al. (2019), pupils who have greater levels of self-efficacy will surely outperform their peers in mathematics studies. Li et al. (2020) identified three contributing factors that have a direct impact on mathematical achievement: motivation, peer-assisted learning, and self-efficacy. According to Arthur et al. (2021), students' interest mediates the relationship between motivation and mathematics achievement. According to the same Arthur et al. (2021) report, the relationship between peer-assisted learning and mathematical achievement is mediated by students' interest.

The above past researches show that peer-assisted learning has a direct significant effect on mathematics achievement, motivation has a direct significant effect on mathematics achievement, peer-assisted learning has a direct significant effect on self-efficacy, motivation has a direct significant effect on students' self-efficacy and also self-efficacy has a direct effect on mathematics achievement.

1.3 Problem Statement

There had been studies on factors that influences students' mathematics achievement in senior high schools both in the past and present. The current approach of teaching and learning had moved from teacher-centered to a learner-centered approach (Marinko, et al., 2015). This informed the researcher to choose the four constructs for

the study: peer-assisted learning, students' mathematics learning motivation, students' self-efficacy and students' mathematics achievement. It was acknowledged by Alegre et al. (2019), Rockinson-Szapkiw and Wendt (2020), and Thurston et al. (2020) that peer-assisted learning has significant influence on students' mathematics achievement. Kian et al. (2014), Arthur et al. (2021), Ayub (2010), Hosen et al. (2021), Howard et al., (2021) and Ikhlas (2021), as well as others, have demonstrated that motivation has positive effect on mathematics achievement. Kim et al., (2015), Heyd-Metzuyanim and Graven, (2016), Karakis et al., (2016), Milman and Wessmiller, (2016), Hernandez-Martinez and Vos, (2018) also revealed that peer-assisted learning has a direct positive effect on motivation. May and Glynn (2008), Bonne and Lawes (2016), Toropova et al. (2019), Callanan and Itaas (2020) reported that students' self-efficacy significantly predict mathematics achievement.

This present research thus contributes to existing literature by combining the four constructs for the study and looking at the relationship between them using structural equation modelling (SEM). Although other researchers used the same SEM for the identified constructs in their studies, none of them combined all the four at the same time. This was identified as a gap for the study. Again, the study also investigated the mediating role of students' self-efficacy between peer-assisted learning and students' mathematics achievement and between motivation and students' mathematics achievement.

1.4 Purpose of the Study

This research looked at the mediating effect of self-efficacy in predicting mathematics achievement through peer-assisted learning and motivation. The following specific objectives were the focus of the research work:

1. To determine the effect of peer-assisted learning on mathematics achievement.
2. To determine the effect of peer-assisted learning on motivation
3. To determine the effect of motivation on mathematics achievement
4. To determine the mediating role of self-efficacy of the relationship between peer-assisted learning and mathematics achievement.
5. To determine the mediating role of self-efficacy of the relationship between motivation and mathematics achievement.

1.5 Hypotheses

This research study tested on the following hypotheses,

1. H_0: Peer-assisted learning does not significantly predict mathematics achievement.

   H_1: Peer-assisted learning significantly predicts mathematics achievement.
2. $H_{0:}$ Peer-assisted learning does not significantly have direct effect on motivation.

   $H_{1:}$ Peer-assisted learning significantly have direct effect on motivation.
3. H_0: Motivation does not significantly predict mathematics achievement.

   H_1: Motivation significantly predicts mathematics achievement.
4. H_0: Self-efficacy does not mediate the relationship between Peer-assisted learning and mathematics achievement.

H_1: Self-efficacy mediates the relationship between peer-assisted learning and mathematics achievement

5. H_0: Self-efficacy does not mediate the relationship between motivation and mathematics achievement.

   H_1: Self-efficacy mediates the relationship between motivation and mathematics achievement.

1.6 Significance of the Study

A complex interplay of variables has an impact on mathematics achievement both directly and indirectly. Despite the fact that factors influencing mathematics achievement have been extensively investigated, it is crucial to examine some of the factors that influence senior high school students' mathematics achievement. Peer-assisted learning, students' self-efficacy and motivation were found to influence mathematics achievement among senior high school students. The results of this study show how these factors have an impact on mathematics instruction in the senior high school. The researcher expects that Ghanaian stakeholders in mathematics education in senior high schools will benefit from this research and make wise judgments.

1.7 Delimitations

The study was conducted in a senior high school in Atwima-Mponua District in Ghana. This research work is delimited to the Senior High School in the District.

There were many variables which could be used, but this study made use of the following variables: peer-assisted learning, motivation, students' self-efficacy and mathematics achievement.

1.8 Definition of Terms

The researcher introduced these definitions for some of the key words used in this research work to set the stage for this investigation on the variables that influence mathematics achievement in senior high schools.

Peer-assisted learning

Peer-assisted learning is the acquisition of knowledge and skills through active assistance and support among friends. It affects people from comparable social groups who aren't trained teachers assisting one another to learn (Topping 2005). Peer-assisted learning is defined by Miquel and Duran (2017) as an educational process in which students support one another while also learning in the process. According to Thurston et al. (2020), peer-assisted learning is described as a procedure in which students are assigned to practice academic content and professional skills with the majority of students with better abilities serving as mentors. Peer-assisted learning happens when a student accepts the duty of a mentor by instructing their peers, with the connection being based on the content of the educational plan (Ginsburg-Block et al., 2006).

Students' self-efficacy

Self-efficacy refers to the confidence in one's capacity to finish a job and one's abilities to complete a task at the right time frame (Bandura, 1997). Schunk, (2013), defines self-efficacy as the conviction that one can successfully learn and perform given academic tasks at designated levels.

Mathematics learning motivation

Maslow (1962) defined motivation as the action and zeal of individuals with their own aspirations to achieve a specific goal. Lin (2012) defines motivation as the expectations

an individual wishes to accomplish when learning new things and acquiring new knowledge.

Structural Equation Model (SEM)

SEM has been described as combining exploratory factor analysis, confirmatory factor analysis and path analysis (Ullman, 2001). Observed variables are also known as measurable, indicator, and manifest. Typically, squares or rectangles are used by researchers to represent observed variables. A classic illustration of an observed variable is the response to a 5-likert-scaled item.

Unobserved variables are also referred to as constructs, latent factors, or factors. Circles or ovals are used to graphically represent them. The causal relationship between a latent variable and the observable variables is shown by a straight line. Latent variables are connected to each other by arrows. Single-headed arrow, connecting two latent variables shows a direct link. Exogenous variables (also known as independent variables) are constructs that have an influence on other constructs being studied in the context of structural modeling. Exogenous and other endogenous factors in the model have an impact on those constructs classified as endogenous (dependent variables). Prior to testing a structural model, factor loadings and modification indices are estimated. As required by theory based on empirical data, direct and indirect interactions among latent variables are described. An independent variables (exogenous) impact on a dependent variable(endogenous) is known as a direct effect. The impact of motivation on mathematical achievement is an example of direct effect. An indirect effect is the result of an independent variable having an impact on a dependent variable via a mediating factor. An example is how student self-efficacy

mediates motivation and math achievement. In conclusion, SEM enables researchers to examine hypotheses relating to significant relationships as well as the theoretical connections between constructs.

1.9 Organization of the Study

There are five primary chapters to this research. The study's background, the problem statement, the study's purpose, the research objectives, and the hypothesis are all covered in the first chapter, which is an introduction. The significance of the study, Delimitations, and definition of key words are also presented. The second chapter discusses the literature review, specifically the theoretical review, empirical review, and conceptual framework. The methodology utilized to collect the relevant data for the research is discussed in chapter three. This chapter goes into great detail regarding the study area, research design, population, sample and sampling techniques, instrument used in the data collection process, as well as its procedures, validity, reliability, data analysis plan, limitations, and ethical considerations. The data representation of the results, its analysis, as well as discussions on the results acquired, are examined in chapter four. The summary of the findings, conclusions, and recommendations based on this work are also covered in chapter five.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This study's chapter reviews literature on the various factors used in this research work. To give a full grasp of what has been done in the past and to gain a better view of the findings to be produced by this study, the researcher refers to studies that have already been conducted in other works as well as the discoveries made and evaluates them. The review of literature includes sections on theoretical review, empirical review and conceptual framework.

2.2 Theoretical Review

People's actions and words are two of the important ways that their attitudes are shown (Kela, 2016). Rikard and Banville (2006) assert that our opinions are molded by our behavior, which in turn affects how involved we are in the events taking place around us. In this approach, we may comprehend why some events and circumstances have little or no impact on our attitudes while others have a big impact. Understanding certain concepts and issues require the use of theories. This study has used some literary theories, including social constructivism, behaviorism and cognitivism, to explain peer-assisted learning, motivation, and students' self-efficacy in mathematics education.

2.2.1 Social-constructivism Theory

Education has to do with a child's growth utilizing a variety of techniques, often taught by a teacher and guided by a syllabus. Teachers, students, and the schools involved must actively participate for education to be effective (Behar, 2014). However, the current educational system places more of a focus on getting students ready for

examination than on effective learning. The main problem is that students are not studying as they should and are instead concentrating more on memorization and rote learning (Wessel, 2015). Since the academic performance of children in constructivist classrooms is better than that of the rote learning strategy, schools are urged to employ this constructivist approach, which is more centered on inventive activities and knowledge acquisition (Dagar &Yadav, 2016). The social constructivist theory developed by Vygotsky is the theoretical pillar of this investigation. While biological and social factors both contribute to the acquisition of information, Vygotsky argued that language is a necessary component of learning. It emphasizes how students may acquire information and participate in the social creation of knowledge via hands-on learning and experiential education.

The idea that the capacity for cognitive growth is constrained to a "zone of proximal development" is another aspect of this approach. Only subjects that are appropriate for the learner's developmental stage can be taught. It also suggests that learning only creates the "zone of proximal growth" when it activates a several internal developmental processes and can only take place when the youngster interacts with others in his surroundings and works together with his classmates. Peers learning from one another is based on the principle that knowledge is generated via social discourse, which reflects the view that social contact promotes learning more effectively than independent study (Vygotsky,1978). Students get the chance to express their ideas through interaction with others, leading to the creation of a common comprehension of the topic. Peer-assisted learning is a successful additional remedial intervention used in classrooms because it helps students connect with one another more. According to research, pupils who participated in peer-assisted learning significantly improved their

arithmetic skills (McMaster et.al.,2007). On the basis of student growth and performance, peer-assisted learning is viewed as remedial instruction. Peer-assisted learning techniques also provide the teacher a chance to stand aside and allow the students lead the discussion and instruction for a time (Wessel, 2015). One way for enhancing teaching and learning is peer-assisted learning, which offers a secure learning environment to support knowledge acquisition and retention. When participating in small or big group conversations, students feel more at ease and driven to ask questions of one another since they have to debate the many arguments brought forth (Wessel,2015).

Social constructivism's guiding principles may be applied to create constructivist learning practices that will raise students' social and emotional intelligence, academic performance, and capacity for higher-order thinking (Dagar & Yadav, 2016). The constructivist setting of a classroom can provide students exposure to the process of knowledge production. Here, the instructor is intended to introduce a subject to the class and assist the students in exploring the subject further. Later, the teacher assists the pupils in responding to questions, increasing their drive and sense of self-efficacy. It is thought that every student is unique, especially in terms of how they view the world. The students are so encouraged and motivated to collaborate in groups in order to express their opinions on the subject. According to Burhanuddin et al. (2021), a teaching session should be based on the students' past knowledge and experiences for the learning process to take place. Not only does this assist the students in their learning process, but it also aids the instructor in understanding the learner's aptitude, knowledge, and abilities so that they can support and encourage the students toward the lesson, which is extremely important for the educational process. Constructivists also

make the intriguing point that each person's perception and creation of knowledge is unique and depends on that person's perspective. The learner doesn't start with a clean slate (Tabula rasa), but they do put their prior experiences and cultural background to bear on how they would later interpret and build what they have learned. Social constructivism holds that people share knowledge with their surroundings, changing both as a result. The functions that first manifest as social phenomena would subsequently internalize and manifest as psychic phenomena, according to Vygotsky (Boyle, 1997).

According to social constructivist, learning and development must work together for children to grow intellectually in the framework of socialization and education. Children's attention, perception, and memory skills are transformed by important cognitive tools offered by culture, history, traditions, language, and religion. In order for learning to take place, children must connect with the social world on a personal level and then absorb the experiences they have. Children are influenced by their experiences and previous beliefs, which helps them create new concepts (Vygotsky, 1978). Although the form of the contact varies in each, the two theories, psychological and social constructivist are complimentary rather than in opposition to one another because they both highlight the importance of interaction and the process of constructive development in learning. Contrary to behaviorism theory, which behaviorists advocate, constructivism sees learning as an active process rather than a passive one (Greening, 1998).

According to Jaworski (2006), constructivism is a theory that not only establishes our intellectual way of thinking but also builds knowledge. As per a large portion of the instructive explores done in mathematics writing, understudies accomplish high in

mathematics just when they foster their numerical grasping (Clements and Battista, 1990). Because knowledge is created through the interaction of these two factors, constructivist learning theory revealed that both learner and environmental factors are very important.

New information that squeezes into a laid-out construction is simpler to appreciate, retain, and recollect (Slavin, 1988). New data that are deep rooted by a related schemata (or plans) will subsequently be simpler to ingest and coordinated than new materials which have less settled schemata. The development of cognitive tools that take into account the individual's perspectives and experiences as well as the knowledge of the environment in which they are carried out is the foundation of constructivism.

Compelling learning ought to take a gander at these three significant viewpoints for it to find success, significant, and keep going long. The first is action (practice), then idea (information), and furthermore setting (culture) (Brown et al., 1989). Students do not only gain the information that they have from the environment, but they also make interesting capacities for themselves in view of their own encounters and communications with the accessible assets they have (Ugwuozor, 2020).

Both cognitivists and constructivists consider the student to be a functioning member yet constructivists consider the student to be really partaking in the making and understanding of information (Duffy and Jonassen, 2013). The learner creates meaning from the information because the learning objectives are neither pre-defined nor designed. Constructivists emphasized transferring instruction from teaching to learning and avoiding passive information recipients in favor of active problem-solving. In

constructivism, students are viewed as active creators of ideas that they share with relevant facts.

According to Jonassen (1991), constructivists contend that the context influences behavior. It is vital to call for essential changes in educational aspects. The constructivist theory approach is regarded as one of the most effective approaches for comprehending the desired instructional outcomes of the majority of mathematics educators. In this hypothetical system, learning is seen as a course of expanding on the student's ongoing composition or information. Social constructivism hypothesis expresses that language and culture are the spine through which people insight, impart, and comprehend the world obviously.

As per Vygotsky, language and culture display fundamental parts in both human scholarly turn of events and how people view the world. This indicates that learning outcomes are conveyed through language and are interpreted and comprehended by experience. Since it takes a gathering to have language and culture to develop learning structures, information in this way is not just socially built however developed and alternate ways. The distinction here is that while the constructivist sees information as what understudies develop without anyone else in light of the encounters they accumulate from the environment, the social constructivist sees information as what understudies do as a team with different understudies, educators and companions. Social constructivism is therefore the cooperative idea of learning under the direction and the help of a facilitator or as a team with different understudies.

Students' comprehension is influenced, according to social constructivism, not only by interactions with the environment but also by interactions between individuals in

relation to the environment through culture, which is made possible by language. According to Hein (1991), a student is considered to have achieved academic success when they are able to construct ideas on their own or with the help of friends or teachers. According to social constructivism, the student views learning as a social activity with other people, like his friends and family. Social Constructivism see the social part of learning and the utilization of discussion, cooperation with others, and the use of information as a fundamental piece of learning and as an approach to accomplishing learning targets.

Vygotsky uncovered that long lasting course of advancement in learning relies upon social cooperation and that social advancing really prompts mental turn of events. At the end of the day, all educational experiences should be possible by students under educators' direction or with peer joint effort. With this theory, students can work together with their classmates and teacher to build knowledge and comprehension. According to Kapur (2018), social knowledge construction takes place in a variety of settings and in a variety of ways. It could be done in a group discussion, as project work, on any educational or training platform, on social media, at religious gatherings, or in any other public location. Students gain more experience, which is essential for leading fulfilling and successful lives, as they interact with others. Because it relies on students sharing, discussing, and interacting with one another, social constructivism is also known as collaborative learning. Teaching and learning can use a variety of groupings and interactive approaches thanks to social constructivism. These may incorporate absolute class conversations, small gathering conversations or understudies working together on given projects. The significant component about the hypothesis is that students work in groups, sharing thoughts, conceptualizing and get to know

circumstances and logical results, replies to issues or simply making a genuinely new thing to add to existing group of information.

Implications of social constructivism on teaching methods

Teaching methods is considered as the fundamental guiding principle to manage the strategies used for lesson delivery in the classroom.

Dorgu (2015) characterizes teaching methods as the procedure by which an educator conveys his/her topic to the student in light of foreordained educational targets to advance learning in the students. Westwood (2008) views teaching strategy as involving the standards and techniques utilized by educators to empower understudy learning. These definitions uncover that instructing has standards and techniques intended to expand understudies' learning. Theories of learning like social constructivism serve as the foundation for these principles and strategies. Social constructivism maintains that information is created because of social cooperation between students in the environment. Kelly (2012) recommends that social constructivism could be applied in the classroom involving such educational strategies as contextual analyses, research projects, issue-based analyses, conceptualizing, group work, guide disclosure learning, reenactments among others. The instructor could at times partition the class into gatherings or match the understudies and afterward guide by provoking, addressing and guiding the gatherings or matches to find ideas or accumulate growth opportunities as indicated by the planned targets. Methods of social constructivism education fall into two broad categories. They are discussion and activity work.

Discussion

Omwirhiren (2015) characterizes discussion strategy as a technique that uses directed cooperation to feature a specific topic fully intent on working with the understudies. Jegede (2010) says however the strategy is tedious, it upgrades advancing by giving understudies space to foster their conveying abilities, mental abilities like decisive reasoning, intelligent reasoning and assessing different assessment. In this approach, the teacher serves as a facilitator. Through informed discussion, the teacher helps the students discover things for themselves. This is a teaching method in which students and teachers discuss a selected topic. This should be possible as small group discussion or entire class discussion. The discussion is led by the teacher, and each student is free to share their thoughts on a given issue or topic. Rules are laid out from the start to stay away from irregularities. This technique elevates students' advantage, helps maintenance, animates trade of thoughts and make students dynamic member in the example. It advances critical thinking among students as they openly share their thoughts and challenge each other to show up at an agreement. As a result, they acquire reflective thinking abilities that aid in in-depth analysis and comprehension of issues. This assists with further developing their relational abilities, foster resilience as they figure out how to endure and regard others' view in any event, when it isn't wonderful to them. Conversation technique can appear as discussion, think-pair-share, pretend, conceptualizing, field trip and other socially intuitive types of instructing/learning. They encourage research, the development of speaking and listening skills, and the capacity to evaluate the opinions of others.

Activity work

Students in groups collaborate to accomplish an instructional goal in this approach to teaching. Within the group, each student assumes a role that can be formal or informal and frequently alternates. It is centered around the students' participation in activities and thinking to build their own learning. Basically, it is recognizing what they definitely know, what they need to be aware, the how and where to get to new data that might prompt the goal of the issue. The job of the instructor is to work with students by supporting, directing, and checking the growing experience. The educator needs to construct students' certainty while resolving issues, while additionally growing their comprehension. In contrast to traditional teaching and learning, which is typically lecture-based, this approach represents a paradigm shift. An illustration of activity work is the learner centered approach of teaching and learning. Bell (2010) describes Activity-Based Teaching and Learning as an innovative learning strategy that teaches a variety of strategies essential for students to be successful in the 21st century. With this activity strategy, students work cooperatively to investigate and make projects that mirror their insight. Blumenfeld et al., (2011) likewise confirm that activity-based learning is an important way to deal with classroom educating and discovering issues that is intended to help students in examination. One more type of activity work strategy is the jigsaw. Jigsaw is a form of guided discovery teaching method that utilizes cooperative learning technique. According to Igwe (2018), jigsaw instructional strategy adopts cooperative learning method and its principles. In this technique for teaching students, teachers support students through collaboration with one another in the showing of educational experience. Ike (2016) stated that, what makes jigsaw a compelling activity strategy is that every student’s contribution is required for the progress of the process. This makes the strategy to function collectively to make

progress. In the jigsaw classroom, the educator who has 30 students in a class would isolate them into 5groups of 5students. These gatherings are the home gatherings. The understudies in each gathering take their numbers from 1-5. All the 1s, 2s, 3s, 4s, and 5s will emerge to form another gathering called the master gatherings. The instructor will break up the same learning task. For example, a lesson on hospital vocabulary into five distinct parts and ask each group to discuss each part in detail with notes and emphasis on it within a short time. The educator moves from one group to the next, directing and observing the exercises in every master group. Toward the finish of the apportioned time the students are presently approached to return to their home gatherings to convey as specialists what they realized, found or settled in the master gatherings. This way every understudy has something to show different individuals from the home gathering.

The teacher's role in the social constructivist classroom

Social constructivism defines the teacher's role in the teaching and learning process, which lends credence to instructional pedagogy. This suggests that instructors ought to embrace instructing strategies that are:

1. Student centered: here the emphasis is on the students as opposed to the educator. This implies the students are asked to be effectively engaged with their own course of learning. They are permitted to develop their own concepts, questions, definitions, and constructs.
2. Collaborative Based: here accentuation is put on learning through friendly association. This is done by making students to work in groups to take care of issues, research and investigate themes/circumstances to come to end results. Thusly they find or build information without anyone else

3. Led by the teacher: Collaborative learning is a process of peer interaction that is mediated and structured by the teacher in social constructivist classrooms. Conversation can be incited by the introduction of explicit ideas, issues or situations, and is directed through really coordinated questions, the presentation and explanation of ideas and data, and references to recently educated material.

In view of these, the educator is supposed to

i. Give a social constructivist classroom environment that will help group collaboration.
ii. Put rivalry among students down while empowering cooperation and sharing of involvement among students.
iii. Consider the students contributions and commitment as significant whether right or wrong.
iv. supplying the students with the necessary resources and direction to encourage them to construct knowledge in the desired manner.
v. Guarantee that students feel at ease to ask and answer questions, cooperate and add to openly group conversations.
vi. Guarantee that more and less performed students gain from one another.
vii. Give platform support where important and the right level for students.

Implications of social constructivism for students' education

The following are the repercussions for students' education:

1. They never again plunk down to be educated or stacked by the educator however find illustration contents without anyone else as they answer the instructor's questions, tasks, project works and such like.

2. Students presently figure out how to function in groups as coordinated by the educator for powerful agreeable learning.
3. They become co-caretaker of information as they offer and expand on their past encounters to make new information.
4. They assume the ability to advance by effectively partaking and teaming up simultaneously.
5. Students ought to figure out how to consider the assessment of others by appreciating and exploring novel thoughts and illustrations gained from their partners.
6. They ought to esteem each insight, gain from them and be prepared to impart to their groups to ceaselessly work on their mental capacity.

Significance of social constructivism in the educating and educational experience

Social constructivism is significant in the following ways:

1. Supports dynamic interest of students.
2. Empowers dynamic cooperation and communication among students, the educator and others by showing growing experience.
3. Empowers the improvement of ability.
4. Urges students to create and utilize their own drives.
5. Discourages students from rote learning and passiveness.
6. Invigorates interest and helps maintenance.
7. Increases capacity for critical thinking and problem-solving.
8. Advances individual and agreeable learning in the study classroom.
9. encourages students to work together as a team when they work in groups.

10. Stimulates students' curiosity through the utilization of activity-based teaching strategies by the instructor.
11. Advances high confidence with respect to understudies in light of their confidence in self-way to deal with learning. The educator directs the understudies to trust, have confidence in themselves and show the way that they can achieve given task.
12. Encourages students to explore and interact with the resources that are available, facilitating the active construction of knowledge.
13. Concretizes learning and information as in understudies are bound to hold the realities that they find and build without anyone else than those they are told or given by the educator.
14. Assist understudies with reviewing previous occasion in light of specific experience that encompassed it. According to Kanno (2018), these encounters serve as benchmarks and facilitate retention and recall, which are essential for effective learning.

In conclusion, it is generally accepted that mathematical concepts are challenging to comprehend. Contrarily, constructivists hold the view that when students are in charge of their own learning activities, they will acquire topics more effectively. The researcher therefore chose this theory since it offers solutions and inspiration for how students may shape their own learning habits to better grasp subjects and do well on mathematics tests.

Social-constructivism theory is closely related to the study since peer-assisted learning helps students to construct their own learning which improves their mathematics learning motivation and their confidence to learn mathematics.

2.2.2 Behaviorism theory

According to behaviorism theory, education and learning are seen as a person's changing their behaviors, a process that includes some exploration and trial-and-error up to a successful outcome. Behaviorist disregard internal processes in learners because, in their perspective, these processes cannot be immediately observed from the outside (Watson, 1913). This approach emphasizes that learning is a stimulus-response process that is essentially passive and that knowledge is viewed as factual and specific. The behaviorist Skinner emphasizes four crucial aspects of learning. The first is that each learning step has to be brief and carry over from previously acquired behavior. Second, for a successful learning process, pupils should regularly get praise and reinforcement, at least in the beginning stages until the environment's pattern of reinforcement shapes the behavior. Third, the learner needs to receive prompt feedback. Finally, 'stimulus-discriminations' for the most likely route to success should be offered to the learner (Skinner, 1984). Contrary to constructivism, which includes a person creating their own world, behaviorism entailed the use of external environmental stimuli. Constructivist sees learning as happening from the inside of a person to the outside, while behaviorist sees learning as happening from the outside of a person to the inside. As was already noted, the notion of behaviorism theory is built on the idea of "stimulus-response." All of a person's behaviors are brought on by outside factors (Watson, 1930).

A behaviorist further stated that it is not necessary to take into account a person's inner mental states or consciousness in order to understand their behavior. Additionally, this theory makes the assumption that a learner's nature is passive and responsive to contextual cues. The learner always begins with a blank slate (tabula rasa), and behavior

is subsequently molded by rewarding or punishing conduct (Watson, 1913). Both positive and negative reinforcement contribute to behavior modification while also raising the likelihood that the old behavior will recur. However, both negative and positive consequences of punishment contribute to a reduction in the likelihood that earlier conduct would recur. While negative conduct indicates withholding of stimuli, positive behavior suggests application of stimulus (Watson, 1930). According to Burhanuddin et al. (2021), "Humans are fallible beings and are like seeds." They have the potential and ability to become flawless, but this can only occur under the right circumstances.

The change in behavior with the participation of external environmental stimuli as a sign that one's behavior has switched to either a good or bad side centers around the locus of learning in behaviorism theory. According to Skinner, a person's conduct is the outcome of a past action. The learner will be more likely to repeat the desired behavior if positive reinforcement follows the behavior. There are several methods to use positive reinforcement. This applied to vocal praise such as "That's nice," "That's right," or "You're doing the correct thing." Additionally, this type of reinforcement can be given in the form of a direct reward, such as some kind of recognition for successfully managing to attend classes without missing a single day during the academic year. Negative reinforcement has the same effect as positive reinforcement in terms of strengthening behavior. This describes an instance where a bad scenario is avoided or prevented as a result of actions. A student who fails to do assigned homework may be required to pay the teacher 2 Ghana cedis as an example of negative reinforcement. In contrast to how positive reinforcement functions, when a student completes the assigned homework successfully, a teacher will be the one to reward them with 2 Ghana

cedis. Both positive and negative reinforcement led to a shift from an undesirable or enjoyable behavior to one that is more likely to be repeated. Punishment, on the other hand, is a component of the reinforcement style that will diminish behavior. This is so that they learn not to repeat the same behavior as it was unfavorably rewarded when the condition was introduced and experienced by them. The basic goal of punishment is to establish a circumstance that will eventually result in the cessation of a certain undesirable conduct (Burns, 1995). Burhanuddin et al. (2021) also made reference to this area of behaviorism, contending that love is necessary for the learning process. Force should not be used by teachers that children look up to as role models (Arifin, 1991). To their students, they should act like a mother or father and show them love and affection rather than intimidating them. The use of force might cause kids to develop negative behaviors.

This is so that education may instill good principles rather than harmful, as stated by (Burhanuddin et al. in 2021). Consequently, education is a process of systematic action to bring about gradual changes in human behavior (Bigot, 1957). It is crucial to stress once more the close link between learning and a person's changing behavior. Learning is a generally long-lasting change in behavior or prospective behavior that comes from experience and cannot be ascribed to transient bodily states like those brought on by disease, exhaustion, or drug use (Hergenhahn & Olson, 2001). Behaviorism's primary goal is to alter behavior in the desired way. Operant conditioning, a form of behavior modification established by Skinner in his experiment (Skinner, 1938), has been heavily utilized by educators throughout the teaching process and is used in many educational settings today. One can set an example by rewarding positive actions and punishing or ignoring undesirable ones. Although the application and implementation

of this operant behavior treatment may seem simple, it is not. For instance, fear is not just a response of the glands and smooth muscle; it is also a decreased likelihood of going toward a frightened thing and an increased likelihood of moving away from it. It is referred to be an operant side of emotion for these kinds of situations. However, rage also has an operant aspect, which is a learnt habit. In this situation, there is a high likelihood of injuring someone and a low likelihood of acting in someone's best interests.

As a result of responder conditioning, feeling is regarded as a physiological state, whereas a state of mind is a corporeal state resulting from operant conditioning. When a reaction produces positive outcomes, an operant is reinforced, but following actions are dictated by what has already occurred rather than what will happen (Skinner, 1988). This justification offered by Skinner demonstrates how operant treatment affects behavior modification. The prior discussion of positive and negative reinforcement provides an illustration of how operant conditioning may be enhanced. When considering the theory presented, it would appear simple for the teacher to use this concept in the classroom for what we presume to be a behavioral issue. The real challenge, however, is for a teacher to put all of this theory into practice by applying reinforcement and punishment in the right circumstances while focusing on the child's desired and undesirable behavior.

The following scenario might serve as an illustration for this; "In a classroom at school is a kid. The teacher ignores him when he is quiet (reading or drawing). He launches a paper ball towards the opposing youngster. The instructor reprimands him. He begins to read but then tosses something else. The instructor pays him close attention. He

eventually tosses stuff a lot" (Greene & Hicks 1984). Based on the aforementioned instance, it is evident that the youngster, as soon as the instructor tells him to stop, finds a reward for himself rather than punishment since, for him, he is successful in generating some sort of attention while engaging in that particular conduct. He was given attention by his teacher after engaging in a repetitious action, which was what he preferred versus sitting still and receiving no attention. A teacher is said to have properly administered reinforcement or punishment when: First, the instructor praises the student for their desired conduct, which is being silent. Second, the instructor effectively ended the commotion the student had produced and refrained from falling for the second time into the child's trap. When the scenario develops so that the instructor rewards the misbehaving student while still expressing annoyance at the disruptive student, it will truly be a win-win situation. With this, a confrontation with the disruptive youngster would undoubtedly be averted. The significance of the teacher's role in class management is highlighted by this incident. According to Burhanuddin et al. (2021), teachers should simplify the lesson and the complex ideas that are challenging for students to understand. This might be accomplished by providing explanations, telling tales, offering praise, and using a variety of other techniques to make education effective and efficient.

2.2.3 Cognitivism theory

The introduction of cognitivism which was identified as a theory in learning by some philosophers can be traced back from history in the early twentieth century. This was seen as different from the behaviorist theory because, cognitivism examined why and how a person could make sense and process information with the mind, specifically, how the brain receives and process information. In other words, cognitive theory came

as the results of limitations which came out of behaviorism. There was a dissatisfaction with the behaviorism theory by other researchers such that greater opinion was placed on the observable behaviors on the individual through stimulus and response in behaviorism rather than looking at the prior knowledge and mental knowledge which is the key definition of the cognitivist and forms the bases of the individual learning process (Deubel, 2003). The cognitivist revealed that people are not considered as robots or animals that respond to only the environment. Among the proponents of the cognitivist theory are Jean Piaget, Jerome Brunner and Edward Chase Tolman from whom are the front liners who hold the views contrary to that of the behaviorist. The cognitive theory explained learning as an active process of obtaining knowledge by the organization of the cognitive structures from which the learner process and keeps an information with the mind and also the learner is identified as an active participant in the learning process (Simon, 2001)

Piaget (1973) created an investigation of children's cognitive development. Piaget (1973) shown via his studies that children think quite differently from adults. This did not imply that youngsters are less intelligent or slower than adults; rather, it simply indicated that children think differently from adults. According to Piaget's research, infants are born with a very basic, genetically inherited mental framework (schema) that serves as the basis for all subsequent learning and knowledge. This schema changes as children get older. According to him, cognitive growth is the gradual restructuring of mental processes brought on by experience and maturing.

Piaget describes intelligence as an organism's ability to adapt to its environment, which is governed by the schema (mental structures) that a person employs to categorize and represent the outside world. According to Jean Piaget (1973), intellectual development

is a process of acclimating to the outside environment. This is accomplished through assimilation, the use of the environment or its transformation in order to integrate it into preexisting cognitive structures. In order to accept anything from the environment, accommodation, which is also the act of altering cognitive structures, is necessary. The balance between applying prior information (assimilation) and altering behavior to account for new knowledge (accommodation) is accomplished through what he dubbed the equilibrium process. Both processes are engaged concurrently and alternatively throughout life (Piaget 1973). The theory of Piaget offers a sound foundation for understanding what children do and think at various stages of development. According to Piaget, kids have very strong, coherent, and dynamic worldviews that they use to explain the world. They think significantly differently from adults in many aspects. Children's ways of thinking and doing have their own logic, which is frequently suitable for their present demands and opportunities. Children's perspectives on the world can span a wide range, resulting in a level of complexity in their thought processes. Piaget did stress, however, that knowledge is internal and always expands from inside in accordance with intricate principles of self-organization. Piaget's conception of education has serious implications, including the following: First, instruction is always indirect. This illustrates how complicated the minds of infants are and how they do not just accept the information they are given and what is said about them; rather, they interpret it based on their own understanding in light of their prior knowledge and experiences. Second, Piaget believed that interaction with the outside world, other people, and objects is how knowledge is acquired. not something that is given to you all at once.

The process of learning takes place concurrently with the construction of experience. Finally, it's important to take learning barriers seriously. Piaget established that outside influences children encountered as they matured aided in their learning process. This is due to the fact that as they go through the process, kids will encounter new things and have to cope with conceptual challenges, which helps them grow. The philosophy of Piaget was concerned with kids and emphasized growth about learning. In his theories, he shows how children's growth and learning are closely related, making it possible to use more persuasive teaching strategies. In his work, Piaget (1972) investigates four sequential stages of a young learner's psychological development. He thinks that teachers should be aware of these stages.

The Sensory-Motor Stage is the first stage. From birth until the age of two. It is at this period when children's senses, reflexes, and motor skills quickly grow, allowing them to learn and experience new things. The fundamental motor and sensory exploration of the environment that children exhibit is what is meant when reflex movement becomes more refined. When a baby chooses to play with their favored toys, that may be an illustration of it. Only through perception and previously direct experiences with an object can a child comprehend the world. Most of the time, kids learn how to respond from actual experiences, and they repeat that activity in other contexts to get the same outcomes. At this stage of growth, according to Piaget, children continue to understand objects even when they are unable to see them. Accidentally discovered procedures are then reproduced and used to fresh circumstances to get the same outcomes.

Pre-operational stage is the following level, when children cannot yet reason rationally and learn via pretend play. From the age of two to seven, this happens. With the aid of language learning, they conceptualize and symbolize the world. These symbols,

however, rely on the perception and intuition of the child. A child at this stage is fully egocentric and perceives everything from their own point of view, despite the fact that they have previously exhibited an interest in the things and people around them. They continually question everything and look into new topics since they are at the age of curiosity. Since their knowledge of the universe is confined to their own experiences and viewpoints, children create their own explanations when there isn't one. Children think differently from most people throughout this preoperational period.

The stage of concrete operational comes after this. Children go through this stage between the ages of seven and eleven. The youngster starts to think more rationally and carry out mental processes at this period. A youngster continuously makes meaning of the prior action they took through mental processing. At this moment, their perspective is pretty solid. They still have trouble grasping abstract ideas. However, they start to become less egocentric and cease focusing only about themselves. They begin to consider other individuals. A mental operation, according to Piaget, is an action carried out inside the mind. The ability to think back on physical activities that were previously accomplished by the youngster is facilitated by mental processes. The preoperational youngster could count from one to ten, but it isn't until the stage of concrete operations that one actually understands that one stands for one item. Reversibility is a feature of this stage. The youngster has the ability to think in the other direction. A child is aware that he can subtract as well as add. He or she can see where she left a toy without doing a random search of the entire house, or map her path to school and then follow it back home. Children once more start to apply inductive reasoning. This requires moving from a particular experience to a generic one. However, they struggle with using logical reasoning. At this age, a youngster is capable of doing basic mathematical calculations.

Concrete operations only apply to things that are actually there, which is why they are given this name.

The formal operational stage is the final step. Between the ages of eleven and sixteen, Piaget's last stage of development takes place. At this age, children's logical reasoning develops, they start to comprehend complex concepts, and they can employ deductive reasoning. They are now able to solve difficult problems and think more logically and scientifically to explain what is occurring around them. A child who is at formal operational thinking stage may consider the far future and hypothetical situations. The final stage of Piaget's theory corresponds to the onset of adolescence and is characterized by the development of abstract cognition and logical reasoning. Thought is more adaptable, logical, and structured. The person may now imagine all the potential solutions to an issue and can approach a challenge from several angles. The teenager is able to "act on operations, not just tangible objects," and think about thoughts. He or she is capable of thinking about imprecise ideas like space and time. The teenager develops a moral sense and internal value system. He or she now possesses the "mental tools" required for living his or her life. Piaget's theory of phases has had a significant impact in that it allows for the parallel design of learning processes with children's cognitive development. Piaget's work has had a significant impact on how educators think about and advance education. However, there is still criticism of his theory because he neglected to include the impact of social contact and the importance of cultural transmission. In essence, Piaget, who saw the human body as a whole system, thought that in addition to physical and biological development, humans simultaneously underwent cognitive development. He claimed that the human body was built with cognitive, emotional, and physical growth. He advocates that change in

cognition is the same as evolution-equilibration in a large portion of his studies. He defined equilibration as a dynamic process of self-regulated behavior that balances the two intrinsically polar tendencies of assimilation and accommodation, which were briefly stated before. A method of arranging an experience is assimilation. It represents a person's propensity to see, comprehend, and respond to their environment.

According to Piaget, when one develops through time while seeking out new information and exploring "new terrain," this process is what happens. In the meantime, accommodation involves integrative, reflective conduct that is accountable for altering one's own behavior and analyzing the object in order to work with cognitive balance in connection to it. In Equilibration of Cognitive Structures, Piaget explained that his earlier model had been insufficient and that his main new idea is that knowledge comes from successive constructions rather than just from experiencing things firsthand or from an innate programming carried out by the subject. He suggested a constructivist classroom dubbed "The Piagetian Classroom" in order for a successive construction to occur.

According to Piaget, this style of classroom may help students build their knowledge while also inspiring them to learn new things, improving their readiness to learn, and accepting personal diversity. Through this process, experiences may be developed that run parallel to the natural programming carried out within students, in line with what Piaget stated in Equilibration of Cognitive Structures (1977), which has already been described earlier. The usage of videodisk, CD-ROMs, and simulation software in the classroom is an illustration of his concept about how to improve learning. In the meanwhile, communication methods like email and the internet should be utilized to

interact with the local community and give settings for debate. When these elements are put into practice, students' knowledge and concepts will become more expansive to include global challenges.

For Piagetian elementary classrooms, concrete learning activities like theater, painting, model-building, and field excursions are advised so that kids may actively participate in hands-on chances to hear, see, touch, taste, and smell. According to Piaget, such sensory systems are necessary for a successful learning process to take place. Additionally, these simple exercises and visual aids help as the foundation for later, more complex tasks.

Self-guidance has additionally been utilized to train students to direct their exercises during learning (Meichenbaum, 1977). It includes the utilization of explanations coordinated towards self for direct learning. When faced with a challenge, children frequently "talk themselves out of it." Vygotsky (1962) observed that children rely on verbalization to complete tasks. With self-talk or confidential discourse, youngsters figure out how to control their way of behaving. This is a significant piece of the formative interaction. Many self-guidance processes were identified by Meichenbaum and Goodman (1971). In cognitive modeling, the adult instructs the child while carrying out the task. Children perform under adult supervision in overt guidance. Children perform while teaching themselves aloud in overt self-guidance. Children in faded overt self-guidance whisper the instructions to themselves while doing a task. In Secret self-guidance, youngsters perform with the assistance of interior quiet discourse. In a study hall of pre-essential classes, these cycles are in many cases clear where students guide themselves through the errand distributed to them. Self-guidance has been broadly

utilized with different assignments and kinds of understudies (Fish and Pervan, 1985). It is particularly helpful for those students who have learning incapacities Sawyer et al. (1992). Learners define the requirements of the task when they define a problem. In centering consideration, they produce plans. Then they make a procedure, trailed by self-assessment. They additionally explore their troubles through survival methods lastly reward themselves with self-support. Learning is contingent on the students' competence, vicarious effects, and developmental status, so observing models does not guarantee that it will occur.

In view of this, cognitivist highlights on the application of the learner's memory in which knowledge becomes more meaningful and well arranged by the learner based on his prior knowledge (Sobel, Hess & Verdi, 2001).

In conclusion, the cognitivism theory stated that learning should be student-centered in the dispensation of knowledge in the classroom and also based on active discovery learning. The teacher's duty is to support learning rather than to provide instruction. Teachers should give students' the chance to perform some of the tasks themselves in order to determine their developmental stages.

Cognitivism is the theory of learning which stresses on the human cognition and social endowment for developing intellectually. The underlying factors of cognitivism are centered on the way we think and acquire knowledge. Implications of cognitivism in the classroom setting are very important, since the learners develop knowledge by receiving, storing and retrieving information, when the need arises. Based on this, it is imperative for learning instructors to thoroughly analyse and consider the required tasks needed in order to facilitate learners for effectively and efficiently process information.

Learning becomes more clearer when it is related to concepts that already exist in a person's cognitive ideas.

The foundations of cognitive learning theory on student learning should include instructional goals which factor in learner needs and interest, look at the concerns of society and also geared towards the present and the future needs of the student.

2.3 Empirical Review

Numerous researches had been undertaken in recent years to identify the variables that affect senior high school students' mathematics achievement. It has been noted in various academic works that a variety of factors, including peer-assisted learning, motivation, and students' self-efficacy, which are the core components of this study have an impact on mathematical achievement.

2.3.1 The Impact of peer-assisted learning on mathematics achievement

Three writers, Lynn Fuchs, John Fantuzzo, and Keith Topping have done a lot of researches on the subject of peer-assisted learning in mathematics despite the fact that hundreds of authors have contributed to this field. Peer-assisted learning has been shown to boost academic success in mathematics for all types of pupils, including those with learning disabilities, according to research by Fuchs et al. (2019). Although Fuchs has recorded experiences in early childhood and secondary school, her research often focused on primary education. She stresses that in order to get the most out of these kinds of experiences, student interactions need to be robust and overseen by an expert in the topic. Peer-assisted learning impacts mathematics success, according to a number of scholars in the field of peer-assisted learning, including Swartz et al. (2012) and Clarence (2016). According to Fantuzzo et al. (2011), organized peer-assisted learning

is essential so that students can best support their own learning; these authors cite peer learning as a crucial factor in mathematics achievement. Topping has researched peer-assisted learning at several levels and for a variety of disciplines, but his contributions to higher education is particularly impressive.

According to Topping (2011), peer-assisted learning can help students communicate more effectively, and it can also have a favorable impact on other factors including students' attitudes toward mathematics. Peer-assisted learning, according to Topping, is an inclusive system in which every student receives something in return for their interactions, ensuring that every student gains from its adoption. Numerous nations have recorded dozens of peer-assisted learning events over the past ten years in their academic publications. One of the nations in the world with the most positive development in peer-assisted learning reports over the past ten years is South Africa. The importance of this technique has been consistently demonstrated in studies by Tangwe and Rembe (2015), Spaull (2015), Maphosa (2018), Mkonto (2018), and Taole (2020), to mention just a few. Since many of the aforementioned writers discuss how peer learning may be advantageous under difficult financial circumstances, their experiences may thus be viewed as an important educational resource for emerging countries as a result of these research. According to Schofield et al. (2005), peer-assisted learning in mathematics was generally advantageous from an academic, social, or psychological standpoint. In several earlier investigations (Jarvis & Hill (1996), Fulk & King (2001), McMaster, Fuchs & Fuchs (2007), Parkinson (2009), Maxwell & Smyth (2010), Wessel (2015), Diana (2017) all stated that peer-assisted learning has a strong influence on mathematics achievement. According to Diana (2017), peer-assisted learning helps students to develop practical skills in how to teach and provide critical feedback to peers.

2.3.2 The impact of peer-assisted learning on motivation

Peer-assisted learning makes it easier for students to approach other students without feeling intimidated, and could encourage them to concentrate on their mathematical studies. Peer-assisted learning, which has the ability to raise learners' motivation, is an approach identified by Heyd-Metzuyanim and Graven (2016) to address low mathematics performance. According to Milman and Wessmiller (2016), some students find it difficult to pay attention in math class or think math is useless. Others may lack confidence in their capacity to participate in mathematics or may not be happy with the level of instructor feedback. If peer tutors understand their role in encouraging students to study mathematics, they may be able to help instructors and students overcome these issues. There are a number of factors that could make it difficult for students to pay attention in math class. Ghana has a lot of packed math classes. Such classrooms, according to Ntow and Adler (2019), do not encourage dialogues, and students have little opportunities to speak freely or with other students. Peer tutors, whether at the same grade level or a higher grade level, can provide struggling math students the individualized attention they need, which isn't always achievable in a packed classroom. Additionally, when students are actively engaged in hands on activities, they are more conscious of the material being taught. Peer-assisted learning might inspire students to pay more attention in mathematics studies, which in turn increases their motivation (Kim et al., 2015). Hernandez-Martinez and Vos (2018) claim that many students are discouraged and think that math is not important to their lives or their future pursuits. However, when peer tutors show how the learner's potential accomplishments are applicable to the future, they may help the learner imagine what the future could contain and motivate them to pursue mathematics.

Peer tutors may be able to help students with the mathematics they need to learn while also addressing their ideas about themselves and the subject matter (Izmirli & Izmirli, 2015). Kim et al. (2015) found that when students believe a task is important, they are more driven to complete it. The authors contend that learners' motivation improves when they feel they are capable of completing mathematics problems. When a work is seen to be excessively challenging, students may begin to feel like failures, which has a detrimental effect on their motivation. Therefore, Schukajlow et al. (2017) proposed that since motivation is topic-specific, greater focus should be placed on the content in mathematical activities.

Extrinsic motivation is the drive to achieve objectives like receiving praise or avoiding punishment (Güvendir, 2016). Contrarily, intrinsic motivation refers to a learner's natural drive to attain a desired result or just finish a work out of sheer enjoyment without considering a reward (Winberg et al., 2014). Teachers frequently need to continue teaching new mathematics material during contact time in order to finish the mathematics curriculum, therefore they are unable to respond to students' questions right away. Mathematical learning challenges should not be ignored since they may have a detrimental impact on students' intrinsic motivation to learn the topic. However, support from peer tutors may speed up the delivery of comments and allow students to feel more pride in and pleasure from their work (Izmirli & Izmirli, 2015). Peer tutors might help students develop a knowledge of the subject material at their own speed and in their own time instead of waiting for formal lessons from their lecturers (Karakis et al., 2016). Peer-assisted learning can increase students' motivation during the learning process, which will ultimately result in improved mathematical performance (Kim et al., 2015).

Peer-assisted learning is a strategy to address students' self-perceptions and the mathematics they must learn (Hoops et al., 2016). Peer tutors could also be inspired by learners to study new mathematical material and to acknowledge the limitations of the subject matter they already know (Galbraith & Winterbottom, 2011). Peer-assisted learning has become more widespread and necessary as class numbers in secondary schools throughout the world have increased (Alegre et al., 2020).

Peer-assisted learning is a significant intervention approach used mostly at the senior high level that has a significant impact on how well students are able to retain the knowledge they have learned (Layton & McKenna, 2016). The tutorials in peer-assisted learning system gives students the chance to acquire the information they need to pass exams (Clarence, 2018). Peer-assisted learning could speed up the teacher's response time for feedback or provide students the chance to review certain areas of their work at their own pace and in their own time after the teacher has moved on to new material (Kroeger & Kouche, 2006). By receiving comments, students may improve their own comprehension of the material (Karakis et al. 2016). Peer-assisted learning can help students who struggle with the desire for peer acceptance since it promotes dialogue and discussion between the learner and the peer tutor (Kim et al., 2015). In peer-assisted learning, the student and peer tutor work together one-on-one. Since the peer tutor and student frequently have more in common, this connection has the potential to have a stronger influence on the learner (Kroeger & Kouche, 2006). Despite the many advantages of peer-assisted learning on motivation of students, one drawback might be the unfavorable interactions among peers outside of the classroom (De Backer, Van Keer, & Valcke, 2015). De Backer, Van Keer, and Valcke (2015) suggested additional research on negative socio-emotional peer interactions since there is a possibility that

they may have a negative impact on the learners, despite research showing primarily positive social interactions between peer tutors and learners.

Peer-assisted learning has been shown by Kroeger and Kouche (2006) to have a favorable impact on students' attitudes toward mathematics at an inclusive middle school in the Midwest of the United States. In addition, (Topping et al., 2003) found that mathematics games used in peer tutoring had a favorable effect on students' attitudes toward mathematics and motivate them to continue with the subject even when they find the material challenging.

2.3.3 The impact of motivation on mathematics achievement

The term motivation describes an individual's own interest in wanting to know, enjoy, be near to, or relate to a certain item (Pitsia et al., 2017). Then, it indicates a person's ambition, tenacity, and expectation of achievement (Tambunan, 2018). He will eventually find a way to complete the task, especially in the face of difficulties (Elliot & Covington, 2001). Students who have high expectations for academic achievement will have a definite propensity toward positive conduct which forms intrinsic motivation (Prast et al., 2018). Extrinsic motivation, as described by Steinmayr and Spinath (2009), can result from a person's desire to escape the humiliation of others in the event that they fail and earn praise from others. While some researchers have suggested that motivation interacts with other elements that impact mathematics success, many previous studies have shown that motivation has a link and may be used as a direct predictor of mathematical achievement. Farmer (2018) discovered that students with learning motivation outperformed pupils without it as a key predictor of mathematical ability in the classroom. Intrinsic motivation was found to be a significant

element in both direct effect and indirect effect models of mathematics success prediction by Dickhauser et al. (2016) and Yurt (2015). (Skaalvik et al., 2015) have discovered that teaching strategies such as emotional support by teachers, assigning homework with appropriate quality, as well as giving positive feedback to students lead to motivation and to develop student achievement.

According to Kebritchi et al. (2010), students' motivation in class and mathematical success are both impacted by the current teaching of mathematics via computer games. In regard to cognitive accomplishment, there has been much study on the motivating components of learning. Numerous studies have demonstrated that students' motivation strongly influences their ability to succeed in school (Aunola et al., 2006; Marsh et al., 2005; Smith et al., 2012). Students' who are intrinsically motivated are more likely to work hard in order to get better grades and acquire better jobs (Ryan & Deci, 2000). Extrinsically driven children are more likely to achieve less as compared to intrinsic motivated students. (Becker et al., 2010; Lepper et al., 2005). The focus of intrinsic motivation is on engaging in an activity because it offers personal satisfaction (Lee et al., 2012). The work must be delightful by itself, with no expectation of external reward. Students that are intrinsically driven put a lot of time and effort into completing the assignment, even if it is too challenging or complex for them. Schukajlow et al. (2017) examined that motivation and emotions affect students' perceptions and interest in mathematics. Winberg et al. (2014), stated that learners are more inclined to interact with information if they find it interesting or valuable. Oswald and Rabie (2016) discovered that motivated and persistent talented learners are more likely to succeed in mathematics.

2.3.4 The impact of students' self-efficacy on mathematics achievement

Self-efficacy, which refers to judging, identifying, and measuring one's capacity to manage a variety of challenging activities in order to reach one's goals, is a significant aspect that is strongly tied to a student's capacity to study (Bandura, 1986). Students' judgments of their capacity to study and achieve in mathematics are referred to as students' mathematics self-efficacy (Garcia et al., 2016). High self-efficacy students typically use effort and bravery to overcome formidable learning obstacles. They have little fear of stress or failure, which allows them to undertake tasks that are indicative of success (Prast et al., 2018). According to Tosto et al. (2016), students with high self-efficacy outperform those with low self-efficacy in mathematics, who exhibit behavioral inclinations to avoid math-related tasks. According to Karakolidis et al. (2016), the growth of students' mathematical success is impacted by their development of self-efficacy. According to Kalaycioglu (2015), a factor that may be utilized to predict math performance is math self-efficacy. According to Mundia and Metussin (2019), students who are self-confident will correlate with their own learning abilities and have the capacity to strategically plan their studies, which will result in the improvement of mathematics learning achievement.

According to Rastegar et al. (2010), self-efficacy and metacognition combine to provide students the capacity to give justification for their actions, make wise choices, and have a strong chance of achieving high academic performance. According to Tosto et al. (2016), high school students build positive self-efficacy in the classroom, which helps them to improve their problem-solving and accomplishment skills in mathematics. In Bandura's social cognitive theory, the concept of self-efficacy plays a central role. People are neither completely independent nor completely restricted by their current

situation, according to the social cognitive theory (SCT) (Bandura, 2001). Instead, the relationship is viewed as reciprocal, where the domain can limit an individual's options while the individual can choose what aspect of the possible environment will be capable (Zimmerman, 1990). According to Callaman and Itaas (2020), academic performance on the mathematics test correlated with academic self-efficacy. The understanding that students have of their academic potential helps anticipate what they will do with the information and talents they already have, which ultimately affects their academic success. Anyone who typically has low mathematical self-efficacy will also have mathematical challenges May and Glynn (2008). According to (Bonne & Lawes, 2016), the higher a person's rating on the mathematics self-efficacy measure, the better they do while solving mathematical tasks. According to Toropova et al. (2019), students were more likely to have positive attitudes about academics than their friends with low self-efficacy. Bandura, (2002) stated that prior experience focuses on the fundamental skills a person uses to adapt to a new situation which builds students' mathematics self-efficacy.

2.4 Conceptual framework

The conceptual framework below offered variables that influence mathematics achievement. A conceptual framework, according to Sitko (2013), is a group of notions, presumptions, expectations, beliefs, and theories that act as the basis and informational source for research. As can be seen in the image below, students' achievement in mathematics is influenced by motivation, self-efficacy, and peer-assisted learning.

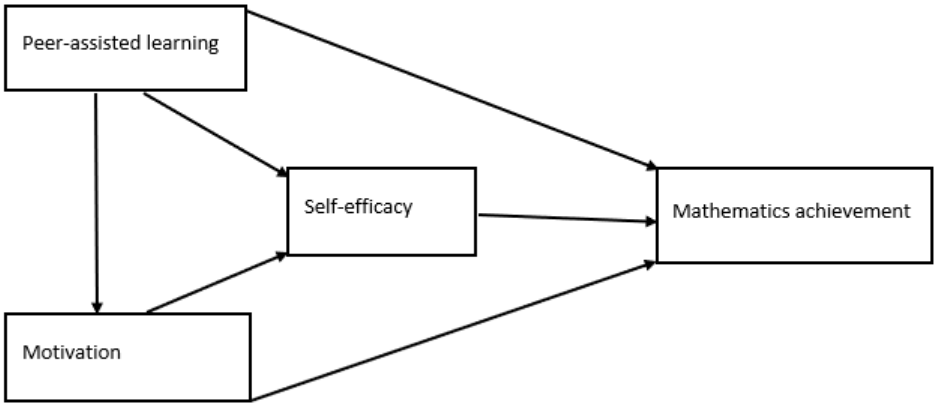

Figure 1: Conceptual framework

2.5 Chapter Summary

The chapter initially presented the theoretical review, which looked at three theories that are Cognitivism, behaviorism, and social constructivism theories. The chapter continued by reviewing empirically how students' motivation, self-efficacy, and peer-assisted learning affect mathematics achievement. The presentation of a conceptual framework that graphically shows the direction of the individual paths was shown. In a diagram, the conceptual framework clearly depicts the paths taken by the various variables.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

The methodologies and techniques used in the study are discussed in this chapter. The study area, research type, research design, population, study variables, research paradigm, sample and sampling techniques, data collection instrument and procedures were all examined. The chapter include the validity and reliability testing, limitations and ethical considerations.

3.2 Research Paradigm

The conceptual lens through which researchers examine the procedures and techniques to assess data for research work is known as research paradigm (Kivunja & Kuyini, 2017).

In this study, the research paradigm that the study used was positivism. The positivism research paradigm is based on deductive logic. That is, forming of hypotheses, making analysis of the hypotheses which involves calculations, giving explanation based on the test conducted, and drawing conclusions. Those quantifiable results are in line with the four assumptions suggested by Cohen, Manion, and Morrison (2002) as determinism, empiricism, parsimony, and generalizability. These assumptions are the basic ways to help every researcher conducting research under this paradigm to make meaning and derive a better conclusion. By brief explanation, the assumption of determinism implies that every problem we notice is supported by one or two elements serving as an influence on the situation. In this manner, in any event, if we understand the connections (cause and its effect) among the factors, there should be a way we can use these variables to control the possible effects of these independent variables against the

dependent variables. The second assumption suggested Cohen was empiricism. This assumption seeks to investigate on the problem under study, gathering of empirical data from respondents of which it's support the theoretical framework of the research under study and making test of the hypotheses generated. Lastly, the generalizability assumption informed us concerning the results obtained from the study within the positivist paradigm its application in other discipline of study by inductive implications. This implies that the positivist researcher should be able to analyze the causal relationships in a particular phenomenon being examined and ought to have an option to generally anticipated the expectation in another environment. Due to these suppositions, the Positivist worldview advocates the utilization of quantitative research methods as the fundamental for every researcher. These fundamentals are the ability to make a concise definition of the parameters being studied and the analysis and the interpretation associated with the data collected, and comprehend connections fixed among the variables in the data analyzed (Cohen, Manion & Morrison, 2002).

According to this idea, social reality may be studied using methods from the natural sciences. It asserts that knowledge arises through the rigid application of the scientific process, which forbids speculation about the nature of reality (Uddin & Hamiduzza, 2009). Positivism involves putting hypotheses to the test and creating scientific laws. Positivism employs the approach of scientific method, which works on the basis of cause and effect. The concepts that come from this perspective are founded on meticulous observation and evaluation of the world's findings. In order to comprehend the world, rules that control it must be examined and improved (Creswell, 2003). According to positivists, there is information out there that can be measured. The positivist viewpoint holds that everything is predetermined and that science may be

used to identify the laws guiding social behavior (Babbie,2005). According to Crowther and Lancaster (2008), positivism studies often use a logical approach. It pertains to the idea that the researcher should focus on existing facts. Positivists contend that there is just one true reality out there. The information acquired is then utilized to confirm or disprove the initial hypotheses that guided the investigation.

Researchers must maintain objectivity and be free from bias in order to be taken seriously, according to positivist theory. The positivists think that research work should be completely impartial on its results. When doing research, independence implies that the researcher interacts with the subjects as little as possible (Wilson, 2010). The scientific nature of the positivist approach means that laws are used (Newman, 2007). Researches conducted by positivists are empirically tested. They conduct investigations using quantitative methods including surveys, experiments, correlational analysis and others. According to positivists, research should adhere to the scientific process of inquiry and rely on the creation and testing of hypotheses. Several hypothesized links are proposed in this study that will be evaluated and quantified. The quantitative technique, which also employs a deductive procedure, is mostly associated with the positivist approach (Bryman, 2008).

A variety of constructs concerning several tested theories and models were employed in the current investigation and are described in Chapter 2. Therefore, from an epistemological standpoint, this research is justifiable. To test hypotheses, structural equation modeling was used in this study. The positivist methodology is described by the statistical software used (Struab et al., 2005). This section covered the justifications for selecting the positivist paradigm for this study.

3.3 Study Area

The study was carried out in Ashanti Region at a senior high school in Atwima-Mponua District. The Atwima-Mponua district is one of 43 districts in the Ashanti Region of Ghana. Nyinahin serves as the district's capital. Its total area is 2411km^2 (931sqmi). According to the 2021 census, 155,254 people formed the population of the district. "MPonua" is the name for a collection of trees or a forest of trees. Atwima-Mponua is the westernmost district of the Ashanti Region. It was once a part of the Atwima District, which at the time was bigger, until President John Agyekum Kuffour ordered on November 12, 2003, that the district be divided into two to create the Atwima-Mponua district. On January 18, 2004, Atwima-Mponua and the remaining portion, known as Atwima Nwabiagya Municipal, were formally established. Ahafo Ano South West District (Mankranso), Bibiani/Anhwiaso/Bekwai Municipal, and Atwima Nwabiagya Municipal (Nkawie) are the three districts that share borders with Atwima-Mponua. Atwima-Mponua is bordered by the following forest zones: Offin shelter, the Asanayo, the Gyamera, and the Tano-Offinso forest reserves. Atwima-Mponua is commonly referred to as the "bauxite city" since the area has large amounts of bauxite. The value chain can satisfy the demands of the nation for more than 40 years. The Atwima-Mponua district has four second cycle institutions which are Otaakrom ICCESS, Adobewura Community Day SHS, Mpasatia Technical SHS and Nyinahin Catholic SHS.

3.4 Research Design

The research type was quantitative research approach. Quantitative approach helped to quantify by way of generating numerical data or data from the field and transform them into useable statistics. According to Omari (2011), research design refers to a distinct

plan on how a research problem will be attacked. Creswell, (2003) defined research design as the plan, structure and strategy of investigation conceived so as to obtain answers to research questions and hypotheses.

The study used a descriptive survey as its research design. A research design is said to be descriptive if the form of study from which the sample of people is given a questionnaire at a specific time to identify their attitudes, opinions, behaviors, perceptions, or attributes (Creswell, 2012). According to Creswell, survey researchers deploy questionnaires to collect measurable, numerical data, which they are formerly statistically analyze to characterize trends in answer to questions and evaluate study questions or hypotheses. The survey design was found adequate in terms of gathering data from a large group of respondents in a relatively short period of time, given the nature of the study.

The descriptive method of research is an information-gathering study that includes acceptable and accurate interpretation of data. It is a commonly regarded method in educational research.

3.5 Population

The target population of the sample is the large group of people, which shares at least some qualities for all intents and purpose on which the research study will be followed (Kothari 2004). A population, according to McMillan and Schumacher (2006), remains a group of essentials or cases, whether humans, objects, or events, that meet particular characteristics and to which we wish to generalize the research findings. All form one, two and three students in Nyinahin Catholic Senior High School in the Atwima-

Mponua District capital of Ashanti Region in Ghana constituted the population for the research work. The total number of these students were two thousand, nine hundred and thirty-three (2933).

3.6 Study Variables

Peer-assisted learning, students' mathematics learning motivation, students' self-efficacy, and students' mathematics achievement were the study's variables. In this study, mathematics achievement served as the dependent variable, while motivation and peer-assisted learning served as the independent factors. The mediator was students' self-efficacy.

3.7 Sample and Sampling Techniques

A sample, as described by Best and Kahn (1993), is a selection made from among all the populations for observation and study. The sample refers to a subset of target populations which the researcher plans to study to generalize the target population (Creswell, 2005). Avoke (2005) also mentioned that samples generally reflect a subset of the whole population of the researcher's interest. In research work, the growing need for a representative statistical sample has generated the need for an effective sample size determination process. 352 SHS one, two, and three students from Nyinahin Catholic Senior High School in Atwima-Mponua District capital were selected as sample size from the population, which was determined using a method derived from Miller and Brewer (2003).

$$n = \frac{N}{1 + N(\alpha^2)}$$

Where, n= sample size, N= population (2933) and α=significant level (0.05).

From the formula, we have;

$$n = \frac{2933}{1 + 2933(0.05^2)}$$

$$n = \frac{2933}{8.3325} = 351.995 \approx 352$$

Proportional stratified random sampling technique was used to find the sample for each form: SHS1=85 SHS2=145. SHS3=122.

Simple random sampling technique was employed for this study to select the sample size from each form

On the basis to avoid any bias, simple random sampling technique was employed for this study to select the sample size. In the students' survey, simple random sampling was used as it ensures that the sample is accurate through the random selection of all population elements. Simple random sampling ensures an equal chance of being selected for the study for every potential element of the population. It is the type that does not select individuals based on their abilities or background.

With the approval of the school administration and the subject instructors, questionnaires were delivered to the students randomly in their classrooms.

The questionnaires were disseminated personally and was then taken back by the researcher.

3.8 Research instruments

A questionnaire was utilized as the study tool to collect information on the responses of the students. They were simple to administer quickly, and respondents responded of their own free choice without being influenced by anybody else. Additionally, its outcomes were simple to tabulate and comprehend. The study's appendices contain the questionnaire that were employed. Questionnaire was adapted from Usher et al. (2009),

Prast et al. (2018), Zhou et al. (2016), and Thurston et al. (2020) for the four constructs: peer-assisted learning, motivation, self-efficacy and mathematics achievement.

The variables which were considered were peer-assisted learning, motivation, students' self-efficacy and mathematics achievement. The instrument consisted of two sections. The first section collected information about students' biographic data while the second section was made up of various questions that sought to reply to the research objectives. The instrument used contained forty (40) items closed- ended statements divided into four main sections based on the research variables. A 5-point Likert Scale was used (SA- Strongly Agree, 5: A- Agree, 4: N- Neutral, 3: D- Disagree, 2 and SD- Strongly Disagree, 1). The Likert scale has been determined to be one of the most effective tools for assessing attitudes and perceptions. This is because it allows respondents to rate how much they agree with a series of statements regarding how they feel about a topic (Webster et al., 2001).

3.9 Validity

The research measuring instrument was handed to research professionals for their review and suggestions in order to confirm the validity of the investigations. The reviewers shared their thoughts on any issues they observed with the items for the instruments that were used to collect the needed data. Following the expert opinion, the instruments were piloted before the research began.

3.10 Reliability

Cronbach's alpha coefficient was used in the reliability analysis. The consistency of the instruments in getting information from more than one respondent is referred to as reliability. The reliability coefficient was analyzed using the Cronbach's alpha

reliability test. According to De Veilis (1991), a reliability coefficient of 0.70 and above is considered as the minimum requirement for establishing the appropriateness of an instrument. After the pre- test exercise, the reliability coefficient was recorded as 0.879 and as stated by De Vellis, the items on the instrument for the data analysis threshold was very high to be used as a questionnaire for the data analysis.

3.11 Data Collection Procedure

Participation in this research work was purely voluntary. With the approval from the school administration and the subject instructors, the questionnaires were delivered to the students in their classrooms.

The questionnaires were disseminated personally and was then taken back by the researcher. A total of three hundred and fifty-two (352) questionnaires were distributed to students from the school. An introductory letter from the researchers' department was taken and sent to the school to seek for permission upon which the appropriate date and time were discussed with the school authorities. The researcher visited the participated school and when the permission was granted, the researcher administered the questionnaires personally and gave them to the students. Structured questionnaires containing close ended questions were administered to respondents. All the respondents were able to read and comprehend the questionnaire items and therefore completed the questionnaire independently.

3.12 Data Analysis Plan

To perform the analysis of this research work, exploratory factor analysis (EFA) was initially done using the principal component approach with varimax rotation. Confirmatory factor analysis (CFA) was then performed using the factors identified in the EFA to assess the stability and model fit indices of the constructs. Finally, a path

analysis was performed to look at how the factors interacted. Two reliability analyses: the composite reliability (CR) and the internal consistency reliability (Cronbach's alpha) were both estimated. Both values range from 0 to 1, with higher values denoting better reliable values. 0.7 and above is considered to be an acceptable range. Investigations were also done into convergent and discriminant validity. The average variance extracted (AVE) is used to verify convergent validity on the constructs. A construct is said to explain, on average, more than half of the variation of its indicators when the AVE value is at least 0.50 (Hair et al., 2017). Using IBM SPSS AMOS 23.0v, confirmatory factor analysis (CFA) was carried out. The Chi-square test, comparative fit index (CFI), Tucker-Lewis index (TLI), normed fit index (NFI), and root mean square error of approximation (RMSEA) were used to examine the goodness of fit indices of the model with the data. CFI, TLI, and NFI have a range of 0 to 1. At least 0.90 denotes a good model fit. RMSEA value ranges from 0 to 1, with lower values suggesting a better model fit. A good model fit of RMSEA ranges from 0.08 or below. (Kline, 2015). Additionally, the proposed paths were examined. According to the literature's findings and the correlation coefficients, the path model's parameters were determined. The same indicators used in the CFA analysis were used to examine the path analysis goodness of fit indices including CFI, TLI, NFI, RMSEA and other indicators (Hair et al., 2017).

3.13 Limitations

Like any research studies, the current study had certain limitations. The research's limitation to students in particular geographic area is cited as one of its shortcomings. To generalize the research findings, it is suggested that future research concentrate on other geographical areas. Although the current study used a descriptive survey to

examine the impacts of motivation, self-efficacy, and peer-assisted learning on students' achievement in mathematics, no attempt was made to apply a qualitative method to evaluate the results. Qualitative method should be used in future study to examine the variables for this research work. The self-reported measures employed in this study's instrument depended on the participants' capacity and desire to provide correct information. The responds may be determined by a person's social desirability. Prior studies, however, indicated that self-reported responses might not be accurate. (Blair & Burton, 1987).

3.14 Ethical Consideration

The researcher was mindful of research ethics and its ideals as they related to gathering the study's data and disseminating the results. This ensures that the reputation of research work is upheld (Omari, 2011). Before taking part in the study, each participant gave their consent to be included. With permission from the school administration, the study was carried out. In this study, participant confidentiality was guaranteed. The study's goal was made clear to the participants before participation and students were allowed to express their concerns they had. The respondents were promised an explanation to any potential hazards or discomforts associated with the research work. In order to protect the respondents' privacy and identity, respondents answered the questionnaire without writing their names on the paper.

CHAPTER FOUR

RESULTS AND DISCUSSION OF FINDINGS

4.1 Introduction

The results of the questionnaire are presented in this chapter. Tables and narratives are used to present the findings in relation to the study hypotheses. The discussion of the results then turns to what the literature has shown. The items included in this study were linked to students' motivation, self-efficacy, peer-assisted learning, and mathematical achievement. The demographic or background information for the respondents included in the research were analysed. The frequency and percentage of each demographic characteristic were determined using descriptive analysis, and then the level of data reliability was determined. The research items were then subjected to EFA analysis to ascertain how they were categorised according to factor loadings. The next step was to verify the proposed model using CFA and path analysis. This chapter discusses the findings.

4.2 Demographic Data

According to Table 1, there were 352 respondents in total. Out of these respondents, 197 were girls, which formed 56.0 percent and 155 boys, constituting 44.0 percent. 88 respondents or 25.0%, were between the ages of 13 and 16. 73.6 percent of the sample which is 259 respondents, were between the ages of 17 and 20. Five respondents or 1.4 percent, were 21 and above. Additionally, according to the descriptive data, there were 122 SHS3 students representing 34.7 percent, 145 SHS2 students forming 41.2 percent, and 85 SHS1 students constituting 24.1 percent.

Table 1: Demographic Data

Background	Frequency (N)	Percentages (%)
Gender		
Male	155	44
Female	197	56
Age		
13-16	88	25
17-20	259	73.6
21 and above	5	1.4
Class		
Form 1	85	24.1
Form 2	145	41.2
Form 3	122	34.7

Note: n= 352

Source: *Field survey, 2022*

4.3 Exploratory Factor Analysis

EFA may be viewed as a strategy with the objective of addressing the connected factors. EFA is a variable reduction approach that distinguishes between latent variables where some factors are retained and others are taken off (Surh, 2005). EFA is used to study the type of factors that may be responsible for the collection of variables being analyzed, as stated by Child (2006). To assess the assumptions for the linked factors in the underlying arrangement, a KMO measure of sample adequacy and a Bartlett's test of sphericity were used. The accepted factoring value is 0.5 and above. The KMO measure of sampling adequacy is 0.848, which is significantly higher. According to Hair et al. (2017), this is a good value, demonstrating that there is a close connection between the elements. With a substantial Chi-square value of 3929.073 and 105 levels of degree of freedom, Bartlett's sphericity test was performed. The Bartlett's test value was significant. Four factors were recovered as a result of the factor analysis, which

was done in the order specified in the questionnaire. Four components in all were retrieved and rotated. Total variance explained was 78.478 percent which was an acceptable value. The rotational varimax technique was used because it can boost the average yield while reducing the number of factor loadings.

To determine whether a factor should be kept or removed, its values were examined which should be more than 0.5. Iteratively, low item values were removed, and each time one was removed, the fit indices were examined. Table 2 listed the remaining items.

Table 2: Exploratory Factor Analysis

Measurement Items	Component			
	1	2	3	4
MTV1	0.917			
MTV2	0.912			
MTV3	0.917			
MTV4	0.934			
MTV5	0.912			
PAL1		0.945		
PAL2		0.935		
PAL3		0.919		
SE1			0.788	
SE2			0.815	
SE3			0.812	
SE4			0.744	
MA1				0.779
MA2				0.862
MA3				0.866

Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO)	0.848	Determinant	1.139E-5
Bartlett's Test of Sphericity Approx. Chi-Square	3929.073	df	105
Total Variance Explained	78.478	Sig.	.000

PAL: Peer-assisted learning; SE: Students' self-efficacy; MTV: Motivation; MA: Mathematics achievement

Source: *Field Survey, 2022*

4.4 Reliability Analysis

To determine the internal consistency of the instrument, a reliability test is crucial. In terms of an instrument's measuring scale, reliability refers to the accuracy and firmness of the points or markings, or the scale's internal consistency (Kimberlin & Winterstein, 2008). According to Sekaran and Bougie (1992), reliability increases in direct proportion to the alpha value. Furthermore, Tavakol and Dennick (2011) claimed that item elimination should take place because the alpha values were low due to a poor relationship between the items. In order to evaluate the internal consistency of the observed variables, Cronbach's alpha (CA) was also used. The EFA's retained components were used to compute the Cronbach alpha values in SPSS (v.23). When the CA score is at least 0.7, the reliability of the observed variables is stated to have been reached. It was possible to determine from the analysis in Table 3 that all latent variables had CAs greater than 0.7, a sign that internal consistency had been attained. Peer-Assisted Mathematics Learning had a CA value of 0.948, Students' Self-Efficacy had a CA score of 0.806, and Mathematics Achievement likewise had an alpha score of 0.801. Mathematical Learning Motivation had a CA score of 0.960.

Table 3: Reliability Analysis

CONSTRUCTS	NUMBER OF ITEMS	ALPHA COEFFICIENT
Peer Assisted Learning (PAL)	3	0.948
Motivation (MTV)	5	0.960
Self-Efficacy (SE)	4	0.806
Mathematics Achievement (MA)	3	0.801

Source: *Field Survey, 2022*

4.5 Test of Normality

Here, the researcher examined the mean scores and standard deviation for the item-by-item descriptive statistics. All of the evaluation criteria were scored on a scale of 1 to 5 with 1 being the strongly disagree and 5, strongly agree. Table 4 findings showed that respondents rated the measurement items positively, with a mean score of more than three for each item (midpoint). The skewness and kurtosis statistics were computed to assess the data's normalcy. Given that the resulting skewness and kurtosis indices are well within the accepted criteria of less than |4| and less than |8| respectively, the findings showed that the distribution of scores on each item is suitably normal (Kline, 2011).

Table 4: Test of normality

	N	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
PAL1	352	3.7500	1.55982	-0.888	0.130	-0.810	0.259
PAL2	352	3.6080	1.58869	-0.672	0.130	-1.150	0.259
PAL3	352	3.6392	1.58625	-0.746	0.130	-1.067	0.259
SE1	352	3.8068	1.23674	-0.846	0.130	-0.263	0.259
SE2	352	3.8722	1.16849	-0.859	0.130	-0.058	0.259
SE3	352	3.9148	1.23971	-0.992	0.130	-0.045	0.259
SE4	352	3.9432	1.23674	-1.028	0.130	0.038	0.259
MTV1	352	4.5426	1.01184	-2.573	0.130	5.912	0.259
MTV2	352	4.5994	0.96154	-2.799	0.130	7.268	0.259
MTV3	352	4.5426	1.02025	-2.488	0.130	5.400	0.259
MTV4	352	4.5284	1.00952	-2.476	0.130	5.491	0.259
MTV5	352	4.4631	1.08015	-2.244	0.130	4.191	0.259
MA1	352	3.3892	1.40581	-0.301	0.130	-1.228	0.259
MA2	352	3.5199	1.38763	-0.472	0.130	-1.083	0.259
MA3	352	3.2187	1.51738	-0.104	0.130	-1.480	0.259
Valid N (listwise	352						

Source: *Field Survey, 2022*

4.6 Confirmatory Factor Analysis

CFA allow researchers to test the hypothesis on whether there is a relationship between the elements studied, as stated by Yong and Pearce (2013). The goal of CFA is to test a hypothesis, and once it has been proven, the variables are identified using an analysis diagram. The CFA was persuaded to further work on the factors adopted at the EFA. 352 samples were used to acquire the data, and AMOS 23.0v was used to assess four measurement model components. To enhance the model, a few changes were done. The removal of low factor loadings was one of the modifications. CMIN/DF should be less than 3, CFI and TLI should be at least 0.9, RMR and RMSEA should be less than 0.08, and P-close should also be larger than 0.05, according to Hair et al. (2010). CFI and TLI indicate incremental fit indices, by evaluating how well the hypothesized model matches the baseline model, whereas RMR and RMSEA represent absolute fit indices, by measuring the departure of a hypothesized model from a perfect model. CMIN assesses the smallest disagreement in the model (Xia & Yang, 2019). With continuous data, normal-theory maximum likelihood is used to determine the cutoff values for both CFI and TLI. P-close is greater than 0.05 and is acceptable.

All of these were accomplished as shown in Table 5. The general model showed that the relevant index value was p=0.000, CMIN= 126.086 with 82 degrees of freedom after the modifications. CMIN/DF is 1.538, p-close is 0.579, TLI is 0.985, and RMR is 0.062. The CFI generated a value of 0.989, which was more than 0.90, demonstrating the validity of the model and the high degree of agreement between the model and the data. The GFI's subsequent value of 0.956 indicates that the final model is appropriate. Additionally, this study's RMSEA was 0.039, which is below the permitted level of 0.08 for RMSEA. This demonstrated that the core component of the four constructs is

legitimate and acceptable. The 4-factor model fits correlate well, according to the fit indices. To evaluate the convergent validity of the observed variables, the Average Variance Extracted (AVE) was determined. The new scale's convergent validity is evaluated based on how well the measurement items correlate with those on the same concept (Trochim & Donnelly, 2001). According to the Fornell and Larcker (1981), convergent validity was attained among the observed variables if the least of AVE was at least 0.5 and the least of composite reliability (CR) was at least 0.7. The findings show that the least AVE (SELF-EFFICACY) was 0.625, and the least CR (SELF-EFFICACY) was 0.869, indicating that the study's convergence validity was reached.

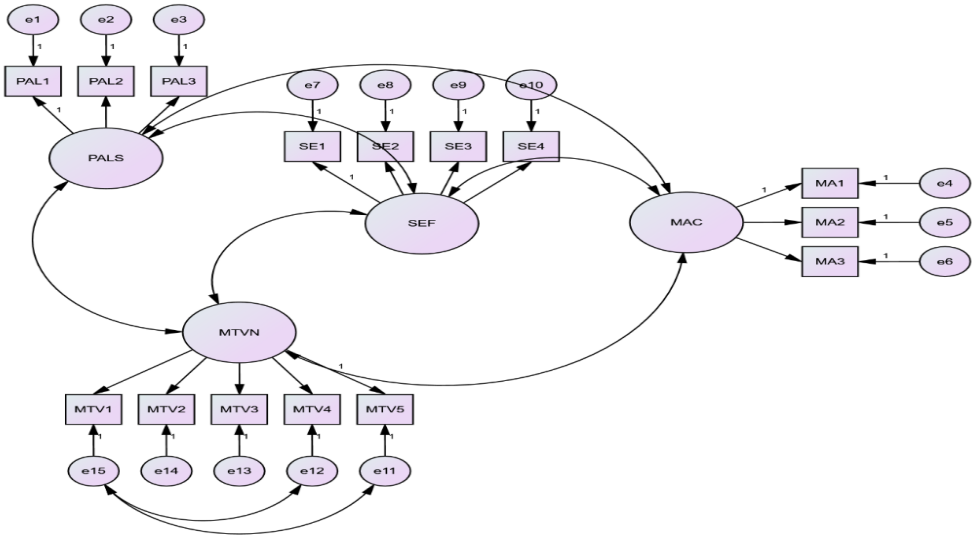

Figure 2: CFA Model

Table 5: Confirmatory Factor Analysis

Model Fit Indices: RMSEA=0.039 TL1=0.985 CFI= 0.989 GFI= 956 CM1N= 126.086 DF= 82 CMIN/DF= 1.538 PCLOSE= 0.579 RMR= 0.062	**Std. Factor Loading**
Peer-Assisted Learning **AVE= 0.871 CA= 0.948 CR= 0.953**	
Classmates make me feel comfortable and at ease	0.944
Classmates show genuine interest and concern	0.927
Peers listen carefully to what I say	0.909
Motivation **AVE= 0.844 CA= 0.960 CR= 0.964**	
My biggest wish is to understand the content of the learning material used in the math class.	0.901
Learning math can improve my thinking logics.	0.902
I hope I can get higher grade in math than any other classmates.	0.945
I want to get higher scores in math class, because I want to demonstrate my capability to my classmates.	0.888
I want to get other people's recognition so I want higher scores in math class.	0.892
Self-Efficacy **AVE= 0.625 CA= 0.806 CR= 0.869**	
I am certain I can understand the ideas taught in the mathematics course.	0.737
I feel confident when taking a mathematics test.	0.731
I am sure I am the kind of person who is good at mathematics.	0.759
SE4: I feel confident enough to ask questions in my mathematics class.	0.633
Mathematics Achievement **AVE= 0.700 CA= 0.801 CR= 0.875**	
Mathematics is more difficult for me than for many of my classmates.	0.706
Mathematics is not one of my strengths.	0.777
Mathematics is boring.	0.795

MFI: Model Fit Indices **CFI:** Comparative Fit Index **CMIN/DF:** Chi-Square/Degree of Freedom **RMR:** Root Mean Square Residual **RMSEA:** Root Mean Square Error of Approximation **TLI:** Tucker-Lewis Index **AVE:** Average Variance Extracted **CR:** Composite Reliability **CA:** Cronbach's Alpha **GFI**: Good of fit index.

Source: *Field Survey, 2022*

4.7 Path Analysis

A multiple regression extension is path analysis. Path analysis goes beyond regression because it enables the examination of more complex models. The impact of numerous dependent and independent variables on one another may be examined using path analysis (Strainer, 2005). Models are tested using a process called path analysis. Exogenous and endogenous variables are the two categories used to classify the variables in path analysis. Exogenous variables are those in path analysis which causes

effect on endogenous variables. Straight arrows point away from exogenous variables. Straight arrows normally point towards the direction of endogenous variables. To examine the mediating and moderating impacts on variables, path analysis is often performed. Typically, path analysis is carried out with the aid of a software known as the Analysis of Moment Structure (AMOS).

Path analysis approach, determines how much of a link between two factors based on theoretically stated causal influence of one component on the other (Appiah et. al.,2022). Table 6 shows that the path analysis Chi-square value is 126.086 which reflects the model's quality of fit. Additionally, the NFI and TLI fit indices were above 0.9, indicating a very high model fits to the 4-factor model, and the RMSEA of 0.039 indicates an excellent fit model for an absolute fit index with a 95 percent confidence interval.

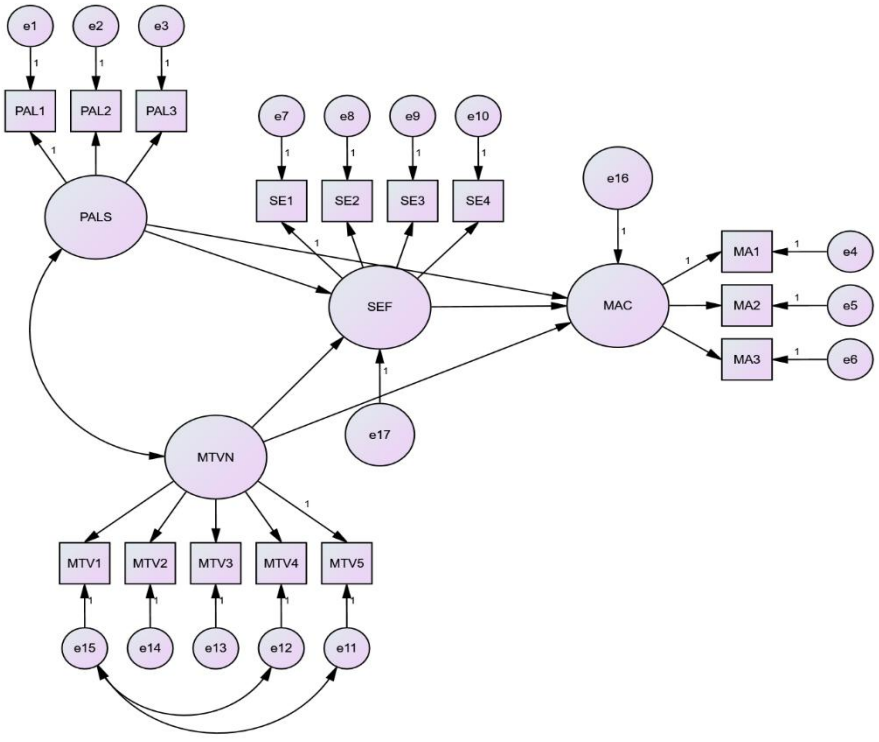

Figure 3: Structural Paths

Table 6: Path Summary

Direct and indirect				
Direct paths	Unstd. estimate	Std. error	CR	P-value
PAL→MAC	0.187	0.043	4.374	***
MTV→MAC	0.073	0.065	1.115	0.265
SEF→MAC	0.023	0.072	0.319	0.750
PAL→SEF	0.057	0.038	1.501	0.133
MTV→SEF	0.248	0.060	4.158	***
PAL→MTV	0.167	0.036	4.695	***
Indirect paths	Unstd. estimate	Lower BC	Upper BC	
PAL→SEF→MAC	0.013	-0.011	0.041	
MTV→SEF→MAC	0.006	-0.028	0.052	

Model fit indices: CMIN=126.086 DF=82 CMIN/DF=1.538 CFI=0.989 LI=0.985 RMR=0.063 RMSEA=0.039 p-close=0.910 GFI=0.956 Bias-corrected (BC) percentile method; 2,000 Bootstrap samples; 95% Confidence level ***p-value significant at 1% (0.01)

Source: *Field Survey, 2022*

4.8 Hypotheses Testing

Amos (v.23) was used to do the structural equation modeling (SEM) in order to evaluate the study hypotheses. 95 percent confidence level and 2,000 bootstrap samples were utilized in the Bias-Corrected (BC) percentile technique of bootstrapping. The structural model indices shown in Table 6 fulfilled the different accepted model fit indices suggested by (Hair et al.,2010). The structural paths for the investigation are also shown in diagrammatic form in Figure 3.

4.8.1 Peer-assisted learning significantly predicts mathematics achievement

Table 7: Hypothesis 1

Direct paths	Unstd. estimate	Std. error	CR	P-VALUE
PAL→MAC	0.187	0.043	4.374	***

Source: *Field Survey, 2022*

Results from the path analysis show that peer-assisted learning had a direct positive effect on mathematics achievement (β= 0.187; C. R. = 4.374). The path coefficient is 0.187 which forms 18.7%. It is then concluded that when studentss are taught by their peers, their mathematics achievement increases. Thus, the null hypothesis, H_0 which states that peer-assisted learning will not significantly predict mathematics achievement is rejected and the alternative hypothesis H_1 which suggest that peer-assisted learning will significantly predict mathematics achievement is accepted.

4.8.2 Peer-assisted learning significantly have direct effect on motivation

Table 8: Hypothesis 2

Direct paths	Unstd. estimate	Std. error	CR	P-VALUE
PAL→MTV	0.167	0.036	4.695	***

Source: *Field Survey, 2022*

Motivation was directly and significantly positively impacted by peer-assisted learning (β= 0.167; C. R. = 4.695). The path coefficient is 0.167 which forms 16.7%. It is then concluded that when students are taught by their peers, their mathematics learning motivation increases. Thus, the null hypothesis, H_0 which states that peer-assisted learning will not significantly have direct effect on motivation is rejected and the alternative hypothesis H_1 which suggest that peer-assisted learning will significantly have direct effect on motivation is accepted.

4.8.3 Motivation significantly predicts mathematics achievement.

Table 9: Hypothesis 3

Direct paths	Unstd. estimate	Std. error	CR	P-VALUE
MTV→MAC	0.073	0.065	1.115	0.265

Source: *Field Survey, 2022*

Motivation had positive but statistically insignificant effect on mathematics achievement (β= 0.073; C. R. = 1.115). The path coefficient is 0.073. Thus, the null hypothesis, H_0 which states that motivation will not significantly predict mathematics achievement is accepted and the alternative hypothesis H_1 which suggest that motivation will significantly predict mathematics achievement is rejected.

4.8.4 Self-efficacy mediates the relationship between peer-assisted learning and mathematics achievement.

Table 10: Hypothesis 4

Indirect paths	Unstd. estimate	Lower BC	Upper BC
PAL→SEF→MAC	0.013	-0.011	0.041

Source: *Field Survey, 2022*

Students' self-efficacy did not mediate the relationship between peer-assisted assisted learning and mathematics achievement (PAL→SEF→MAC). The path coefficient was 0.013 which is statistically insignificant. Therefore, the null hypothesis, H_0 which states that Self-efficacy will not mediate the relationship between Peer-assisted learning and mathematics achievement is accepted and the alternative hypothesis H_1 which suggest that Self-efficacy will mediate the relationship between peer-assisted learning and mathematics achievement is rejected.

4.8.5 Self-efficacy mediates the relationship between motivation and mathematics achievement.

Table 11: Hypothesis 5

Indirect paths	Unstd. estimate	Lower BC	Upper BC
MTV→SEF→MAC	0.006	-0.028	0.052

Source: *Field Survey, 2022*

Students' self-efficacy did not mediate the relationship between motivation and mathematics achievement (MTV→SEF→MAC). The path coefficient was 0.006 which is statistically insignificant. Therefore, the null hypothesis, H_0 which states that Self-efficacy will not mediate the relationship between motivation and mathematics achievement is accepted and the alternative hypothesis H_1 which suggest that Self-efficacy will mediate the relationship between motivation and mathematics achievement is rejected.

4.9 Discussion

This section discusses the results of the study and the interpretation with respect to analysis of previous studies. The discussion was organized under the objectives of the study as:

1. The effect of peer-assisted learning on mathematics achievement.
2. The effect of peer-assisted learning on motivation.
3. The effect of motivation on mathematics achievement.
4. The mediating role of self-efficacy of the relationship between peer-assisted learning and mathematics achievement.
5. The mediating role of self-efficacy of the relationship between motivation and mathematics achievement.

4.9.1 The effect of Peer-Assisted Learning on Mathematics Achievement

Peer-assisted learning is very efficient in enhancing students' understanding in mathematics because students perform much better and enables them to work together (Bozzi et al. 2021). According to research by Ganesh (2021), peer-assisted learning increases students' ability to share ideas with their peers that they are unable to share

with teachers. When a student helps another student demonstrate what they've learned, their self-confidence increase (Mazurek et al. 2021). Mathematics achievement is influenced by a peer tutor's capacity to provide instructions on time, cope with peers' challenges with mathematics learning, and present error-free material (Nez-Andrés et al. 2021). Thurston et al., (2020) evaluated how social interactions affected mathematics achievements in primary school while employing peer-assisted learning. They discovered that students' performance in mathematics was significantly influenced by their perceptions and trust in tutoring partner. Alegre et al. (2019) discovered that peer-assisted learning is a strong predictor of success in mathematics at the secondary education level.

These past researches made it clear that peer-assisted learning significantly influence mathematics achievement. Results from the path analysis for this current research show that peer-assisted learning had a direct positive effect on mathematics achievement. The results show that when students are taught by their peers, their mathematics achievement increases. This result supports the existing literature findings.

4.9.2 The effect of Peer-Assisted Learning on Motivation

Peer-assisted learning, which has the ability to raise learners' motivation, is an approach identified by Heyd-Metzuyanim and Graven (2016) to address low mathematics performance. According to Milman & Wessmiller (2016), some students find it difficult to pay attention in math class or think math is useless. Others may lack confidence in their capacity to participate in mathematics or may not be happy with the level of instructor feedback. If peer tutors understand their role in encouraging students to study mathematics, they may be able to help instructors and students overcome these issues.

Peer-assisted learning might inspire students to pay more attention to the assignment, which in turn increases their motivation to finish the job (Kim et al., 2015). Hernandez-Martinez and Vos (2018) claim that many students are discouraged and think that math is not important to their lives or their future pursuits. However, when peer tutors show how the learner's potential accomplishments are applicable to the future, they may help the learner imagine what the future could contain and motivate them to pursue mathematics. All these past research findings suggest that peer-assisted learning has statistically significant effect on students' mathematics learning motivation. The literature already in existence is supported by this current study's result which confirmed that peer-assisted learning has direct significant effect on motivation.

4.9.3 The effect of Motivation on Mathematics Achievement

Motivation is one of the key components of students to achieve high results in mathematics according to educational experts (Arthur et al. 2022). Extrinsic motivation's effects on academic accomplishment have been investigated, and it has been found that students who are driven in this way are more likely to succeed academically (Howard et al. 2021). The teachers' external motivation to students is arguably very significant factor in mathematics achievement, and there are a number of strategies teachers can employ to motivate their students, including rewards for excellent performance and educational excursions that can boost mathematics achievement (Law et al. 2019). According to Garca et al. (2016), the influence of motivation on mathematical performance at elementary levels is statistically significant. Habók et al. (2020) examined the impact of motivation on mathematics performance, and the findings showed a significantly favorable effect. Bringula et al. (2017) also examined how children in grade 7 performed well in mathematics in

relation to their motivation to learn the subject. Also, they discovered that these students' mathematics performance was substantially predicted by motivation. Among other things, Froiland and Davison (2016) reported that ninth-grade mathematics students' intrinsic motivation had a significant impact on their eleventh-grade mathematics performance. This current study reported that mathematics learning motivation has a direct but statistically insignificant influence on mathematics achievement. This current study failed to confirm the results of the past research findings which state that motivation has statistically significant effect on mathematics achievement. This may be occurred due to the methodology employed in this research work.

4.9.4 The Mediating role of Self-Efficacy on the relationship between Peer-Assisted Learning and Mathematics Achievement

Froiland and Davison (2016) discovered that students' mathematics motivation mediates the relationship between peer-assisted learning and performance in mathematic. Li et al. (2020) examined how self-efficacy mediates the link between peer-assisted learning and motivation. According to Arthur et al. (2021), mathematics interest mediates peer-assisted learning and mathematics achievement and also mediates motivation and mathematics achievement. This research sought to test the mediating role of students' self-efficacy between the relationship of peer-assisted learning and mathematics achievement. According to the results of this study, Students' self-efficacy did not mediate the relationship between peer-assisted learning and mathematics achievement even though existing reports state that peer-assisted learning influence students' self-efficacy and students' self-efficacy also influence mathematics achievement.

4.9.5 The Mediating role of Self-Efficacy of the relationship between Motivation and Mathematics Achievement.

Li et al. (2020) examined how self-efficacy mediates the relationship between peer-assisted learning and motivation. Froiland and Davison (2016) discovered that students' mathematics motivation mediates the relationship between peer-assisted learning and performance in mathematic. According to Arthur et al. (2021), mathematics interest mediates peer-assisted learning and mathematics achievement and also mediates motivation and mathematics achievement. This research sought to test the mediating role of students' self-efficacy between motivation and mathematics achievement. According to the results of this study, Students' self-efficacy did not mediate the relationship between motivation and mathematics achievement even though existing reports state that motivation influences students' self-efficacy and students' self-efficacy also influences mathematics achievement.

4.10 Summary of Chapter

The analysis of the field data was addressed in this study's chapter. The conclusions as they were provided were based on the objectives of the study; as a result, they were done in accordance with the research hypotheses that the study aimed to address. The quantitative data was statistically examined by the researcher, and structural equation modeling was used to display the findings.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents a summary of the study, the conclusions drawn, and the recommendations suggested.

5.2 Summary

The study was conducted with a focus on the variables that affect senior high school students' mathematics achievement. The senior high school in the Atwima-Mponua district capital participated in the research. Participants in the research were from 352 form one, two and three students. The study specifically looked at these specific objectives:

1. To determine the effect of peer-assisted learning on mathematics achievement.
2. To determine the effect of peer-assisted learning on motivation.
3. To determine the effect of motivation on mathematics achievement.
4. To determine the mediating role of self-efficacy of the relationship between peer-assisted learning and mathematics achievement.
5. To determine the mediating role of self-efficacy of the relationship between motivation and mathematics achievement.

Students responded to the survey by simple random sampling procedure. Exploratory factor analysis (EFA), Confirmatory factor analysis (CFA) and Path analysis were performed to analyze the data. According to the research, peer-assisted learning had statistically significant impact on mathematics achievement. Peer-assisted learning also had direct effect on motivation. Motivation had direct but insignificant effect on mathematics achievement. The study's findings showed that students' self-efficacy had

no mediating impact between peer-assisted learning and math achievement and also had no mediating effect between motivation and mathematics achievement.

It was revealed in this study that, peer-assisted learning positively increased students' mathematics learning motivation and also their achievement in mathematics.

5.3 Conclusion

The purpose of the study was to determine whether mathematics achievement could be significantly predicted by peer-assisted learning and motivation, and the mediating role of students' self-efficacy between peer-assisted learning and mathematics achievement and also between motivation and mathematics achievement among senior high school students. To address the study hypotheses, a structural equation model which comprises with exploratory, confirmatory, and path analyses were performed.

According to the research, it was concluded that peer-assisted learning had statistically significant impact on mathematics achievement.

Peer-assisted learning also had direct effect on motivation. Motivation had direct but insignificant effect on mathematics achievement.

The study's findings showed that students' self-efficacy had no mediating impact between peer-assisted learning and math achievement and also had no mediating effect between motivation and mathematics achievement.

According to the results of the study, it was concluded that teachers should encourage peer-assisted learning in schools since it increases students' motivation and mathematics achievement.

5.4 Recommendations

The findings of the study suggest the following recommendations:

1. Mathematics teachers are to encourage students on peer-assisted learning to promote mathematics achievement since the findings from the study showed that peer-assisted learning significantly influences mathematics achievement.
2. It is recommended that mathematics teachers are to empower students on using peer-assisted learning to improve their mathematics learning motivation since the findings from the study showed that peer-assisted learning significantly influences motivation.
3. Senior High Schools' authorities are encouraged to organize in-service training for teachers on how to implement peer-assisted learning to help them in studying mathematics.
4. A replication of this study would be beneficial in re-examining the validity of its results. The influence of peer-assisted learning, motivation, and student self-efficacy on students' mathematics achievement in senior high schools would be validated by more empirical investigations employing bigger sample sizes from diverse and more geographically diverse locations.

5.5 Suggestion for Further Studies

1. It was suggested that since this study was conducted at the senior high level, comparable research be done at the basic and tertiary levels.
2. It was further suggested that qualitative research should be used to carry out this current research work in future for more reliable outcomes.

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APPENDIX

QUESTIONNAIRE FOR STUDENTS

This questionnaire seeks to find out about the relational role of peer-assisted learning, self-efficacy and motivation in predicting mathematics achievement among students. The responses you provide would contribute to improve performances in the study of mathematics. There is no right or wrong answer. The information you provide is solely for academic purposes and your anonymity will be in ultimate confidentiality.

Demographic Data

Gender: Male [ ] female [ ]

Age: 13 – 16years [ ] 17 – 20years [ ] 21 years and above [ ]

Class: Form 1 [ ] Form 2 [ ] Form 3 [ ]

others…….(specify)

QUESTIONNAIRE FOR SURVEYING PEER-ASSISTED LEARNING IN MATHEMATICS

Please tick [√] where appropriate in the spaces provided

SD-strongly disagree **D**-disagree **N**-neutral **A**-agree **SA**-strongly agree

SN	STATEMENT	SD	D	N	A	SA
1	Mathematics becomes easy when taught by my classmates					
2	Mathematics is theoretical and complex to be taught by my classmates					
3	Small group discussion improves my understanding of mathematics					
4	I seek assistance from my classmates when unable to solve a mathematics problem					
5	My interest increases when a fellow student solves a mathematics problem on the board					
6	After PALS session, I have more confidence in my ability to retain the knowledge					
7	After PALS session, I feel prepared to succeed in mathematics lesson					
8	Classmates make me feel comfortable and at ease					
9	Classmates show genuine interest and concern					
10	Peers listen carefully to what I say					

QUESTIONNAIRE FOR SURVEYING STUDENTS' SELF-EFFICACY IN MATHEMATICS

Please tick [√] where appropriate in the spaces provided

SD-strongly disagree **D**-disagree **N**-neutral **A**-agree **SA**-strongly agree

SN	STATEMENT	SD	D	N	A	SA
1	I am certain I can understand the ideas taught in the mathematics course.					
2	I expect to do well in the mathematics class.					
3	I am sure I can do an excellent job on the problems and tasks assigned in the mathematics class.					
4	I think I will receive a good grade in the mathematics subject.					
5	I know that I will be able to learn the material presented in the class.					
6	I feel confident when taking a mathematics test.					
7	I feel confident when using mathematics outside school.					
8	I am sure I will be able to do well in future mathematics courses.					
9	I am sure I am the kind of person who is good at mathematics.					
10	I feel confident enough to ask questions in my mathematics class.					

QUESTIONNAIRE FOR SURVEYING STUDENTS' MOTIVATION IN MATHEMATICS

Please tick [√] where appropriate in the spaces provided

SD-strongly disagree **D**-disagree **N**-neutral **A**- agree **SA**-strongly agree

SN	STATEMENT	SD	D	N	A	SA
1	In math class, I would like to have some challenging materials and they will make me learn more.					
2	I would like to have curiosity-initials materials in math class even they are quite difficult.					
3	My biggest wish is to understand the content of the learning material used in the math class.					
4	In math class, I would like to have more projects and homework, which will help me learn more, even though these will not improve my scores.					
5	Learning math can improve my thinking logics.					
6	My most wanting is to get best grades in math class.					
7	I hope I can get higher grade in math than any other classmates.					
8	I want to get higher scores in math class, because I want to demonstrate my capability to my classmates.					
9	My best wish is to attend ideal university via learning math.					
10	I want to get other people's recognition so I want higher scores in math class.					

QUESTIONNAIRE FOR SURVEYING STUDENTS' ACHIEVEMENT IN MATHEMATICS.

Please tick [√] where appropriate in the spaces provided

SD-strongly disagree **D**-disagree **N**-neutral **A**-agree **SA**-strongly agree

SN	STATEMENT	SD	D	N	A	SA
1	I usually do well in mathematics.					
2	I would like to take more mathematics in school.					
3	Mathematics is more difficult for me than for many of my classmates.					
4	I enjoy learning mathematics.					
5	Mathematics is not one of my strengths.					
6	I learn things quickly in mathematics.					
7	Mathematics is boring.					
8	I like mathematics.					
9	I think learning mathematics will help me in my daily life.					
10	I need to do well in mathematics to get the job I want.					