UNIVERSITY OF EDUCATION, WINNEBA

INFLUENCE OF TEACHER RELATED FACTORS ON STUDENTS' MATHEMATICS ACHIEVEMENT. A CASE OF ATWIMA-KWANWOMA DISTRICT

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A thesis submitted to the school of graduate studies in partial fulfilment of the requirement for the award of the degree of Master of Philosophy (Mathematics Education)

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DECLARATION

STUDENT'S DECLARATION

I, **Richard Agyei**, 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 in part or whole, for another degree elsewhere.

SIGNATURE:…….

DATE:…….

SUPERVISOR'S DECLARATION

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

SUPERVISOR : DR. GLORIA ARMAH

SIGNATURE:…….

DATE:……..

DEDICATION

I wholeheartedly dedicate this work to my wife Dorothy and my children, Agyeiwaa-Kordieh, Abigail and Cephas for being there for me. You have been patient and understanding when I was unavoidably absent from home when you most needed my attention. I appreciate your immeasurable contributions to my life

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ABSTRACT

The aim of the study was to assess the influence of teacher related factors on students' mathematics achievement. A case of Akwima Kwanwoma District senior high schools. Thus, the study examined the effect or the connection between the teacher factors such as teacher experience, teacher motivation, teacher-student interaction and his attitude on student's mathematics achievement. The study consisted of 1600 form two students from three senior high schools in the district. A convenience sample technique was used to select the sample. The sample for the study was 160 consisting of one hundred and fourteen girls and forty-six boys. The triangulation mixed methods approach was used. The quantitative data from semi-structured questionnaire and focus group discussion scheduled were used for data collection. Quantitative data were coded and input into the SPSS (version 23) and AMOS (version 23) software packages. The structural equation model (SEM) was then used to assess the quantitative data. The analysis of the gathered data was done to identify the key characteristics and relationships between the data in order to generalize and predict the results. However, qualitative data from the focus group discussion conducted were analysed thematically. The finding of the study showed that, teachers have significant influence on students' mathematics achievement in schools due to its numerous advantages in the environment. Because they enjoyed great teacher motivation, have experience teachers, good teacher-student interaction, it was quite explicit per the discussions as was gathered and analysed from the interviews that, the influence of peers or colleagues on achievement was substantial.

CHAPTER ONE

INTRODUCTION

1.0 Overview

This chapter discusses the background of the study, statement of the problem, objectives of the study, research questions, and the purpose of the study, significant of the study. Operational definitions and organization of the study are also discussed.

1.1 Background

Mathematics, like any other compulsory and examinable subject offered at both the primary and secondary school levels in Ghana, plays a significant role in shaping how individuals manage different aspects of personal, social, and civic life (Anthony & Walshaw, 2009). The Government of Ghana recognizes the importance of mathematics and science education in attaining the Millennium Development Goals (MDGs) and realizing Vision 2030, which aims to equip the nation with the necessary human resource base for technological and industrial advancement. This recognition is evident through the Ministry of Education's deliberate efforts to improve student performance in mathematics at both the basic and senior high school levels through the implementation of various educational reforms and support policies. Despite these initiatives, which include the provision of textbooks, free education, improved facilities, and other essential learning materials, low achievement in mathematics has continued to persist across many schools. This consistent underperformance has raised major concerns among educational stakeholders, suggesting that there may be additional underlying factors influencing students' outcomes that require deeper investigation (Ministry of Education, 2021).

The performance of Ghanaian students in the West African Senior School Certificate Examination (WASSCE) has shown fluctuations and, in many cases, persistent low achievement in mathematics over the years (West African Examinations Council [WAEC], 2021). Reports from the Ghanaian media have highlighted the issue as a matter of national concern, emphasizing that this pattern is evident across many districts, including mine (Boateng, 2020). Considering the importance of mathematics to both individual and national development, prolonged underperformance could have long-term negative consequences for the country's future progress. Poor achievement in mathematics limits students' access to diverse career opportunities and makes it more difficult for them to grasp and excel in other academic subjects, given that mathematical reasoning supports understanding across the curriculum (Obilor, 2020). Consequently, consistent failure in mathematics undermines the country's broader educational and developmental goals.

Although many educational reforms in Ghana have focused on curriculum design, learning materials, and instructional strategies, there is growing recognition that these measures alone are insufficient to improve mathematics achievement. Researchers have observed that the teacher's influence, attitude, and instructional behavior have a significant impact on student motivation and learning outcomes (Akinsola & Olowojaiye, 2008). While effective instructional design is crucial, it cannot independently guarantee academic success. To achieve meaningful improvement in mathematics learning and bridge the gap between educational objectives and student performance, instructional designers and policymakers must consider affective variables such as students' motivation, self-efficacy, and attitudes, which play a critical role in shaping their engagement and achievement (Bandura, 1986; Syyeda, 2016).

1.2 Statement of the Problem

Despite numerous interventions by the Government of Ghana and the Ministry of Education aimed at improving students' achievement in mathematics, persistent low performance continues to characterize the results of many secondary schools, including those within the Atwima-Kwanwoma District. Reports from the West African Examinations Council (WAEC) and district-level performance analyses consistently reveal that a significant number of students fail to attain the minimum grade required for tertiary education in mathematics. This situation raises serious concerns about the quality and effectiveness of mathematics teaching and learning within the district.

While national studies have examined broad causes of poor mathematics performance, much less attention has been given to teacher-related factors that may influence students' achievement at the local level. Factors such as teacher motivation, teaching experience, teacher-student interaction, and teachers' attitudes toward mathematics and their learners have been identified in research as critical determinants of students' academic success. However, how these factors jointly and specifically affect mathematics achievement within the Atwima-Kwanwoma District remains underexplored.

Table 1.1, which summarizes the 2021 and 2022 mathematics results of Atwima-Kwanwoma Senior High, demonstrates consistently low pass rates, with a majority of students unable to meet the required C6 benchmark for progression to tertiary education. This suggests that the problem may not lie solely in curriculum content or resource availability but rather in the human factors associated with teaching and learning.

Therefore, this study seeks to fill this empirical and contextual gap by investigating how teacher-related factors, particularly teacher motivation, experience, attitude, and teacher-student interaction—affect students' mathematics achievement in the Atwima-Kwanwoma District. The findings are expected to contribute to local educational policy and practice by providing evidence-based insights into improving mathematics outcomes in the district's senior high schools.

Table 1.1: The 2021 and 2022 results analysis for mathematics in Atwima-Kwanwoma Senior High, Trede

Grade / Year		A1	B2	B3	C4	C5	C6	D7	E8	F9	Total
2021	**No of stud's**	1	4	20	18	104	34	100	129	147	560
2022	**No of stud's**	3	4	24	51	108	102	165	120	14	591

Source: Atwima- Kwanwoma Senior High, Trede

From Table 1.1, students who scored between grades A1 and C6 in mathematics qualified for entry into tertiary institutions. Conversely, those who obtained grades D7 to F9 could not progress since mathematics is a core subject. The data reveal that only a small proportion of students achieve the required pass mark. For instance, in 2020, out of 569 candidates, only 152 (26.7%) attained grades between A1 and C6, while the remaining 417 (73.3%) failed to meet the basic requirement. This persistent trend of low mathematics performance in Atwima-Kwanwoma Senior High School has drawn concern from the District Directorate of Education, the School Board of Governors, and the Parents Association, who continue to question why such poor outcomes prevail despite available teaching and learning resources.

It appears that the problem is not solely due to students' effort but may also be linked to teacher-related factors such as motivation, teaching experience, attitude, and teacher-student interaction. These factors may significantly influence how students perceive and perform in mathematics. This situation has prompted the present study to investigate how these teacher-related factors affect students' mathematics achievement in the Atwima-Kwanwoma District.

1.3 Purpose of the Study

The purpose of this study is to examine the influence of teacher-related factors specifically teacher motivation, teaching experience, teacher-student interaction, and teacher attitude on students' achievement in mathematics. The study aims to provide evidence-based insights that can inform educational policy and practice toward improving mathematics performance in senior high schools in the district.

1.4 Objectives of the Study

The study was guided by the following objectives:

1. to examine the influence of teacher motivation on students' achievement in mathematics in the Atwima-Kwanwoma District.
2. to assess the effect of teacher experience on students' mathematics achievement in the Atwima-Kwanwoma District.
3. to determine how teacher–student interaction influences students' achievement in mathematics within the Atwima-Kwanwoma District.
4. to investigate the effect of teachers' attitudes on students' mathematics achievement in the Atwima-Kwanwoma District.

1.5 Research Questions.

The research was guided by the following questions:

1. what is the influence of teacher motivation on students' mathematics achievement?
2. how does teacher experience aid students' mathematics achievement?
3. what is the extent to which teacher-students interaction influence students' mathematics achievement?
4. what are the effects of teachers' attitude on students' mathematics achievement?

1.6 Significant of the Study

This is an important work as low achievement in mathematics is perceived as a challenge to attaining economic and social development at the individual as well as national level. As with any West African nation, the achievement of students in Ghana remains low. They do not rank high in international assessments (Bethell, 2016). According to Bethell (2016), development in Sahara African requires much improvement in mathematics education. In this context, it is vital that we identify ways to optimize student achievement. Findings will be made available to the Curriculum Research and Development Division (CRDD) to be used as a reference source in developing teacher's handbook, supplying appropriate materials to facilitate the teaching and learning of mathematics.

Also, international entities focused on mathematics education such as the Japan International Cooperation Agency (JICA), United States for International Development (USAID) etc., will have firsthand information and knowledge of teacher-related aspects of students' mathematics achievement. Furthermore, this work will be extremely beneficial to education policy makers in Ghana because it would provide information

concerning the influence mathematics teachers have on students so that teachers will be properly trained to teach the subject and the required logistics will be provided. Moreover, this work will constitute another knowledge addition; it will now be a groundwork for further research.

1.7 Limitation of the Study

Limitations are those conditions outside the control of the researcher, so they may limit the study and application conditions Best and Kahn (2003). Time and budget, in particular, restrict the study to the Atwima-Kwanwoma district. The schools participating were not willing to release their students' results analysis readily. Thus, with the introductory letter from University of Education, the needed support was given and the researcher assured the authority of anonymity and confidentiality.

1.8 Delimitation of the Study

This study took place in public secondary schools of Atwima-Kwanwoma district in Ashanti. Thus, the findings cannot be generalized for the entire region or the whole country. The study specifically examined the effect of teacher related characteristics on mathematics performance. Factors include teacher motivation, teacher training and experience, teacher content knowledge, teacher student interaction and the effects of teacher attitude on mathematics achievement. The study involved only the two schools due to COVID-19 pandemic, time and finances.

1.9 Organization of the Study

The book comprises five chapters. The Introduction is the opening section of this study. It addresses the background of this study, statement of the problem, purpose for the study, objective of the problem, research questions, significance of the study, and operational definition of terms. Chapter Two addresses the literature relevant to the

problem under study. This research covers the following topics: theoretical framework, factors of teachers that affect students' achievement, factors of teacher motivation that affect students' achievement, learning environment on students' achievement, teacher training and experience influence students' performance, influence of teacher motivation on students' performance, influence of teacher training and experience, influence of teacher content and pedagogical knowledge, and teacher-student interaction.

Headings of research design, design advantages and limitations; study population; sample and sampling procedure; data collection procedures; research instruments; data analysis; and ethical issues of Chapter Three. The results of the study are described and the procedure of analysing the data are presented in Chapter Four. Chapter Five presents a discussion about the data analysis considering the outcome of the study presented in Chapter Four. Discussion focused on several important results of teachers' role on students' mathematics achievement. A case study of Atwima-Kwanwoma District. This section again presented a brief summary of the findings, conclusion and suggested further work for the present study.

CHAPTER TWO

LITERATURE REVIEW

2.0 Overview

The purpose of this section is to review related literature on the influence of mathematics teacher related factors and attitude on student's mathematics achievement. The review explored varied research findings and views relating to teacher factors and attitudes in Mathematics. This revealed a complexity of interrelated teacher factors that have been found to influence students' achievements in mathematics.

2.1 Theoretical Framework

The research was guided by Reinforcement Theory propounded by Skinner, which usually form part of the motivational theories. This theory elaborate how individuals are motivated to achieve certain abilities which otherwise would not have strived to achieved.

2.1.1 Reinforcement Theory

Regardless of an organism's capability or species, learning occurs, according to research conducted by renowned learning theorist Skinner (1953). Skinner noted that reflexive behaviour accounts for a very small percentage of all conducts, despite the fact that certain behaviour are unmistakably triggered by particular stimuli. Subsequently, Skinner brought out another group of behaviours, referring to them as operant behaviours. According to him, the reason for this is that these actions control the surroundings despite the clear lack of any unconditioned inputs.

Subsequently, Skinner shifted his focus to the correlation between actions and their outcomes. Operant conditioning is the process of changing behaviour by rewarding

desired outcomes. According to Lahey (2003), the concept is learning, in which the consequences of one's actions result in modifications.

Mathematics have made the case that encouraging students to show an interest in the subject will greatly improve their performance and success in the subject, and vice versa (Ismali,and Anwang, 2009; Khatoon and Mahmood, 2010; Schackow, 2005; Sweeting, 2011). One of the main components of the reinforcement theory, which is an expansion of the operant conditioning theory, is rewarding students for demonstrating strong performance in mathematics and reprimanding students for demonstrating poor performance. This is the most often used theory of classroom for motivation for mathematics in our schools, where we applaud and commend learners who perform poorly, and occasionally even administer physical punishment to make a difference. This tends support the belief, inspire students who performed well on the mathematics test, and drive those who performed poorly to perform better on subsequent assessments. Therefore, motivation and attitude have a close link.

Furthermore, a student needs to be driven to create a favourable attitude towards mathematics in order to have a positive performance or achievement in the subject. It is sufficient to argue that the degree of motivation to study or acquire the topic determines or informs the establishment of a positive or negative attitude towards mathematics. Due to the aforementioned, it became necessary choose the theory of reinforcement, whose fundamental idea is motivation, in order to explain or establish the connection between attitudes and academic achievement while accounting for mathematics as a subject.

2.1.2 Attitude

An attitude is a learned predisposition from a person that makes them likely to respond in a positive or negative way toward an object, event, idea or person. In addition, it is regarded as a belief through which people operate, exhibiting opinions and sentiments that sometimes manifest themselves in action (Joseph, 2013). Thus, attitudes are connected to behaviour and feelings because what an individual thinks about an object, event or person compels them to behave a certain way toward it.

In addition, an attitude is a hypothetical construct not directly observable but measurable through quantifiable response to the object of the attitude (Ajzen, 1993) in this case, learning mathematics. According to Syyeda (2016), an attitude is three-dimensional with three components. The first is effective, which is made up of emotion, belief and vision toward the subject. Emotion is the positive feeling associated with learning the subject or the thought that it is boring, challenging and tedious. Belief is the belief that students will be capable of learning the subject. Vision is how students envision themselves within the field of mathematics. Cognition involves how useful students believe the subject will be for their future lives, while behavior relates to how motivated students will be to learn the subject as evidenced through action, engagement, and classroom success.

2.1.3 Students' Attitudes Formation

Attitudes are psychological orientations formed by experience affecting one's perception of situations and how to respond to them either positively or negatively or favourably or unfavourably (Mensa, Okyere & Kuranchie, 2013). According to Vaughan & Hogg (2005), attitude is the organization of beliefs, feelings and behavioural tendencies towards an object. Attitudes are positive or negative views

about a person, object, idea or situation that influence individual decisions to take action and responses to challenges (Zelley, Mariane & Elaine, 2005). Attitudes have three interrelated characteristics or elements that vary in direction, degree, or strength. A part of the emotional category refers to the feeling that we experience; an aspect considers how we think and believe; another is the behavioural component – action, experiences (Maio & Haddock, 2010). The social learning theories developed by Bandura suggest that individuals acquire attitudes through observing, imitating and modelling the behaviours of others. They thus develop from experience with models, objects or issues or ideas that we engage with. They are learned attributes which affect their behaviour. A student can gain a positive attitude towards Mathematics because he or she learns to relate positive experiences with it. Also, positive reinforcement creates room for the formation of positive attitude towards Mathematics (Mensah et al, 2013).

2.1.4 Attitudes of Students Regarding Mathematics Accomplishment

According to the report on attitudes, attitude is a major predictor of Mathematics learning and achievements (Zan & Martino, 2007). Thus, their subject achievements contribute to their subject abilities and attitudes, facilitating learning opportunities, discussing different tasks assigned to them and continuing through mandated responsibilities given to them. In general, how students feel about their abilities in Mathematics-related activities is facilitated or disallowed due to their attitudes toward Mathematics. Unfortunately, many students achieve this through a Mathematics attitude. This attitude is rule-based and procedure-oriented. This means that students fail to embrace the expansiveness of Mathematics and the countless procedural tools necessary to encourage proper understanding (Mensah et al, 2013).

Most studies, however, found a correlation between student attitudes in Mathematics and achievement. Several studies were considered to find the connection between student attitudes in Mathematics and academic performance, which resulted in performance and attitudes where related. For example, Nicolaidou and Philippou (2003) found that pupils with a favorable attitude toward mathematics had good performance where performance and attitudes were related. Mato & De La Torre (2010) surveyed students in high school mathematics and concluded that high Mathematics performing students perform better academically, display a more positive attitude toward Mathematics, than low performing students. The same results were seen through a more extensive study on mathematics study on attitudes of senior high school students among nine different countries by University of Michigan (Sanchez et al, 2004).

The mathematics attitude of junior high school students was studied by Arthur, Asiedu-Addo and Assuah (2017) from a multivariate statistical perspective. A total of 1263 participants were derived from 10 (10) secondary schools across the Ashanti Region of Ghana. The study was conducted through a questionnaire. For example, 58.1% of the participants of this study agree that poor experiences in Mathematics at the elementary level greatly impact students' interest in Mathematics as they continue their academic career. Alternatively, 20.4% of participants completely disagreed and 4.4% agree. In addition, it was discovered that students at the elementary level perform poorly in Mathematics with an overall score of 3.6 out of 10.

Conversely, teachers know that student interest negatively impacts student interest in Mathematics. It also found that teacher strategies help alleviate negative interest and provide proper motivation to students for maximum interest. Conversely, these researchers focus on the perception change by teachers and schools where they note

that increased proper teacher strategies, motivated teachers, and other strategies can greatly increase performance in Mathematics.

2.1.5 Attitudes of Students Instruction in Mathematics

Individual experiences; the contexts in which students commune with others and with mathematics and consequently are a key theme, is a focus of this research regarding learner attitudes as a predictor of learning and success in mathematics. Fraser and Kahle (2007) found that home learning environments, school learning environments and peer-to-peer environments were associated with a significantly high variance in student attitudes. Mohammed and Waheed (2011) developed three clusters of key characteristics for investigating student disposition in research synthesis on attitudes and the determinants of development. These are, which are students: mathematics achievement, anxiety, motivation, self-efficacy, self-concept, experience at school; school: teacher and teaching materials, classroom management, teacher expertise, mathematics attitude and beliefs and motivation; home and social: level of education of students' parents, parents' aspirations for students, parents' occupation. According to Mata et al. (2012) attributes to Attitude the elements mathematical experiences, perceptions of mathematics, self-regulated beliefs, anxiety, self-efficacy, and concept. Wilkins and Ma (2003) found that social structures including parental, teacher, and peer influence affect students' views on mathematics.

2.2 Conceptual Review

A conceptual review provides a synthesis of key ideas, models, and variables relevant to a study. It doesn't focus on specific findings from previous research like an empirical review does; rather, it clarifies the main concepts, their interrelationships, and how they contribute to the problem being studied. In this research, the central concepts include

teacher motivation, teacher experience, teacher–student interaction, teacher attitude, and students' mathematics achievement.

2.2.1 Teacher Motivation

Teacher motivation refers to the internal and external factors that stimulate teachers to remain committed and effective in their work. It encompasses enthusiasm, passion, and willingness to invest effort in teaching (Adair, 2009). Motivated teachers often exhibit creativity, resilience, and a sense of responsibility that positively affects students' learning outcomes. In the context of mathematics education, motivation drives teachers to prepare well, use diverse instructional methods, and engage students actively. When teachers are demotivated due to poor working conditions, low remuneration, or lack of recognition, their enthusiasm for effective teaching diminishes, which in turn affects students' performance (Akyeampong & Bennell, 2007). Hence, teacher motivation operates as both a psychological and professional driver of classroom effectiveness.

2.2.2 Teacher Experience

Teacher experience is the accumulation of teaching knowledge and skills gained over time through practice, reflection, and exposure to different learners. Experienced teachers tend to manage classrooms better, anticipate learning difficulties, and adapt instruction to meet varied learner needs (Tara & Darling-Hammond, 2019). Their familiarity with content and pedagogy allows them to employ differentiated teaching strategies that help students grasp complex mathematical concepts. Experience also shapes teachers' confidence and attitudes toward the subject, which influences how students perceive and engage with mathematics. However, experience alone does not guarantee effectiveness; continuous professional development is crucial for keeping teachers updated with evolving curricula and methods.

2.2.3 Teacher–Student Interaction

Teacher–student interaction is the relational and communicative exchange that occurs between teachers and learners during instruction. It includes feedback, encouragement, questioning techniques, and classroom dialogue. Positive teacher–student interaction promotes emotional security, active participation, and academic engagement (Roorda & Koomen, 2021). In mathematics classrooms, students often rely on teachers to clarify abstract concepts, guide problem-solving, and provide reassurance. Supportive interactions help build students' confidence and persistence, while hostile or dismissive interactions can create anxiety and disinterest. Thus, teacher–student interaction functions as a social mechanism that connects instructional delivery to student achievement.

2.2.4 Teacher Attitude

Teacher attitude encompasses the beliefs, values, and dispositions teachers hold toward their subject, their students, and the act of teaching itself. A teacher's positive attitude towards mathematics can inspire similar enthusiasm among students, whereas a negative attitude may transmit fear or disinterest (Mensah, Okyere & Kuranchie, 2013). Attitude manifests through behaviors such as patience, encouragement, fairness, and willingness to help. Teachers who perceive mathematics as difficult or irrelevant are less likely to communicate passion or confidence, which can influence students' own attitudes and achievement levels. Therefore, cultivating positive teacher attitudes is essential to creating an encouraging learning environment.

2.2.5 Students' Mathematics Achievement

Students' achievement in mathematics reflects the level of competence and understanding they demonstrate in solving mathematical tasks, typically assessed

through tests and examinations. Achievement is influenced not only by cognitive ability but also by affective and contextual factors, including teacher quality, motivation, and classroom climate (Obilor, 2020). Mathematics achievement is an important educational indicator because it affects students' access to higher education and career opportunities. In the Ghanaian context, consistent underperformance in mathematics has raised concerns about the adequacy of teacher preparation and professional commitment. Therefore, improving teacher-related factors can significantly enhance student outcomes in this critical subject.

2.2.6 Interrelationship Among Key Concepts

The four teacher-related variables motivation, experience, attitude, and teacher–student interaction is interdependent in influencing students' mathematics achievement. Motivation energizes teachers to apply their experience effectively; experience enhances the quality of interactions with students; attitude shapes classroom climate; and interaction translates all these factors into meaningful learning experiences. When these variables function synergistically, they create a supportive and engaging environment that fosters students' mathematical competence and confidence. Conversely, weakness in any of these areas can undermine learning outcomes, as motivation without experience, or experience without positive attitude, may yield limited impact.

2.3 Empirical Review

2.3.1 Teacher Factors Influencing Student's Achievement

Fenech (2006) notes that satisfaction on the job plays a role in work-related matters from efficiency and productivity to absenteeism, turnover and intentions to resign and, eventually, employees qualified persons filling the teaching gap; educator wellbeing

has serious implications on the delivery of education. Thus, satisfied educators are likely to remain in the position, are able to provide responsive, positive, consistent interactions to students, and are likely to possess a valuable impact on student performance. The motivation of educators within the educational field and its impact on educational performance is recognized as worthwhile to effective learning. However, a student's response to learning dictates how far he or she gets in learning.

According to Musili (2015), the status of teachers in three nations Zambia and Papua and New Guinea is a potential crisis within a vocational field that complicates the ability of the national governments to achieve globally recognized goals of universal expansion and improved quality of education. In many Third World countries, the teacher population is fragmented and ill-equipped. Furthermore, such findings continue to support status in four categories—conditions of levels, situation as a professional, position in the society, and contribution to educational policy and poor compensation status results in poor status in society as well as approaches.

Yet according to Etsy (2005), teacher factors that significantly impact poor educational attainment are lateness to school, absenteeism and non-coverage of national curriculum which impacts students' national examination results. A World Bank report related to the education system in Ghana Education in Ghana: Improving Equity, Efficiency and Accountability of Education Service Delivery indicates that absenteeism is worse in rural areas and exists within a context of poor working conditions and low teacher morale. Tunisian teachers miss school 11.6 days per year on average while Moroccan teachers miss 13.4; Ghanaian teachers miss school an average of 43 days per year annually. Some of the most crucial reasons identified for the absenteeism rate includes

no supervision of attendance, illness/medical appointments, trip to banks miles away to pick up salaries, and frequent funerals.

Other cited reasons include distance from schools, prayer days (i.e. Muslim teachers' Friday prayers), schools missing basic accommodations (i.e. latrines, clean drinking water), distance from bus terminals and hospitals, and teachers with any agricultural endeavours' who teach in rural areas only to divert their attention for home for secondary earnings (www.peacefmonline.com February 23 2011).

2.3.2 Influence of Teacher Personality on Student's Achievement

The personality is an unconscious, sedentary characteristic that greatly influences everything and everyone in attitude and action. For a teacher, personality will increasingly become a hidden curriculum to affect teaching and learning. Teachers are the primary learning contractors. The action plan of learning that teachers find appropriate for successfully achievement implementation (Goh 2014, Kudryashova, 2016). Teacher characteristics explain much of the variance in quality of teaching/learning (Baier 2019), they are at the center of the teaching/learning process (Wanner & Palmer 2018), they play a great role in developing and forming the student personality (Sayani, 2015), they are the masters of learning (Rindu & Ariyanti 2017) within a larger system of education that informs students.

Marsigit, Istiyono, Kartowagiran, Retnawah and Putranta 2021 investigated effective teacher personality to strengthen character education. The study resuts find 12 traits that define effective teacher personality for character education strengthening. They are: able to act as a friend, able to act as a role model, able to comprehend material being taught, discipline, appreciates students, treats all students the same whether giving sanctions or not, has a lot of patience, calm, humble, willing to possess

continuing education, masters educational character knowledge, not often known as fierce teachers throughout social settings but well-known as cheerful teachers. Current teachers do not only give the material, enable testing and mark/grade papers. The aim of a teacher is to be a person with great influence to become a social foundation for the future of society. Therefore, as a personality with effective learning mastery, they have a lifelong impact on students. Thus, they can act naturally based on ethics without pretention, care about social ethics and act as a private entity who highly regards social ethics, morality, democracy, tolerance and peace in life issues and able to respond to socioeconomic and national problems. Therefore, in reality, teachers greatly determine cultured people being born with firmly established ethics and standards as well-mannered and smart debaters who are graceful everyday citizens. Therefore, it's the teachers who must be improved in quality to improve student achievement (Adewale 2013).

2.3.3 Teacher Motivation on Students Achievement

Motivation is an agent which purportedly activates, responds to or maintains goal-directed behaviour. It is a psychological awareness created by internal arousal whereby various needs, desires and drives can either encourage, engender or sustain Nabie the behaviours (ibid pg. 13). Motivation is one component that has received great attention in the literature for understanding the worker as part of work context. It addresses everything that makes a man act from many downward explanations, like fear, to those upwardly spiralled like money, promotion or acknowledgement (Adair, 2009). Job performance in the School is directly proportional to how well a teacher can facilitate learning from an optimal attitude. For much depends on a good job analysis, job recruitment, selection and job placement of jobs.

Yet job performance is not solely in accordance with the laws. Performance is evaluated by one's performance and that of others. It significantly relies on the abilities and motivation of workers (Ngumi, 2003). Work motivation is a psychological process that adjusts human conduct with respect to personal task accomplishments and organisational work aims. To the extent that this psychological process is not externally perceived and many organisational and contextual concerns could impede goal achievement (Akyeampong & Bennell, 2007), measuring the variables that could enable or impede work motivation is not easy and straightforward. Therefore, one of the critical findings in developed nations in effective schools suggest that improved learning disposition relies fundamentally upon improved teacher motivation and could determine good work motivation dispositions.

While many other variables increase student learning outcomes, it appears teacher disposition is the most critical school-level variable relative to student motivation and performance dispositions. Thus, how to increase the motivation and abilities of teachers brings to the fore all system interventions that could increase learning dispositions. More research has been done on what makes the 'effective' teacher. The only thing missing is policy interventions for most countries that have focused on learning improvement by better allocation of resources, curriculum development systems, assessment systems, and in-service teacher training (Akyeampong & Bennell, 2007). Much research and studies have been conducted on teacher's motivation in developing countries. For example, Kadzamira and Rose (2012) observe that the teachers in Malawi are quite dissatisfied with their pay and other conditions of employment in a bad incentive and employment arena that creates low morale and therefore a negative attitude towards working in this country. They note that in the Malawian setting, criteria like low salaries and bad working conditions were major reasons for teacher

absenteeism and attrition in Malawi. Malawian conditions also note that teachers' motivations according to all stakeholders depend on multiple conditions: level of pay, location of education for housing, access to better training conditions for service, workload, promotions and career paths, student behaviours, community relationships, school esteem including teaching and learning resources provided.

Motivation in Mathematics Teaching Environment Ultimately motivation should be in the Mathematics Teaching Environment so that the teacher gets the focus and seriousness required for a good attitude that could reciprocate a good disposition to student learning. In addition, cognitive crises are the most basic building blocks to students' emotional dispositions created by teacher expectations, support and comments about students (de Lourdes Mata, Monterio & Peixoto, 2021). Therefore, it is necessary for these due factors to include student extrinsic motivation characteristics. It should be clear to us as an audience that the more motivated a learner is the more that learner was a good learner in mathematics courses. According to Guthrie and Knowles (2001), attitude is an emotional response which follows behavior based on a motivational state. Therefore, attitude could be correlated to motivation and it is good to know that attitudes could provide us great information of operant behaviours and mobility approaches to behaviours.

This should be acknowledged by teachers as they presumably motivate learners through smiles, kind dialogues, counselling on emotional concerns, extra help on tasks; etc. Therefore Davis-Ewart and Lee (2023) want those motivated dispositions to be worthwhile incentives but teachers must possess that in personality motivation as those students. There is a need for highly motivated learners in mathematics therefore they must convince to extremes and determine problems, mathematical problems and

theoretical ideas. This confidence begs the learning in mathematics to require stringent learning, focus and motivational focus on results. Students need focus to conquer these trends and motivation towards achievement (Broussard & Garrison, 2004). According to Kariuk and Mbugua (2018) Positive teacher-student relationship 81.5% of the teachers and 86.5% of the learners agreed that rewards play an immense part in motivating students. The study supported that student motivated toward success through teachers significantly impact students' academic performance.

2.3.4 Influence of Learning Environment on Student's Achievement

Education and the school environment also influence students' success in mathematics. The environment a child inhabits decides to what extent the student can cope with learning mathematics. Educational background of parents, occupation of parents as mentioned by Kogce, Yildiz, Aydin, and Altindag (2009) are the basic aspects that affect students' attitude towards mathematics. Many times, mathematics is declared as a challenging, sterile, abstract, theoretical, ultra-rational subject in the public perception (Ernest, 2004). Knowledge among students also influenced by the school of study can be found as shown by the research of Kwasiga (2002); however, Kwasiga revealed that the quantity of facilities that a school provides almost always affects the quality of school which affects performance and accomplishment of the student. Children in a good school system with proper monitoring, supervision, teaching resources and motivated teachers are known to be performing much better as they attend schools and that is mainly owing to the fact that these schools are well resourced and have features of facilities.

According to the view of Sentamu (2003) schools affect the educational process which includes content organization, teacher and teaching learning, and assessment of the educational process in the final analysis. According to all these educationists and researchers, schools strongly affect the students' ability and level of education. Mathematics is an interactive action-oriented subject learned through active interaction with a source. The source can either be a person or any concrete media. Mathematics can be learned at a child's home environment or in the school. In the classroom setting, the mathematics teacher and child do not learn things or have academic work alone; the mathematics teacher supports the child in formally building up new mathematical concepts on the ones they develop in a supportive environment.

It is very important to change the old learning environment of students to the modern learning classroom, this can support them achieving high. Nwoke and Nnaji (2011) proved that mathematics laboratory teaching and learning in mathematics was more effective when compared to the lecture method and students' achievement with respect to students' achievement. In the same vein, Sidhu (2006) viewed mathematics laboratory to be a site which one can keep things in the storage, storing, count, counting, ordering, storing, ordering, recording, packing & unpackaging, grouping, ungrouping, grouping, unarranging, arranging, reordering, mantling & dismantling in addition to measurement, joining, portioning, measuring, and many other things etc.

As it was stressed by Sidhu (2006), laboratory is where students learn mathematics by learning to place, store and apply knowledge of mathematics in their own hands. It refers to the process of organizing and organizing resources to carry out mathematical knowledge (Ibid., 2006). This point of view of a constructivist view on learning can point to different practices. Generally, it refers to encouraging an active way of using

techniques (experiments, real world, problem-solving etc) for students to add knowledge and then to reflect on and discuss what is happening and how understanding is changing. The teacher takes into account students' prior conceptions and directs the activity to target them and then builds upon those concepts to improve performance.

As the Principles and Standards of School Mathematics (PSSM) argue, the learning environment a teacher creates is fundamental to students' development of knowledge. The students' confidence in their ability to manage difficult math problems is also increased in this friendly environment while students are inspired to discover things on their own and try multiple solution methods, which encourages persistence in solving problems. Hardworking students will find success and can thus be motivated to extend their work for mathematics (National Council of Teachers of Mathematics, 2000). Nabie (ibid p.119) discussed that "use of manipulative materials make concept clearer, presentation easier, help maintain learner's interest and give learners the opportunity to extend their knowledge base at their own pace. Practical methods help learners, whether weak or gifted, to see the context in which, for example, a generalization is developed. This makes learning easier and hence motivates children to learn further".

2.3.5 Teacher Training and Experience on Student's Achievement

Training teachers is an ongoing process throughout the world. It is intended to provide the teacher with the skills and knowledge necessary for the provision of education to students. Numerous studies have indicated that teacher training affects the content delivery of the teacher in the classroom. An investigation reported by Gamoran in the University of Wisconsin (2006) revealed that the quality of student learning was increased when teacher training was increased because the changes in such practices, especially that of presenting the material to the student being communicated with, was

facilitated. In addition, Jackson and Davis (2000) found that teacher training significantly facilitated adolescents' learning in New York, and improved their teaching skills and knowledge, increasing their content delivery. Guskey & Clifford (2000) argue that properly trained teachers will possess good knowledge and understanding about content on the subject topic that they are teaching their students. These teachers use different teaching approaches and as a result enhance their delivery of content within the classroom.

In support of this, studies by Richardson (2003) found that teacher training provides teachers with opportunities for hands-on work and is integrated into the day-to-day life of the school and has a positive influence on student achievement. Training is connected to various aspects of performance in the school. These could be concerning content delivery, time management and the effective usage of resources along with a wide variety of other areas. Teachers who are well-trained teach effectively in a classroom, so they have the biggest impact on student learning. According to Atsenga (2002), training teachers enhances teaching methods which in turn supports learning. Atsenga also emphasized that effective teaching approaches influence teacher's roles successfully. Orado (2008) argued that in order to enhance any area of learning, it is necessary to have an organized teacher education program that will help the teacher achieve a leadership role they are expected to play. The nation’s overall development is inextricably tied to its educational system. If we accept these views, then we must add quality to the system.

Many educationists believed that without the right kind and right quality of education, no substantial socio-economic development can take place. A person cannot be educated without a combination of numerous factors and processes. The presence of a

properly trained educator stands at the centre of the process. The teacher is the most indispensable factor in the effective administration of any education system.

Waititu (2008) stated that no matter how much we invest in the nation's education system, if the teachers are not adequately prepared and motivated, we can never expect it to work. Teachers' experience, moreover, influences students' achievements in many different ways. Long-standing teachers use better classroom management strategies and adequate teaching methods that promote the student's independence and reduce custodial control thus allowing them to accept responsibility for learning needs, manage classroom issues, and keep them focused on tasks (Chacon, 2005).

Research has indicated that experience of two years or less in teaching is usually less effective than that of a more senior teacher. The most popular theory of how teachers' experience relates to pupil achievement is that students with more experienced teachers achieve at a higher level, as their teachers have mastered the content and have acquired the skills of classroom management to deal with various classroom problems (Gibbons et al, 1997). In addition, teachers with experience are believed to be able to focus on how best to teach specific material to students, since they vary in their abilities, prior knowledge, and backgrounds (Stringfield & Teddlie, 1991). Benefits, however, appear to level off after five years (Tara & Anne, Darling-Hammond 2019).

Teacher experience and teacher qualifications–specifically, education level and teacher certification–are important factors in student achievement.

According to a 15-year meta-analysis of 30 studies across the United States assessing teacher experience as a teacher qualification for student outcomes by Tara, Anne and Darling-Hammond (2019):

1. Teacher experience is positively related to student achievement gains over the career of a teacher. Teacher effectiveness related to teacher experience increases most dramatically in the early years of teaching, although significant increases occur in the second and third decades of teaching as well.
2. Teachers with greater experience are more likely to have learning gains with their students based on standardized assessments, although they are more likely to have student learning gains assessed through other measures of resources (i.e. attendance).
3. Teacher effectiveness increases at a greater rate when experience is gained in an inclusive setting (collegial and supportive) and maintains experience in the same grade, subject area, or comparable settings (within the same district).
4. Teachers with greater experience are more likely to advocate for peer support for student learning and support for their own classrooms, in which the teacher has taught.

However, they conclude that teacher effectiveness varies at every teacher experience level, meaning that not all novice teachers are less effective and not all novice teachers are more effective.

2.3.6 Teacher-Student Interactions

The abilities of the students and the classroom interaction in which mathematics is taught are major determinant of their progress. The mathematics teacher-student interaction is one that is formed as a result of the relationship that has been developed

between the teacher, the student, and the school, and is critical to the student's success. A classroom with a multitude of mathematical items that correspond to the students' natural classroom allows them to interact with them without intimidated, allowing them to embrace mathematics instruction. It should be mentioned that teachers have a variety of responsibilities in addition to teaching. They are easily place as learning need support parents, and guidance and counselling co-coordinators to students due to their regular interaction with individual students. All sorts of intimidation and activities that are likely to lower or damage the self-concept of all students should be avoided in a healthy mathematics-learning classroom.

A hostile mathematics classroom or one in which students are humiliated, causes tension, which obstructs effective teaching and learning. Teachers' actions, such as throwing objects at, assaulting and insulting students, or lecturing students for poor achievement, inattention, late submission of work, and so on, can cause tension (Nabie, 2004). Such interactions between teachers and students might distract students from learning and lead to truancy. Teachers, on the other hand, will be able to effectively motivate students and cause them to be efficient in their studies if their interactions with students are courteous and receptive.

The teaching-learning process is made more enjoyable by appropriate teacher-student interaction. Teaching is a unique and dynamic profession, and the type and quality of teachers determine what a country becomes (Aboho, Dodo, & Isa, 2014). Because there is a strong link between his or her classroom and the nation's destiny, the classroom teacher is responsible for the nation's destiny in education.

Positive teacher's expectations regarding his students are related with strong academic performance or academic advances, according to Tyler and Boelter (2008), whereas

negative teacher expectations can result in a reduction in student's academic achievement. The importance of teachers understanding their level of effect on students is to foster positive teacher engagement, which will lead to enhanced learning and academic accomplishment for students. As a result, teachers must ensure that they are satisfying their students' intellectual and emotional requirements by providing learning environments that foster positive cultures and healthy interaction, as this can encourage students to channel their educational aspirations effectively (Aboho, Dodo, & Isa, 2014).

In a quantitative study published by Roorda and Koomen (2021), investigated the ways in which primary and secondary school students exhibit externalizing and internalizing behaviours. A sample of 1219 learners in high school was selected. These students completed three separate surveys over the course of a school year regarding their relationships with their teachers, their externalizing and internalizing behaviours, and other topics. The study objective was to ascertain the degree of reciprocity in the interaction between educators and learners and externalizing or internalizing behaviours. An intervention for externalizing behaviours in schools should take relationship-building into account, as externalizing behaviours was proven to be positive predictor of student-teacher conflict.

Johnston, Wildy, and Shand (2022), 25 grade 10 students from three Australian secondary schools participated. They conducted 175 classroom observations and 100 interviews to gather data. The primary study question—how do students perceive their professors' expectations for their achievement—guided the collection of qualitative data by the researchers. After their teachers expressed high expectations for them, kids increased their academic performance, according to the data analysis. Additionally,

when educators shown concern and an interest in getting to know their pupils on a personal level, students reciprocated by forging strong bonds with those educators. According to their reflections, students felt that this interaction improved their academic achievement.

In order to investigate how a teacherstudent connection affects learning results, Ma, L iu, and Li (2022) carried out a quantitative study. Three hundred and twenty-one Chinese fourth and eleventh graders participated in the study. The study assessed the relationship that students felt with their teachers, the degree to which students felt their parents were involved, and curriculum-based indicators of accomplishment. Standard test scores were used to gauge the academic success of the students. The study's findings demonstrated a positive correlation between academic achievement and the teacher-student interaction in both primary and secondary education.

A quantitative research study was carried out by Magro, Nivison, Englund, and Roisman in (2023). The impact of early caregiver and early elementary school teacher connections on a 16-year-old student's academic performance was examined in this study. In order to track students through their academic caregiver, the study employed longitudinal research. They looked explored how a child's connections with their elementary school instructors (K–6) and their primary care experience (3–42 months) with their caregivers were related to their academic achievement at age 16. According to the findings, there was a medium-range correlation between academic achievement and three of the four markers of a strong teacher-student relationship. Relationships with adult figures in a child's life are assessed in conjunction with maternal sensitivity. In a study published in 2018, McNally and Slutsky examined hoe teacher- student connections foster an environment that is conducive to students' overall academic

success. Four preschool classrooms were included in the study: two were from Head Start programs and two were from private schools. Included in the study were four preschool instructors. Questionnaires, observations, interviews, a poll of teacher beliefs, and a final focus group were used to gather data.

To find out how teachers felt about their interactions with each student in the classroom, the teacher employed the STRS long form. Three times throughout the course of regular days, teachers were monitored for an hour each in three occasions. Three dimensions of belief were measured by the teacher survey: classroom practices, punishment procedures, and beliefs regarding students. The results proved that higher student teacher relationship scale (STRS) scores predicted lower levels of conflict closer and more positive relationships. Teachers use positive discipline strategies, clarify expectations, follow consequences, and use counselling, fostering high-quality relationships and promoting a safe emotional climate in their students.

Longobardi, Sett, Lin and Fabris (2021) measured the correlation between a student's prosocial behaviour and their relationship with their teacher, as well as their achievement and attitude towards school, 47 teachers and 459 pupils between the ages of 4 and 9 made up the study's participants. Teachers' perceived level of closeness I their connections with their students was measured by the researchers using the student teacher relationship scale (STRS) short form. Using a tool known as the strengths and problems questionnaire, teachers were also asked to score the prosocial of their students. Students also completed a questionnaire designed by researchers to gauge how they felt about going to school. Through the use of multiple regression analysis, researchers discovered that the closeness of a student's teacher and student's perception of their relationship with the perceived relationship and teacher-student intimacy were

positively correlated with students' perception of their academic accomplishment. The way learners felt about school had a good correlation with their prosocial behaviours. Prosocial behaviours were found to be both directly and indirectly associated with teacher-student closeness and perceived relationship between the two.

2.4 Conceptual Framework

Proficiency in mathematics is widely regarded as a fundamental requirement for success in today's world (Mata, Monteiro, & Peixoto, 2012). Attributes such as talent, diligence, self-discipline, a positive attitude, and enthusiasm are all linked to higher achievement in mathematics (Kasimbu, 2004). The development of these qualities, however, depends on several interrelated factors encountered during the learning process. These include the encouragement students receive from teachers and parents, their own willingness to engage with mathematical concepts, and their ability to retain and apply previously acquired knowledge.

According to Skinner (1953), attitudes toward learning are shaped by three interdependent components behavioural, emotional, and cognitive. These components influence how students perceive mathematics, how they feel about it, and how they act in relation to it. The conceptual framework for this study is therefore built on the understanding that these attitudinal components interact dynamically to influence students' engagement and achievement in mathematics.

It is also important to recognize that students learn in diverse environments, and these settings shape how they develop attitudes toward mathematics. Classrooms that are well-organized, visually stimulating, and supportive tend to encourage active participation and curiosity. Conversely, environments that lack adequate teaching

materials, parental support, or teacher involvement can discourage learners and lead to disinterest in the subject.

Moreover, the social context within which learning occurs plays a critical role in shaping students' mathematical attitudes. Interactions with peers, teachers, and the broader school community can either foster or hinder students' confidence and motivation. Learners who associate with peers who value mathematics are more likely to develop enthusiasm and persistence in the subject, while those surrounded by negative attitudes may lose interest. Participation in school-based learning activities and academic groups also enhances students' sense of belonging and engagement, promoting a more positive outlook toward mathematics.

In essence, effective mathematics instruction is not shaped by teaching alone but by the broader social, emotional, and environmental factors that surround the learner. These combined elements influence how students perceive, engage with, and ultimately succeed in mathematics.

The relationship among these elements and how they influence students' attitudes toward learning mathematics are illustrated in the conceptual framework below.

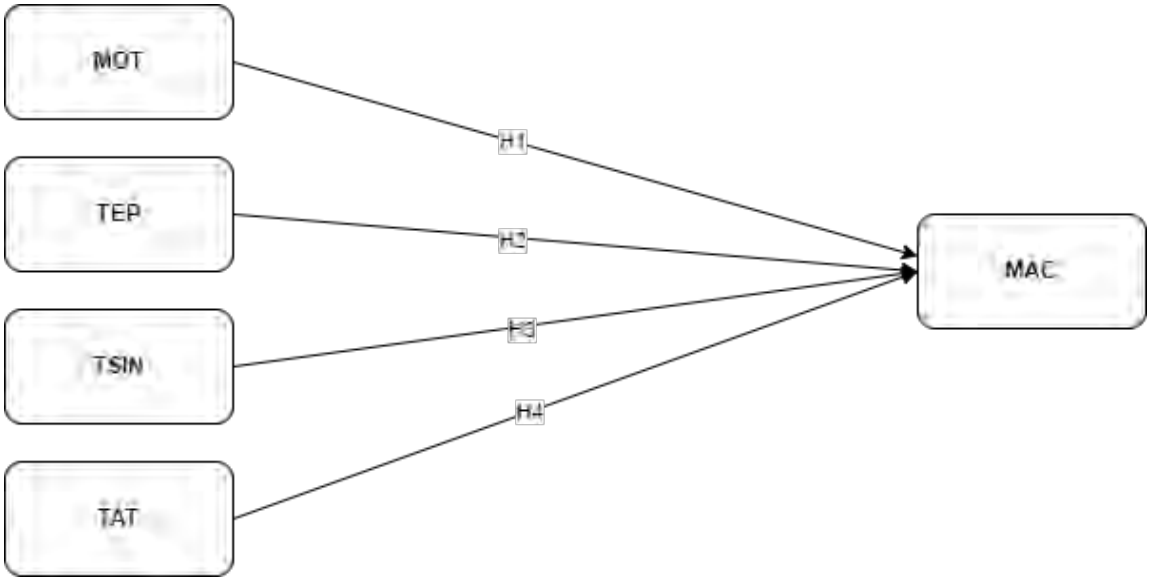

Figure 2.1: Showing conceptual framework

Key to Abbreviations:

- **MOT:** Teacher Motivation
- **TEP:** Teacher Experience
- **TSIN:** Teacher–Student Interaction
- **TAT:** Teacher Attitude
- **MAC:** Mathematics Achievement

Effective mathematics instruction can be influenced by several teacher-related factors, as represented in Figure 2.1. Teacher motivation (MOT), experience (TEP), attitude (TAT), and teacher–student interaction (TSIN) are hypothesized to directly affect students' mathematics achievement (MAC). The framework illustrates how these variables jointly contribute to students' academic performance in mathematics within the Atwima-Kwanwoma District.

In conclusion, the teachers of mathematics must encourage their students in adopting a positive mindset of learning mathematics and in exhibiting a positive attitude toward

the subject. This will help create a better learning environment in the classroom and facilitate maximum students' learning outcomes in mathematics. Attitudes towards mathematics are influenced by individual (students), school and societal factors. Students with positive experiences of those things naturally assume a positive attitude toward mathematics, and usually have better academic performance. On the other hand, if they do not have these good experiences, they will encounter the contrary effect. This framework above shows how teachers' attitude impact students' performance in mathematics.

CHAPTER THREE

METHODOLOGY

3.0 Overview

This section presents the procedures that were employed in gathering data for the research. It provides detailed descriptions of the research design, target population, sample size, sampling techniques, research instruments, as well as the procedures used to establish the validity and reliability of these instruments. Additionally, it explains the methods adopted for data collection and the techniques used for data analysis.

3.1 Research Design

Creswell (2014) defines research design as the overall plan and structure of inquiry used to obtain answers to research questions. This study employed a mixed-methods approach, combining both quantitative and qualitative techniques. The mixed-methods approach was appropriate because it allowed for a comprehensive understanding of how teacher-related factors—specifically teacher motivation, experience, attitude, and teacher–student interaction—affect students' mathematics achievement. Using both forms of data strengthened the study by enabling the researcher to validate findings through triangulation.

Within this mixed-methods approach, the study specifically adopted a convergent parallel design. In this design, quantitative and qualitative data are collected concurrently, analyzed separately, and then integrated during interpretation (Creswell & Plano Clark, 2011). The quantitative component involved the use of structured questionnaires to gather measurable data from students regarding their perceptions of teacher-related factors. The qualitative component consisted of focus group discussions

that explored, in greater depth, students' experiences and opinions about their teachers' motivation, interaction, experience, and attitudes toward teaching mathematics.

The choice of the convergent parallel design was justified by the nature of the research questions, which required both statistical and descriptive evidence to provide a complete picture of the phenomenon under study. This design also ensured that the strengths of one method compensated for the limitations of the other, enhancing the reliability and validity of the overall findings (Denscombe, 2010). By integrating both datasets during analysis, the study achieved a balanced interpretation of results that reflected both numerical trends and contextual insights.

According to Creswell & Plano Clark (2011), the main characteristics of a successful mixed methods study are:

1. Simultaneous collection and separate analysis of quantitative (closed ended) and qualitative (open-ended) responses (for factual determination).
2. Application of quantitative and qualitative traditions data collection/analysis/data procedures with appropriate rigor and predetermined sample size determination relevant to findings.
3. Integration of qualitative and quantitative data collected at any point during collection, analysis, or interpretation.
4. Qualitative and quantitative components conducted simultaneously or sequentially with the same or different samples aligned with the researcher's question.
5. Procedures support a philosophical or theoretical orientation—i.e. a social constructionist approach to understand the phenomenon from multiple perspectives.

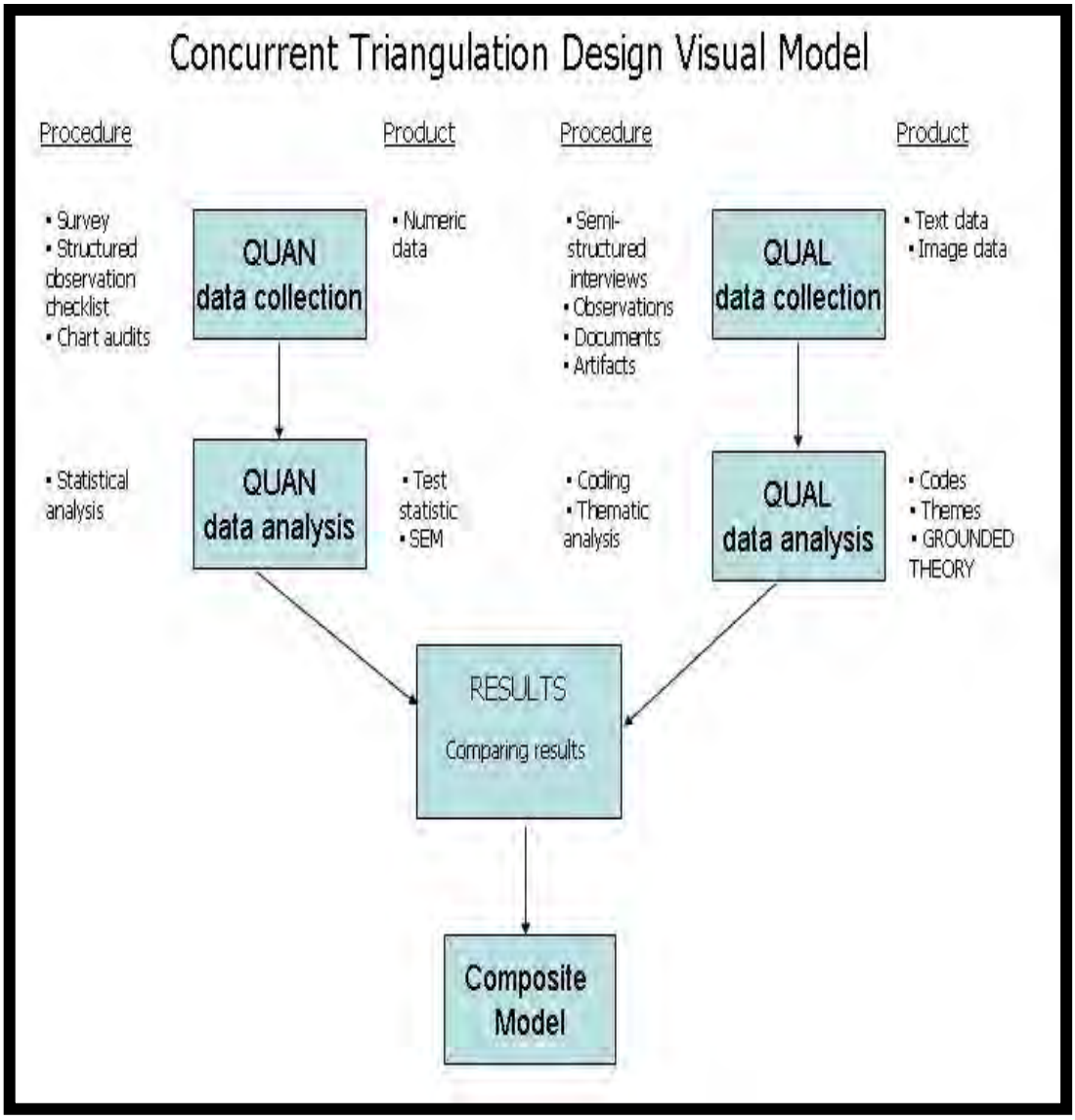

Figure 3.1: Diagrammatic representation of using mixed method

Advantages of mixed method

Using a mixed-methods approach offers several benefits, which are discussed below.

i. Compares and contrasts quantitative and qualitative information: Mixed-methods research is particularly useful for identifying and explaining inconsistencies that may arise between quantitative and qualitative findings. This comparison helps in achieving a clearer and more comprehensive understanding of research outcomes (Creswell & Plano Clark, 2011).

ii. Reflects the viewpoints of participants: Mixed-methods research provides participants with a platform to express their perspectives and experiences. It ensures that conclusions are grounded in participants' realities, allowing for richer and more authentic interpretations of the data (Creswell, 2014).

iii. Encourages intellectual communication: By integrating both quantitative and qualitative techniques, mixed-methods studies promote intellectual collaboration among researchers from different disciplines. This enhances interdisciplinary teamwork and strengthens the quality and depth of research findings (Tashakkori & Teddlie, 2010).

iv. Allows for methodological versatility: Mixed-methods designs are highly adaptable and can be incorporated into a variety of research frameworks, including observational and experimental studies. This flexibility allows researchers to gather more comprehensive data than would be possible using a single method alone (Johnson & Onwuegbuzie, 2004).

v. Collects a large amount of data: Mixed-methods research enables the collection of extensive data by combining quantitative and qualitative information. This mirrors the natural way individuals gather and interpret information in daily life. For example, sports reports often integrate quantitative data such as scores with qualitative descriptions and imagery to provide a more complete story than either approach could achieve independently (Wisdom, Cavaleri, & Onwuegbuzie, 2011).

Limitations of Mixed Methods

Although mixed-methods research has many strengths, it also presents several challenges, especially when used to evaluate complex interventions. Some of these challenges are outlined below.

i. Makes judgments difficult to understand: Designing and executing mixed-methods studies can be complex. Researchers must carefully plan all aspects of the research, including the study sample for quantitative and qualitative components (whether the same, embedded, or parallel), the sequence of data collection, and the integration strategy. Without careful planning, the results may become difficult to interpret or synthesize effectively (Creswell & Plano Clark, 2011).

ii. Relies on a multidisciplinary team of researchers: High-quality mixed-methods research often requires collaboration among researchers from different disciplinary backgrounds. This collaboration can be challenging because each team member must be willing to work with methods outside their primary expertise. As Wisdom, Cavaleri, and Onwuegbuzie (2011) noted, ensuring rigor and quality for both quantitative and qualitative components is difficult because each approach has distinct requirements. Quantitative studies typically need large sample sizes to achieve statistical significance, while qualitative studies must satisfy criteria such as data saturation and thematic relevance.

iii. Requires more resources: Conducting mixed-methods research can be both time-consuming and resource-intensive. It demands additional effort, personnel, and funding compared to studies that use only one methodological approach (Creswell, 2014).

3.1.1 Case Study

These studies adopted case study because looking at the issue under discussion it seemed the most ideal. This choice is justified by Yin (2003) declaration, that a case study is an experiential inquest that probes a contemporary development within a real-life context, particularly when the limitation between phenomenon and context are not evident (Yin, 2003). Yin identifies four scenarios in which case study research is essential. Thus, when (a) the objective of the study is address “how” and “why”

inquiries; (b) the behaviours of the participants in the study cannot be altered; (c)there is a desire to include contextual factors because they are believed to be significant to the phenomenon being investigated; (d) there are unclear boundaries between the phenomenon and its context. In this case, the researcher concurs with Yin's analogy and thus selects a case study approach to effectively address the interview questions, which are central to the qualitative component of the mixed-method research being conducted by the researcher.

3.2 The Population of the Study

According to Putri and Kuswandono (2020), population is a group of people, who have one or more common characteristics, on which a research study envisages. The population for the studies was one thousand and six hundred (1600) students comprising four hundred and twenty-three (423) males and one thousand one hundred and seventy-seven (1177) females of second year students.

3.3 Sample, Sampling Techniques and Procedures

The term *sample size* refers to the number of participants or observations selected from a larger population to be studied in order to make generalizations about that population. Determining an appropriate sample size is essential for ensuring the validity and reliability of research findings. A well-chosen sample must be large enough to capture the diversity within the population but also manageable in terms of time, resources, and logistics.

According to Dornyei (2007), cited in Islam, Nur, and Talukder (2021), a sample representing between one percent (1%) and ten percent (10%) of the total population is considered adequate in social science research. Given the study population of 1,600

students, ten percent (10%) of this figure was chosen as the sample size. This calculation is illustrated as:

$$\frac{10}{100} \times 1600 = 160$$

Therefore, the study involved a total of **one hundred and sixty (160)** students drawn from second-year classes (SHS 2) across the three selected senior high schools within the Atwima-Kwanwoma District.

Sampling Techniques

The study employed both **probability** and **non-probability** sampling methods to ensure that the selected participants were representative of the study population while also providing the necessary depth for qualitative insights.

1. **Quantitative Sampling (Simple Random Sampling):** For the quantitative aspect of the study, the simple random sampling technique was used. This method was chosen because it gives every student in the population an equal chance of being selected, thereby minimizing bias and ensuring that the sample accurately represents the larger group.

   The selection process was carried out as follows:

   - First, the list of all SHS 2 students from each participating school was obtained from the respective Heads of Department.
   - Each student's name on the list was assigned a unique number, starting from 001 up to the total number of students in that class.
   - The assigned numbers were written individually on small slips of paper of equal size and folded to conceal the numbers.

- All slips were then placed into a container and thoroughly mixed.
- A lottery method was used, where a neutral person (such as a class representative or teacher) drew the slips one by one until the required number of students from that class was reached.
- Each student whose number was drawn became part of the sample.

This procedure was repeated in all three selected schools to ensure that each school was fairly represented in the final sample. The number of students drawn from each school was proportional to its total SHS 2 enrollment.

2. **Qualitative Sampling (Purposive Sampling):** For the qualitative component, the **purposive sampling technique** was used to select participants for focus group discussions. This method was chosen because it allowed the researcher to deliberately include students who could provide rich, diverse, and relevant information regarding their experiences with mathematics teachers.

   The selected participants for the focus group discussions were those who had demonstrated varying levels of academic performance in mathematics (high, average, and low achievers) according to their teachers' records. This ensured that different perspectives were represented. Each focus group consisted of six to eight students, which allowed for interactive discussions without making the sessions too crowded.

Justification for Using Students as Respondents

Although the study examined teacher-related factors such as teacher motivation, experience, attitude, and teacher–student interaction, students were chosen as the primary respondents. This decision was deliberate and methodologically appropriate because students are the direct recipients of teachers' instructional behaviors and

attitudes. They experience firsthand how a teacher's motivation, competence, and classroom practices affect their engagement and learning outcomes.

Similar studies, such as those by Obilor (2020) and Kariuk and Mbugua (2018), have also relied on students' perspectives to evaluate teacher-related variables. Hence, using students as respondents aligns with the purpose of this study, which was to assess how teachers' characteristics are perceived and experienced by learners and how these perceptions influence their achievement in mathematics.

Distribution of Sample

To ensure proportional representation across schools, the number of students selected from each participating institution corresponded to the relative size of its SHS 2 population. The process ensured that no school was over- or under-represented.

Table 3.1: Sampling Matrix

School	No of males	No of females	Total
Afua Kobi SHS	-	96	96
A.K SHTS	35	09	44
Kwanwoma SHS		09	20
Total.	11	114	160
	46		

Source: Field data (2025)

In summary, the sampling process combined random selection for the quantitative data and purposive inclusion for the qualitative phase to balance representativeness with depth. This hybrid approach ensured that the final sample was both statistically sound and contextually rich, allowing the study to draw reliable and meaningful conclusions

about teacher-related factors influencing students' mathematics achievement in the Atwima-Kwanwoma District.

3.4 Research Instruments

The research employed two different types of instruments. A structured questionnaire was used; and focus group discussion (FGP) were carried out for the same group of students in the sample.

3.4.1 The Questionnaire

The structured questionnaire used for the study consisted of two main sections. Section A gathered data on the demographic characteristics of respondents, including their gender and age distribution. Section B focused on obtaining information regarding the influence of teacher-related factors on students' performance in mathematics. The instrument comprised 30 items, each presented as a statement followed by a five-point Likert scale ranging from Strongly Agree (SA) to Strongly Disagree (DA). The questionnaire items were adapted from Obilor's (2020) study on teacher factors influencing students' academic performance in public secondary schools in Rivers State. The items were designed to align with and reflect the central themes outlined in the research questions (see Appendix 1).

3.4.2 Focus Group Discussion

Section C of the questionnaire sought information on the influence of teacher-related factors on students' academic performance. Since Likert-scale items could not fully capture respondents' thoughts and experiences, open-ended questions were also included. These questions were designed to collect qualitative data regarding students' emotions, reasons behind their low performance, and perceptions of their teachers' attitudes toward them. This section further explored students' expectations of teachers'

responses when they encountered learning challenges or provided incorrect answers, as well as the impact of teachers' comments on their academic reports.

In certain instances, it was necessary to interview several groups of participants simultaneously. The focus group discussion technique was used to collect a sufficient amount of qualitative data within a short period. According to Lindlof and Taylor (2002, as cited in Boachie, 2016), focus group discussions are among the most effective techniques for gathering such data. The main purpose of conducting focus group discussions is to utilize the "group effect" (Carey, 1994), which refers to the explicit use of group interactions to obtain data and insights that might not emerge in individual interviews (Morgan, 1988, p. 12). Within a group setting, participants are often encouraged by the ideas and experiences shared by others, which enhances the quality and depth of the discussion.

The study was conducted in three selected secondary schools within the Atwima-Kwanwoma District: Trede Senior High Technical School, Kwanwoma Secondary Technical School, and Afua Kobi Girls' Senior High School. Data were collected through focus group discussions, which were recorded using both handwritten notes and audio devices to prevent data loss in case of technical difficulties.

During planning and data collection, an interview protocol was used to guide the process. In line with Creswell's (2014) guidance, the protocol specified the interview date, venue, and participants, and outlined consistent procedures for all sessions. Each interview began with an introductory or ice-breaker question to help participants feel at ease, followed by four or five main open-ended questions designed to elicit detailed views on the topic. The interviewer ensured smooth transitions between questions and

encouraged participants to elaborate on their responses. Each session concluded with a brief appreciation to acknowledge participants' contributions.

The interview protocol (see Appendix 2) served as a framework to maintain uniformity across discussions and ensure that all essential information was systematically obtained from respondents.

3.5 Validity and Reliability

Validity refers to the extent to which the research instruments serve the use for which it is intended (Ahinkora et al, 2021). Face validity was achieved by presenting the instruments for review to some Master of Philosophy colleagues (2020-2021) students in the University of Education, Winneba. In fact, their feedback was taken inti account when the questions were revied. The research supervisor was tasked with carefully examining the items for appropriateness prior to use in order to ensure the content validity of the instruments. The supervisor deemed the goods valid after marking all required adjustment. By operationalizing the research and its metrics and using recognized definition and constructions of ideas and terminology, construct validity was guaranteed.

Kaliappan and Hamid (2022), defined reliability as the extent to which the results are consistent over time and if the results of a study can be reproduced under a similar methodology, then the research instrument is considered to be reliable. To ensure reliability of the research instruments, they were pre-tested on 20 Faith Rockery Senior High School students at Ahenema Kokoben to guaranteed their reliability. Version 23 of the statistical Package for the Social Sciences (SPSS) was used to analysed the pilot test finding using coefficient alpha reliability. According to Tinaguei (2017), this produced a reliability coefficient (r) of 0.73, which is over 0.70 threshold value of

acceptability as a measure of reliability and is therefore considered an acceptable measure reliability. For research purpose, a dependability coefficient of 0.70 is considered extremely reliable, according to Yilmaz and Kabak (2021). This outcome suggests that the instrument was dependable, which is why the actual investigation was employed it.

In addition, the focus group discussion (FGD) guide was also subjected to expert review to ensure its validity and appropriateness for the qualitative aspect of the study. The guide was carefully examined by the research supervisor and two senior lecturers from the Department of Education at the University of Education, Winneba, to confirm that each question aligned with the study objectives and captured relevant teacher-related factors such as motivation, experience, attitude, and teacher–student interaction. Minor revisions were made to improve clarity and flow before the actual data collection. To ensure reliability, the guide was pre-tested with a small group of students who were not part of the main study. The responses helped to refine the wording and sequencing of questions, which enhanced the consistency and credibility of the qualitative data collected.

3.6 Data Collection Procedure

Research clearance was obtained from the appropriate authorities, including the headmasters and headmistresses of the participating schools. In addition, consent from parents was secured through the Parent Association (PA) executives. The researcher initially visited the schools to familiarize himself with the school authorities and to explain the purpose and significance of the study. Subsequent visits were made to make the necessary arrangements for the actual administration of the research instruments and data collection. Several familiarization visits were conducted prior to data

collection to help establish rapport with teachers and students and to reduce possible shyness or anxiety during the study period.

During each visit, the researcher made efforts to build trust with participants and to ensure that they clearly understood the objectives and procedures of the study. Participants were informed both verbally and in writing, through the instrument, about the purpose and nature of the research. Participation in the study was entirely voluntary, and all participants were assured of complete anonymity and confidentiality of their responses.

Strict adherence to COVID-19 safety protocols was maintained by both students and teachers involved in the study. The headmaster of each participating school provided the necessary sanitary supplies, including Veronica buckets, water, liquid soap, and tissue paper, to facilitate proper handwashing before the commencement of each session. All participants were required to wash their hands before entering the classrooms. To maintain social distancing, a maximum of 30 students were allowed per class, and data were collected across six classes in total. The researcher also provided each class with a 200ml bottle of Taabea hand sanitizer. Furthermore, both students and teachers wore face masks throughout the administration of the questionnaires to ensure full compliance with health and safety guidelines.

3.7 Data Analysis

This study employed both quantitative and qualitative methods for data analysis. Each component was analyzed separately and later integrated to provide a comprehensive understanding of the findings.

3.7.1 Quantitative Data Analysis

The completed questionnaires were first collected and checked for accuracy and completeness. Each questionnaire was serially numbered to facilitate easy identification before being scored. Items on the five-point Likert scale were assigned the following values: Strongly Disagree (SD) = 1, Disagree (D) = 2, Neutral (N) = 3, Agree (A) = 4, and Strongly Agree (SA) = 5. The responses were tallied to determine the frequency of each response category for all items.

To facilitate the analysis, quantitative data were coded and entered into the Statistical Package for the Social Sciences (SPSS, version 23) and the Analysis of Moment Structures (AMOS, version 23) software. The Structural Equation Modeling (SEM) technique was employed to analyze relationships among the study variables. This enabled the identification of key patterns, associations, and predictive relationships within the data, allowing for generalizations and statistical validation of the research hypotheses.

3.7.2 Qualitative Data Analysis

The qualitative data were obtained through focus group interviews designed to capture students' perceptions, experiences, and attitudes in greater depth. Each interview session was conducted in a calm and supportive atmosphere to encourage open participation. The discussions were held in classrooms during free periods to avoid interfering with lessons, and each group comprised between six and eight students. The researcher moderated the sessions using a semi-structured interview guide that ensured consistency while allowing flexibility for probing questions.

With participants' consent, discussions were audio-recorded and supplemented with handwritten notes to ensure completeness and accuracy. The recordings were later

transcribed verbatim and reviewed alongside the notes to maintain the authenticity of participants' responses.

The transcribed data were analyzed thematically following Creswell's (2014) guidance. The process involved carefully reading through the transcripts, identifying recurring patterns, and grouping them into themes that reflected the key issues discussed. Following Guest, MacQueen, and Namey (2012), the analysis focused on refining and condensing the data to highlight the most relevant and meaningful insights. Five major themes emerged, representing the main factors that captured students' views on how teacher-related variables influenced their mathematics achievement.

3.8 Ethical Issues

Any research project involves several ethical considerations. These include the selection of the topic to be investigated, the care taken in carrying out the study, the respect shown to participants, and the integrity with which results are reported. According to Creswell (2014), participants should always be informed of the purpose of a study. He further explains that deception occurs when researchers fail to disclose the true purpose of their study to participants. In line with this principle, the researcher clearly communicated the aim of the study through an introductory letter requesting permission from the headmasters and headmistresses of the selected schools to conduct the research.

a. No Harm to Participants: Dixon and Quirke (2018) note that the ethical standards of voluntary participation and the protection of participants from harm are embedded in the concept of informed consent. This principle requires participants to make voluntary decisions to participate based on a full understanding of potential risks. Deshpande (2021) emphasizes that harm may occur in emotional or physical forms. In

this study, the researcher took every necessary precaution to ensure that participants were not exposed to any form of psychological or emotional distress during data collection or analysis.

b. Anonymity:

The welfare and interests of research participants must always be safeguarded. Turnbull, Chugh, and Luck (2021) assert that participants' identities should be masked or concealed to the greatest extent possible. Similarly, Pan et al. (2022) stress that neither readers of the research report nor the researcher should be able to link specific responses to individual participants. In this study, the identities of respondents were protected by using coded identifiers instead of names. This ensured that no personal information could be traced back to any participant.

c. Confidentiality:

Confidentiality is an essential ethical principle that requires researchers to protect participants' privacy and restrict access to personal data. Sim and Waterfield (2019) explain that confidentiality means ensuring that only the researcher knows who participated in the study. In this research, all responses, test scores, and completed questionnaires were securely stored and were not accessible to other students or mathematics teachers. The data were kept solely by the principal investigator and were used exclusively for the purpose of this study.

d. Plagiarism:

Plagiarism, often referred to as the "theft of intellectual property," violates academic integrity. Martins, Almeida, Henriques, and Novais (2021) emphasize that researchers must always acknowledge the intellectual contributions of others. To uphold this standard, all ideas, written works, figures, and other intellectual materials used in this

study were properly cited. Each reference included the author's name, year of publication, title, and source, ensuring full transparency and academic honesty.

e. Trustworthiness:

Under the guidance of the supervisor, the researcher applied rigorous methodological techniques to ensure the trustworthiness and reliability of the qualitative findings. The interview guide was thoroughly validated to ensure its relevance and effectiveness in eliciting meaningful responses from participants. This process enhanced the alignment between the interview questions, the study objectives, and participants' lived experiences, thereby improving the validity of the data collected.

To further ensure credibility, the researcher employed member checking, whereby participants were presented with summaries of their interview responses to confirm that their perspectives had been accurately captured. This iterative process enhanced the confirmability and authenticity of the findings.

Additionally, comprehensive documentation of the entire research process was maintained. This included audio recordings of interviews, detailed field notes, and systematic organization of collected data. Maintaining this audit trail enhanced the study's reliability, ensured transparency, and allowed for the replication of the research process by future scholars.

CHAPTER FOUR

ANALYSIS AND DISCUSSION OF RESULTS

4.0 Overview

This chapter presented an analysis and discussion of research results in alignment with study purpose. These results were discussed in relation to research aims set forth for the study. The first half presented a demographic overview of the sample population selected for study. Then, results relevant to the study purpose were presented. Finally, these results were discussed.

4.1 Demographics

This section presents the demographic characteristics of the respondents who participated in the study. The information includes gender distribution, course of study, and age range. These variables were important for understanding the composition of the sample and ensuring that the findings reflect the perspectives of students from diverse backgrounds within the Atwima-Kwanwoma District. Table 4.1 provides a summary of these demographic details.

Table 4.1: Demographics

Demographics	Frequency (N)	Percentage (%)
Gender	***160***	***100.0***
Male	46	28.8
Female	114	71.2
Course	***160***	***100.0***
General Arts	40	25.0
General Science	47	29.4
Home Economics	16	10.0
Visual Arts	17	10.6
Technical	40	25.0
Age	***160***	***100.0***
11-15 years	52	32.5
16-20 years	108	67.5

Source: Field data (2025)

4.1.1 Gender

According to the gender distribution, 28.8% of the respondents are male students, while 71.2% are female students. This indicates that female students formed the majority of the participants in the study.

4.1.2 Course of Study

Table 4.1 presents the distribution of respondents according to their course of study. Forty (40) students, representing 25%, offered General Arts. Forty-seven (47) students, representing 29.4%, offered General Science. Sixteen (16) students, representing 10%, offered Home Economics. Seventeen (17) students, representing 10.6%, offered Visual Arts, and forty (40) students, representing 25%, offered technical programmes.

4.1.3 Age

As shown in Table 4.1, 32.5% of respondents are between the ages of 11 and 15 years, while 67.5% are between 16 and 20 years. This implies that most of the students are within the typical secondary school age range.

4.2 Preliminary Analysis

To determine whether the study's data were acceptable, preliminary analysis was carried out. Mean and standard deviation (to check for normality), exploratory and confirmatory factor analyses, discriminant analysis, reliability analysis, and path analysis are among the early analyses carried out for this project.

4.2.1 Exploratory Factor Analysis (EFA)

To find underlying latent factors that explain the pattern of correlations among observable variables, exploratory factor analysis (EFA), a statistical approach, is employed in the fields of psychometrics and data analysis. It is a dimensionality

reduction technique meant to reveal the underlying organization or connections between collections of variables that have been observed. The fundamental objective of EFA is to comprehend the underlying dimensions or structure of a dataset by combining variables that have a high degree of correlation with one another and a low degree of correlation with other groupings of variables.

It aids in the simplification of complex data and the identification of the crucial elements that contribute to the patterns shown. Using SPSS (ver. 23), the EFA was calculated. In order to determine how each of the observable variables loaded on its associated latent variable, exploratory factor analysis was used to examine the related components. Through the use of this technique, several observable survey variables whose loading did not match the latent variable's correct location were reduced or eliminated (Marsh et al., 2020). The final EFA is presented in Table 4.2, which juxtaposes the observable variables with their appropriate latent variables.

Table 4.2: Exploratory Factor Analysis (EFA)

Rotated Component Matrix					
Measurement	**Component**				
Items	1	2	3	4	5
MOT1					.853
MOT2					.859
MOT4					.852
TAT2				.829	
TAT3				.859	
TAT4				.836	
TAT5				.766	
TAT7				.712	
TEP1			.817		
TEP2			.886		
TEP3			.895		
TEP5			.851		

TEP7			.798	
TSI1	.929			
TSI2	.933			
TSI3	.897			
TSI4	.873			
TSI5	.856			
MAC1		.776		
MAC2		.880		
MAC3		.891		
MAC4		.885		
MAC5		.777		

KMO and Bartlett's Test		
TVE		76.1862
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.830
Bartlett's Test of Sphericity	Approx. Chi-Square	5447.993
	Df	253
	Sig.	0.000
Determinant		1.23E-09

Source: Field data (2025)

Note:

MOT1–MOT4 represent items measuring **Teacher Motivation**, focusing on how teachers' enthusiasm, recognition, and commitment influence their teaching of mathematics.

TAT2–TAT7 denote items under **Teacher Attitude**, capturing teachers' beliefs, perceptions, and emotional dispositions toward mathematics instruction.

TEP1–TEP7 correspond to **Teacher Experience**, assessing aspects such as years of teaching, exposure to professional development, and the ability to apply effective instructional strategies.

TSI1–TSI5 relate to **Teacher–Student Interaction**, reflecting the quality of communication, engagement, and support teachers provide to students during mathematics lessons.

MAC1–MAC5 represent **Mathematics Achievement**, focusing on students' performance and demonstrated understanding of mathematical concepts.

Table 4.2 analysis results reveal the number of observable variables loaded on the corresponding latent variables. Observed variables that loaded higher than 0.5 and beneath the appropriate latent variables were used for further data analysis. It was found that there were three (3) observed variables for motivation (MOT), five (5) observed variables for teachers' attitude (TA), five (5) observed variables for teacher's experience (TE), five (5) observed variables for teacher students' interactions (TSI), and five (5) observed variables for mathematics achievement (MAC). With a Kaiser-Meyer Olkin Measure of Sampling Adequacy (KMO) of .830, the KMO successfully explained the right-dimensional loading of the observable variables on the latent variables in 83% of the instances. Bartlett's Test of Sphericity, using a Chi-square of 5447.993 and a degree of freedom of 253, found a significant p-value of .000. Along with the EFA, the four latent variables also revealed a cumulative variance of 76.1862%. All additional observed variables, however, that were misplaced on the rotated component matrix were removed. The final EFA is presented in table 4.2, where the variables are paired with the appropriate latent variables.

4.2.2 Descriptive Analysis

Descriptive analysis was also used in the study. This was used to test the questionnaire's normality using the mean and standard deviation. In table 4.2, the findings for each construct piece are displayed. The researcher was notified that the normality test was

successful by the mean and standard deviation for each construct.

Table 4.3: Descriptive Analysis

Measurement Items	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
MOT	***3.6255***	***1.16341***	***-.577***	***.147***	***-.667***	***.293***
MOT1	3.6182	1.33579	-.690	.147	-.643	.293
MOT2	3.6800	1.28699	-.678	.147	-.623	.293
MOT4	3.5782	1.30562	-.529	.147	-.850	.293
TA	***2.3527***	***1.14380***	***.895***	***.147***	***-.243***	***.293***
TA2	2.2364	1.48181	.896	.147	-.702	.293
TA3	2.2727	1.35159	.816	.147	-.553	.293
TA4	2.0655	1.40232	1.091	.147	-.243	.293
TA5	2.3018	1.38810	.824	.147	-.615	.293
TA7	2.8873	1.51815	.123	.147	-1.480	.293
TE	***3.4502***	***1.04955***	***-.545***	***.147***	***-.583***	***.293***
TE1	3.51636	1.187951	-.585	.147	-.491	.293
TE2	3.4545	1.18411	-.542	.147	-.502	.293
TE3	3.527273	1.1660424	-.539	.147	-.497	.293
TE5	3.3236	1.27611	-.413	.147	-.853	.293
TE7	3.4291	1.24010	-.478	.147	-.719	.293
TSI	***3.6160***	***.91398***	***-.364***	***.147***	***-.092***	***.293***
TSI1	3.5600	.99223	-.269	.147	-.241	.293
TSI2	3.5600	.99223	-.269	.147	-.241	.293
TSI3	3.6145	.98741	-.242	.147	-.482	.293
TSI4	3.6327	1.00710	-.422	.147	-.129	.293
TSI5	3.7127	.97843	-.575	.147	.032	.293
MA	***3.7280***	***.89307***	***-.543***	***.147***	***-.378***	***.293***
MA1	3.8727	1.00099	-.732	.147	.068	.293
MA2	3.6945	.97849	-.391	.147	-.425	.293
MA3	3.7964	.97148	-.400	.147	-.604	.293
MA4	3.7782	1.08653	-.684	.147	-.193	.293
MA5	3.4982	1.09869	-.353	.147	-.516	.293

Source: Field data (2025)

Table 4.3 explains how the descriptive statistics for each of the latent variables were analysed. TRF, TA, TE, TSI, and mathematics achievement using their mean scores and each corresponding standard deviation. From table 4.3, the total mean score of student Mathematics Achievement was reported as 3.7280 and a standard deviation of .89307.

Among each of the observed items which loaded under Mathematics Achievement, the lowest mean score was obtained for the question item 4 "I get good results in Mathematics" (M= 3.7782, SD= 1.08653) while its highest mean value was identified on the item 1 "Learning mathematics enhances my professional knowledge and skills" (M= 3.8727, SD= 1.00099). It was identified that the item 3 "Learning mathematics enhances my thinking ability" showed a mean of 3.7964 and a standard deviation of .97148 as the second highest mean. These mean scores lied within 3.7 to 3.8

Descriptive analysis of motivation (MOT) had a total mean score of (M= 3.6255, SD = 1.16341). The mean score of item 1 "Studying math will enable you to prepare for my future career" had a mean of 3.5782 and a standard deviation of 1.30562. This is seen to be the lowest score of the mean while item 2 "Studying math will be useful for the course of your choice at the university" (M= 3.6800, SD= 1.28699) showed the highest mean score among all the items under teaching quality. Item 4 "Studying math will improve work competence in the future" (M= 3.6182, SD= 1.33579) was reported as the second highest among the other observed variables. These mean scores lied within 3.5 to 3.9.

Descriptive analysis of teacher students' interaction had a total mean score of (M= 3.6160, SD= .91398). The mean score of items 3 "Teacher has higher expectation for all students" had a mean of 3.6145 and a standard deviation of .98714. This is seen to

be the lowest score of the mean while item 5 “Teaching individual’s students according to their different needs and abilities” (M= 3.7127, SD= .97843) showed the highest mean score among all the items under teaching quality. Item 4 “Teacher thinks about students as individual and believes all students can learn” (M= 3.6327, SD= 1.00710) was reported as the second highest among the other observed variables. These mean scores lied within 3.6 to 3.8.

The descriptive analysis of teacher experience has a total mean of 3.4502 with a standard deviation of 1.04955. The range of mean of the observed item was within 3.4 to 3.6. The highest item has a mean of 3.5273 and a standard deviation of 1.6604 for 3 “The teacher uses various strategies, teaching materials, and techniques in presenting lessons” while the least mean of the observed item was 2 “The teacher is updated with current trends, relevant to the subject matter” (M = 3.4545, SD = 1.18411). Item 1 “The teacher explains the objectives of the lesson clearly at the start of each period” (M= 3.5164, SD= 1.18795) was reported as the second highest among the other observed variables.

Lastly, the descriptive analysis of teacher attitude has a total mean of 2.3527 with a standard deviation of 1.14380. The range of mean of the observed item was within 2.2 to 2.9. The highest item has a mean of 2.8873 and a standard deviation of 1.51815 for 7 “He is open to suggestions and prompt opinions of students and is worthy of praise” while the least mean of the observed item was 3 “My teach score students’ work promptly with comments for future improvement” (M = 2.2727, SD = 1.35159). Item 5 “” (M= 2.30718, SD= 1.38810) was reported as the second highest among the other observed variables.

The measurement items were positively regarded by the respondents, as seen by the majority of them having a mean score higher than 2, as shown in Table 4.3. As part of the normality test, all the components in multivariate normality are univariate normally distributed. The skewness and kurtosis statistics were used to estimate the data's normalcy. From Table 4.3, the discovered skewness and kurtosis indices are under the required ranges of "below |4|" and "below |8|" indicating that the data on each question is normally distributed (Gosnell et al., 2011).

4.2.3 Reliability Analysis

Cronbach's alpha was used to calculate reliability analyses using SPSS (ver. 23). The study was performed to examine the latent variables' internal consistency. In Table 4.4, the reliability analysis is condensed. For MOT, TAT, TEP, TSIN, and mathematics achievement (MAC), the corresponding coefficients are given as .866, .859, .917, .956, and .918. The dependability coefficients for the four constructs used in this analysis are higher than the 0.6 minimal cut-off values**.**

Table 4.4: Reliability Analysis

Variables	Number of Items	Cronbach's Alpha Value
MOT	3	.866
TAT	5	.859
TEP	5	.917
TSIN	5	.956
MAC	5	.918

Source: Field data (2025)

From Table 4.4, a Cronbach's Alpha rating of 0.866 indicates that the MOT variable has strong internal consistency. The TA variable has a Cronbach's Alpha value of 0.859,

indicating strong internal consistency as well. The TE variable has a Cronbach's Alpha of 0.917, indicating strong internal consistency. With a high Cronbach's Alpha of 0.956, the TSI indicates very good internal consistency between its elements. With a Cronbach's Alpha of 0.918, the MA variable has strong internal consistency, much like the TE variable does.

4.2.4 Confirmatory Factor Analysis (CFA)

A statistical method called confirmatory factor analysis (CFA) is employed in the study of psychometrics and social sciences to evaluate the reliability of a measurement model (Rönkkö & Cho, 2022; Tomarken & Waller, 2005). It is a kind of structural equation modelling (SEM) that uses observable variables or indicators to confirm or support a postulated structure of latent (unobserved) variables (Marsh et al., 2020)**.** Theoretical models for CFA are put out by researchers and include latent variables and the related observable indicators. Although the latent variables cannot be measured directly, they are thought to affect the observed variables. The major objectives of CFA are to evaluate the model's fit to the observed data and determine whether the data obtained support the proposed structure**.**

From Table 4.4, Motivation (MOT) had ten (10) observed variables but seven (7) variables under it were deleted due to poor factor loading remaining three (3) variables with good factor loadings. Teacher attitude had ten (10) variables but five (5) observed variables were deleted due to poor factor loadings remaining five (5) variables with good factor loadings. Teacher experience (TEP) had ten (10) observed variables but five (5) variables were deleted due to poor factor loading remaining five (5) observed variables with good factor loadings. Teacher students' interaction (TSI) had ten (10) observed variables but five (5) observed variables were deleted with poor factor

loadings remaining five (5) observed variables with good factor loadings. Mathematics achievement had ten (10) observed variables but five (5) observed variables were deleted with poor factor loadings remaining five (5) observed variables with good factor loadings.

Table 4.5: Confirmatory Factor Analysis (CFA)

Model Fit Indices: ***CMIN = 413.659; DF = 215; CMIN/DF = 1.924; CFI = .963; TLI = .956; GFI = ; RMR = .067; RMSEA = .058; PClose = .058;***	***Std. Factor Loading***
Teacher Motivation (MOT):CA = .866; CR = .867; AVE = .686	
MOT1: Studying math will enable you to prepare for my future career.	.781
MOT2: Studying math will be useful for the course of your choice at the university.	.852
MOT4: Studying math will improve work competence in the future.	.849
Teacher Attitude (TAT): CA = .859; CR = .863; AVE = .561	
TAT2: My teacher does not bother whether or not students' complete assignment.	.788
TAT3: My teach score students' work promptly with comments for future improvement.	.834
TAT4: My teacher does not give assignment and test promptly except end of semester exam.	.796
TAT5: My teach keep on insulting me when I fail to provide correct answers.	.682

TAT7: He is open to suggestions and prompt opinions of students and is worthy of praise.	.625
Teacher's Experience (TEP): CA = .917; CR = .922; AVE = .703	
TEP1: The teacher explains the objectives of the lesson clearly at the start of each period.	.830
TEP2: The teacher is updated with current trends, relevant to the subject matter.	.871
TEP3: The teacher uses various strategies, teaching materials, and techniques in presenting lessons.	.878
TEP5: The teacher encourages students' participation in discussions.	.837
TEP7: Teachers creates extra time for remedial teaching.	.772
Teacher-Students Interactions (TSIN): CA = .956; CR = .943; AVE = .770	
TSIN1: Students and teaches treat each other with respect.	.987
TSIN2: Most teachers are enthusiastic about teaching and communicating with students.	1.002
TSIN3: Teacher has higher expectation for all students.	.823
TSIN4: Teacher thinks about students as individual and believes all students can learn.	.771
TSIN5: Teaching individual's students according to their different needs and abilities.	.774
Mathematics Achievement (MAC): CA = .918; CR = .926; AVE = .715	

MAC1: Learning mathematics enhances my professional knowledge and skills.	.769
MAC2: Learning mathematics enhances my decision-making ability.	.881
MAC3: Learning mathematics enhances my thinking ability.	.888
MAC4: I get good results in Mathematics.	.885
MAC5: I usually do well in mathematics.	.796

Source: Field data (2025)

Bamfo et al. (2018) analyses the confidence of the model fit of the CFA based on the analysis result in Table 4.5, noting that the CMIN/DF value should be less than 3, the RMR and RMSEA value should not be more than 0.08, and the CFI and TLI value should be at least 0.9. Dogbe et al. (2020) claim that RMR and RMSEA provide the full fit indices by determining how far the model deviates from the different hypotheses put forth, while CMIN guarantees the least degree of disagreement. The normal theory on continuous data, which was anticipated to work with the reference line model, is used to construct the TLI and CFI values, in contrast. The P Close must be statistically insignificant which means that, its value must not exceed 0.05. Figure 4.1 below shows a schematic of the confirmatory factor analysis. CMIN/DF was 1.924, RMR and RMSEA were .067 and .058, respectively, according to table 4.5. Additionally, it was noted that the PClose value of .058 exceeded 0.05. The CFI and TLI scores were both more than .963 at .956 and 0.981, respectively. Since all the model fit indices results as presented in Table 4.5 are in line with as Faremi et al. (2018) model fit recommendation, then data fit for further data analysis.

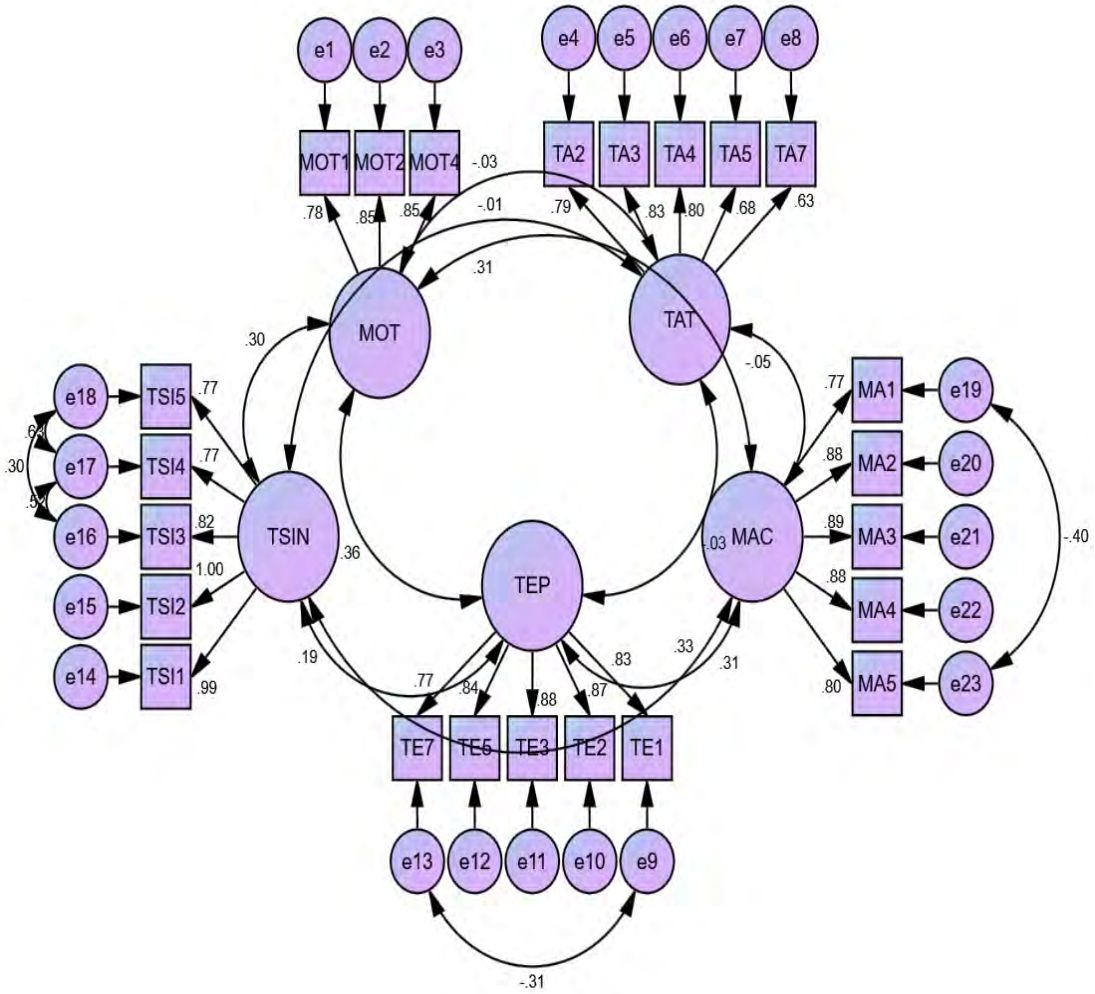

Figure 4.1: Confirmatory Factor Analysis (CFA)

4.2.5 Discriminant Validity

To assess the convergent validity and reliability of the resulting observed variables that estimated the CFA, the average variance extracted (AVE) and composite reliability (CR) were determined. Convergent validity assesses how strongly each observed item correlates with the other observed variables on the same construct (Roemer et al., 2021). It is recommended that the AVE and CR have expected values of at least 0.5 and 0.7, respectively. The AVE and CR were calculated for further analysis of the study and to achieve convergence validity. The results confirm at least AVE =.819 and CR =.931, which satisfies the criteria for AVE and CR by Pomegbe et al. (2020).

The technique of other researchers, such as Arthur (2022), who explained that discriminant validity is acquired when least square-root values of AVE exceeded the correlation coefficient, which the coefficient values were derived from the CFA output using the covariance, was used to evaluate the discriminant validity. Table 4.6 compares the $\sqrt{AVE}$ and associated latent variable association.

Table 4.6: Discriminant Validity

Variables	CR	AVE	MSV	MaxR(H)	MOT	TAT	TSIN	TEP	MAC
MOT	.867	.686	.128	.872	***.828***				
TAT	.863	.561	.002	.877	-.028	***.749***			
TSIN	.943	.770	.110	1.004	.300***	-.005	***.877***		
TEP	.922	.703	.128	.926	.357***	-.033	.187**	***.839***	
MAC	.926	.715	.110	.933	.311***	-.046	.332**	.305**	***.845***

Source: Field data (2025)

According to Table 4.6, where the lowest square-root of AVE value is .749 and the greatest correlation coefficient is .332, the least square-root of AVE value is bigger than the highest value for correlation of the latent variables. It is clear from this why discriminant validity is attained.

Moreover, the composite reliability of all the variables (MOT, TAT, TSIN, TEP, and MAC) is strong, ranging from .863 to .943. This suggests that there is a high level of internal consistency for each variable among the measured items. The range of AVE values is .561 to .770. These figures show how much of the variance was explained by the latent construct in comparison to the measurement error. Certain variables have

higher AVE values, which suggest better convergence between the measured items and the latent construct, even though they are generally acceptable. The range of MSV values is .002 to .128. The maximum shared variance between the latent constructs is represented by these values. It is preferable to have lower MSV values, which show less overlap between constructions. Finally, the range of MaxR(H) values is .872 to 1.004. The maximum correlation between latent constructs is represented by these numbers. Even if these correlations are often high, it's important to determine whether they fall within acceptable ranges in the given situation. Significant T-values for a few variables (TSIN, TEP, and MAC) indicate that particular routes or correlations are statistically significant at the .001 level. TAT negative T-values suggest possible problems that would require more investigation. The percentage of each latent construct's variation that can be accounted for by its measured indicators is shown by the squared multiple correlations. Significant values for TEP and MAC indicate that the measured items account for a sizable portion of the variance.

4.3 Path Results

To ascertain how the independent factors affected the dependent variables, path analysis was performed. It also looked at how the student's interest in mathematics was influenced by their gender, age, religious affiliation, educational level, and program of study.

The research topics of this study are evaluated in Table 4.7 using route analysis to determine the numerous direct effects. The route analysis provides a method of breaking down the link between the independent factors and the dependent variables, supporting theories put forth by previous scholars. This was examined utilizing Amos' Structural Equation Modelling (SEM) (ver. 23).

Table 4.7: Path Summary

Direct Effect	Std. Estimates	S.R	C.R	P-value
TSIN→MAC	.198	.046	4.353	< .01
TEP→MAC	.161	.047	3.423	< .01
MOT→MAC	.122	.045	2.695	.007
TAT→MAC	-.023	.040	-.577	.564

Source: Field data (2025)

2.4 Discussion of Results

2.4.1 Research Question One: What is the influence of teacher motivation on students' mathematics Achievement?

Research question one investigated what influence teacher motivation has on students' math achievement. This was addressed by direct effect (MOT→MAC) analysis from table 4.7. Teacher motivation has a direct positive influence on math achievement as a predictor with $p < .01$. The analysis found that the relationship between the two generated a p-value of .007 which was statistically significant at the 1% level. The standardized estimates revealed that teacher motivation directly influenced mathematics achievement for secondary students ($\beta = .122$; C.R. = 2.695). That is, 12.2% of the benefits to improved student mathematics achievement for high school students is gained when these students feel teacher motivation.

These findings support (de Lourdes Mata, Monterio and Peixoto, 2021). They concluded that student motivation is provided not only through student perceptions, but also through teacher expectations, support and comments. Teacher comments drive their cognitive crises and are the fundamental source to their emotional configurations. Therefore, it is important to consider the influence of these factors as an external

motivating factor for students. Ultimately, the more a student feels motivated, the more successful they feel with mathematics content.

Davis-Ewart and Lee (2023) also explored multi-level motivations for stimulant use in sexual minority men in South Florida. They concluded that it's critical for all teachers to acknowledge that various forms of motivation play a major role in the classroom. For example, a smile from the teacher, polite speech, counseling on social-emotional concerns, after school assistance with a task, etc., can encourage student motivation. Overall, the findings of this study support and align with findings of the above studies that teacher attributes play an important role in student mathematics achievement.

In summary, the findings confirm that teacher motivation has a significant positive influence on students' mathematics achievement, fulfilling the first research objective of the study and aligning with Reinforcement Theory, which emphasizes motivation as a key driver of learning behavior.

2.4.2 Research Question Two: How does teacher experience on students' mathematics achievement?

Relative to the results of the second research question, the question sought to assess the role of teacher experience to predict students' mathematics achievement. This was answered based on the TEP→MAC of the direct effects found in table 4.7. Teacher experience was found to have a direct influence on student mathematics achievement as a path predictor with a $p < 0.01$ significance level. Relative to the SEM analysis run, the path between teacher experience and math achievement received .000 significance at the 1% level. Relative to the paths hypothesized, teacher experience had a direct positive impact on student mathematics achievement ($\beta = .161$; C.R. = 3.423).

These findings were corroborated by Yala and Wanjohi (2011) who found teachers' years of experience and educational qualifications were the two leading predictors of academic achievement from the student perspective.

Tara, Anne and Darling-Hammond (2019) also empirically supported this with their qualitative analysis of 30 different studies produced and reviewed within 15 years; they found that they increased value quicker based on supportive/work collegial systems than time accumulated across grade levels/subjects/a more localized district approach. In conclusion, the results demonstrate that teacher experience significantly predicts students' mathematics achievement, addressing the second research objective. This finding underscores the importance of experienced teachers in improving learning outcomes, consistent with prior studies emphasizing the role of professional growth and pedagogical maturity.

2.4.3 Research Question Three: What is the extent to which teacher students' interaction' influence students' mathematics achievement?

The third question of the research related to teacher-students interaction, the motivator of interest, the extent to which students' mathematics achievement is influenced. This was answered through direct effect from Table 4.7. Teacher-student's interaction is a statistically significant (p-value < 0.01) direct predictor of mathematics achievement. As for path analysis, teacher-student's interaction and mathematics achievement are statistically significant at the 1% level (p = 0.000). As for path (hypothesized) analysis, teacher-student's interaction directly/positively impacts mathematics achievement of senior high school students (β = .198; C.R. = 4.353). This means that 19.4% of the increase of mathematics achievement of senior high school students is experienced by effectiveness of teacher-student's interaction.

According to Nabie (2004), a threatening mathematics classroom causes tension, and punishment (punishments) prevents effective teaching and learning movement. When a teacher pushes a student away, beats him up, insults him, they feel bad resulting in low achievement level. On the contrary, positive interaction in teacher-student (student-teacher) is an essential aspect of performance level of student achievement. Therefore, as a teacher, it is important to attract effectiveness to emotional and academic needs levels by providing a safe and calm atmosphere for teaching and learning and a more positive atmosphere created by a better relationship. Teacher-students interaction also include teachers' questioning, assessment homework, grading and commending or reprimanding. Longobarti, Sett, Lin and Fabrics (2021) evaluate the levels of achievement through multiple regression analysis by a correlation between achievement and teacher-student interaction and based on multiple regression analysis found that closeness with teachers and the perceived intimacy of teacher-students relationship significantly and positively correlated to students' perceived levels of achievement.

The finding in this research is consistent with Longobarti, Sett, Lin and Fabrics (2021). In summary, the study revealed that teacher–student interaction has a strong and statistically significant effect on students' mathematics achievement. This finding supports the third research objective and highlights the importance of positive relational dynamics in fostering active engagement and improved performance.

2.4.4 Research Question Four: What are the effect teachers' attitude on students' mathematics achievement?

Results of the study showed that teacher attitude (TAT) has a statistically insignificant negative impact on student mathematics achievement (MAC). A p-value greater than

0.05, which confirms statistical insignificance beyond the .05 level, supports this finding. In other words, teacher attitude negatively impacts student mathematics achievement. The path from teacher attitude (TAT) to student mathematics achievement (MAC) is standardized at -.023. This means that the attitude of the teacher negatively impacts the achievement of students in mathematics.

In conclusion, although teacher attitude showed a negative and statistically insignificant relationship with students' mathematics achievement, this finding still fulfills the fourth research objective by providing critical insight into how teacher dispositions may indirectly shape classroom motivation and student perception of learning.

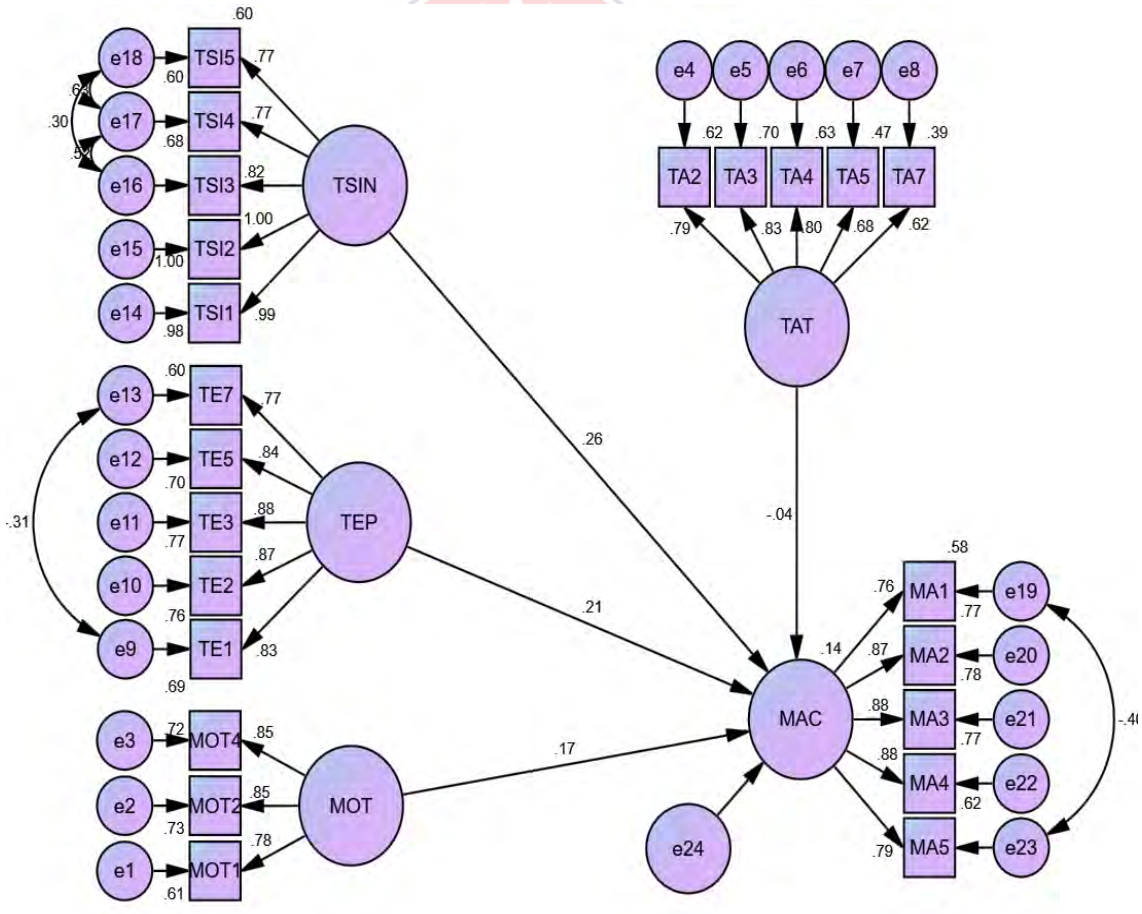

Figure 4.2: Path Summary

4.5 Students Focus Group Discussion Results

Focus group discussion (FGD) were conducted separately for students to get a variety of perspective on the impact of teachers' attitudes on students' mathematics' achievement. Views from the focus group discussions (FGD) are displayed below.

When asked to characterize the teaching style that they felt had improved their academic performance, students responded by putting in more effort because they were afraid of disappointing such excellent teachers. These characteristics included being kind and showing concern for their students' learning difficulties, discussing or counselling them, offering remediation, checking their work, and encouraging them. Instead of making humiliating remarks that would simply lower their spirits, they advised teachers to politely and appropriately to them. In order to keep underachieving students from being discouraged about learning, they recommended that teachers should be understanding, open-minded, and smile freely at them.

Responses to the issue of how beneficial teachers' report form comments had been on students' academic performance such as remarks like "study hard", "put in more effort", "can do improve", "can do better", etc. were found to be psychologically advantageous because they encouraged students to work hard. According to the students these remarks improved their academic achievement.

Nevertheless, it was thought demoralizing remarks such as "poor work", "very poor", "lazy work", etc. caused students to relax and accept the label of failure, leading them to behave accordingly. In turn, these students tended to act in accordance with this label. Additionally, when teachers used similar remarks to them, learners tended to become resentful of them. Respondents gave the following answers when asked if teachers' displays of their student's poor exam scores had any effect at all on their academic

work: the gesture was ineffective because it exposed the students in question to mockery from the public.

They said that learners who felt this kind of embarrassment had a tendency to become low on themselves, which could result in subpar academic results. Students who felt they were being treated unfairly by their teachers also claimed that they tended to cease bringing their books in for grading.

The way some teachers treated them was characterized by students as aggressive. They also bemoaned the fac that this mindset made it challenging for students to ask teachers for assistance with some of their learning challenges. The majority of students reported that relatively few teachers helped them when they were having difficulties with their assignments and this agreed to (Rindu & Ariyanti, 2017), that teachers are learning superintended.

From the findings from students' responses, whilst some of the interviews were encouraging their own colleagues to study mathematics, others were of the view that mathematics is very hard and therefore discouraging from studying the subject. Additionally, one's attitude toward mathematical achievement is influenced by a variety of circumstances, including the attitudes of teachers and co-workers. Students are discouraging one another by making fun of their peers whenever they give incorrect answers to questions, even though teachers attitude in the classroom were helping students to develop positive attitudes toward mathematics. Since one's attitude has a big impact on other people, it can also have a big impact on one's mathematical performance and talent. Maat and Zakaria (2010) of the view that several factors of school (teacher support, student to student interaction, etc) are jointly influence attitudes and behaviour of students toward mathematics.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.0 Overview

This chapter presents a comprehensive summary of the entire study by revisiting its purpose, major findings, conclusions, and recommendations. It serves as the final stage of the research process, where all key insights are brought together to show how the study's objectives were achieved and what lessons can be drawn from the results. The chapter highlights the main findings obtained through both the quantitative and qualitative analyses and connects them to the theoretical framework that guided the study.

The section also provides a detailed account of the conclusions reached, which are grounded in the evidence presented in the earlier chapters. These conclusions are used to propose relevant recommendations aimed at improving the teaching and learning of mathematics at the senior high school level. Specific attention is given to the role of teachers, since their motivation, experience, attitude, and interaction with students were found to be central to students' academic achievement.

In addition, this chapter identifies areas that require further research. These suggestions are intended to help future scholars and education practitioners build on the existing findings and explore other aspects that may not have been fully captured within the scope of the current study.

Overall, this chapter ties together the entire research journey. It transforms the collected data, analyses, and discussions into practical knowledge that can guide policy and educational reform. The chapter concludes by emphasizing that improving mathematics

achievement among students demands a holistic approach that strengthens teacher capacity, promotes positive classroom environments, and fosters student motivation and engagement.

5.1 Summary of the study

The purpose of this study was to investigate the influence of teacher-related factors on students' achievement in mathematics within selected senior high schools in the Atwima-Kwanwoma District of Ghana. The study was motivated by the persistent low performance of students in mathematics in the West African Senior School Certificate Examination (WASSCE), despite the numerous educational reforms and interventions implemented by the Ministry of Education and the Ghana Education Service. This poor performance, which has been consistent across many schools, raised concerns about what other factors, beyond curriculum and resources, might be contributing to the challenge.

The study specifically examined four teacher-related factors, namely teacher motivation, teaching experience, teacher–student interaction, and teacher attitude. These factors were selected based on their prominence in the literature as key determinants of students' learning outcomes, particularly in mathematics. The study was guided by four main research questions, each corresponding to one of these factors, to determine the extent to which they influence students' mathematics achievement.

To achieve these objectives, the research adopted a mixed-methods design which combined both quantitative and qualitative approaches. The quantitative approach was used to collect numerical data through a structured questionnaire administered to students, while the qualitative approach employed focus group discussions to explore students' views and experiences in more depth. This combination provided a more

comprehensive understanding of the research problem and allowed for triangulation of data to enhance the validity and reliability of the findings.

The population of the study consisted of 1,600 second-year students from three senior high schools within the district. Using simple random and purposive sampling techniques, a sample of 160 students was selected to participate. The structured questionnaire included items measuring perceptions of teacher motivation, experience, attitude, teacher–student interaction, and their perceived impact on mathematics achievement. For the qualitative component, focus group discussions were held with groups of students from each school to capture their lived experiences and interpretations of how teachers' behavior, attitudes, and instructional approaches affected their performance.

Data from the questionnaires were analyzed using the Statistical Package for the Social Sciences (SPSS version 23) and the Analysis of Moment Structures (AMOS version 23). Structural Equation Modelling (SEM) was applied to examine the direct and indirect relationships among the variables. This analytical technique made it possible to identify the strength and direction of the influence each teacher-related factor had on students' mathematics achievement. For the qualitative data, the recorded discussions were transcribed, coded, and analyzed thematically to identify recurring patterns and themes that reflected the students' perceptions and experiences.

The study was underpinned by Skinner's Reinforcement Theory, which emphasizes motivation and reinforcement as key elements of learning. The theory was relevant because it explains how rewards, encouragement, and positive feedback from teachers can shape students' attitudes and behaviors toward mathematics. It also helped to

establish the connection between teacher motivation, student engagement, and academic achievement.

The findings revealed that teacher motivation, teacher experience, and teacher–student interaction all had significant positive effects on students' mathematics achievement. Teachers who were motivated and committed to their work were more likely to use innovative teaching strategies, create a supportive classroom environment, and inspire their students to learn. Similarly, teachers with greater experience demonstrated better mastery of subject content and teaching techniques, which helped students understand mathematical concepts more easily. Positive teacher–student interactions, characterized by respect, patience, and effective communication, also contributed significantly to students' confidence and participation in mathematics lessons.

However, teacher attitude was found to have a negative but statistically insignificant influence on students' mathematics achievement. While the quantitative results did not show a strong direct relationship, the qualitative findings indicated that negative teacher attitudes—such as impatience, harsh remarks, and lack of encouragement—often discouraged students and reduced their interest in mathematics. This suggests that teacher attitude may indirectly affect achievement through its impact on students' motivation and classroom climate.

In conclusion, the study confirmed that teacher-related factors are crucial determinants of students' performance in mathematics. It emphasized that improving mathematics achievement requires attention not only to curriculum and instructional materials but also to the human aspects of teaching, including motivation, experience, attitude, and the nature of teacher–student relationships. These findings form the foundation for the conclusions and recommendations presented in the subsequent sections of this chapter.

5.2 Summary of Key Findings

The findings of the study provided valuable insights into how teacher-related factors collectively and individually influence students' achievement in mathematics. Both the quantitative and qualitative analyses revealed consistent patterns that emphasize the importance of the teacher's role in the learning process. The following major findings emerged from the study:

1. Influence of Teacher Motivation on Students' Mathematics Achievement

The study found that teacher motivation has a significant and positive influence on students' achievement in mathematics. Teachers who were well-motivated displayed greater enthusiasm for their work, prepared their lessons thoroughly, and adopted creative approaches that made mathematics more engaging. Students taught by motivated teachers showed higher levels of participation and confidence, which translated into better performance. On the other hand, lack of motivation among teachers—often linked to inadequate remuneration, limited resources, or lack of recognition—was associated with reduced teaching effectiveness and lower student interest.

This finding supports the idea that teacher motivation is a strong predictor of student outcomes because it affects not only instructional delivery but also the emotional and psychological climate of the classroom. Motivated teachers tend to inspire a similar sense of purpose and effort in their students, leading to improved learning outcomes.

2. Influence of Teacher Experience on Students' Mathematics Achievement

Teacher experience was also found to have a statistically significant positive effect on students' mathematics performance. Experienced teachers were more likely to demonstrate mastery of subject content, use a variety of instructional techniques, and

provide effective feedback to their students. They were also better at managing classroom dynamics, identifying learning difficulties, and offering timely remedial support.

The study showed that students taught by experienced teachers were generally more confident in tackling complex mathematical problems. These teachers' accumulated knowledge of effective classroom practices and understanding of individual learner differences contributed to their ability to foster better academic outcomes. However, the study also noted that the impact of experience becomes stronger when combined with ongoing professional development. Teachers who regularly participated in training and workshops were better able to update their knowledge and sustain high levels of instructional quality.

3. Influence of Teacher–Student Interaction on Students' Mathematics Achievement

Among the variables examined, teacher–student interaction emerged as one of the strongest predictors of students' success in mathematics. The study established a direct and significant positive relationship between the quality of teacher–student interactions and students' achievement levels.

Students reported that they performed better when their teachers were approachable, patient, and willing to provide extra help. Positive interactions created a classroom atmosphere in which learners felt valued and supported, which encouraged active participation and reduced anxiety associated with mathematics. Teachers who fostered open communication, encouraged questions, and provided constructive feedback helped students develop confidence and persistence.

Conversely, poor interactions—such as teachers shouting at students, ridiculing them for wrong answers, or appearing disinterested—were shown to demotivate learners and inhibit their ability to perform well. The findings highlight that teacher–student interaction is not only a matter of instructional technique but also a social and emotional process that shapes students' overall attitude toward mathematics.

4. Influence of Teacher Attitude on Students' Mathematics Achievement

The study revealed that teacher attitude had a negative but statistically insignificant influence on students' mathematics achievement. Although the quantitative data did not show a strong direct correlation, the qualitative evidence suggested that teacher attitude still plays a crucial indirect role in shaping classroom experiences.

Students who described their teachers as friendly, supportive, and encouraging tended to express greater interest and confidence in learning mathematics. In contrast, students who experienced teachers as harsh, impatient, or dismissive often lost motivation and developed negative feelings toward the subject. This shows that while attitude alone may not determine academic success, it contributes significantly to the emotional environment that either enhances or inhibits learning.

5. Combined Effect of Teacher-Related Factors

Overall, the study found that teacher-related factors collectively account for a substantial proportion of the variance in students' mathematics achievement. Motivation, experience, and teacher–student interaction demonstrated the strongest predictive power, while teacher attitude, although weaker in direct effect, still influenced students' engagement indirectly.

The findings suggest that mathematics performance cannot be improved by focusing on isolated aspects of teaching. Instead, an integrated approach that combines teacher motivation, professional development, positive interaction, and supportive attitudes is essential. This holistic understanding underscores that teacher-related factors are interconnected and function together to shape the learning environment and determine how effectively students grasp mathematical concepts.

In summary, the study confirmed that the quality of mathematics education depends heavily on the human dimensions of teaching. Teachers who are motivated, experienced, and capable of building strong relationships with their students contribute significantly to better academic outcomes. The next section presents the conclusions drawn from these findings and their broader implications for educational policy and classroom practice.

5.3 Conclusion

The purpose of this study was to determine how teacher-related factors influence students' achievement in mathematics in senior high schools within the Atwima-Kwanwoma District. The study's conclusions are drawn from the analysis of both quantitative and qualitative findings and are interpreted within the context of the Reinforcement Theory, which emphasizes the role of motivation, encouragement, and positive reinforcement in shaping behavior and learning outcomes.

The study concludes that the achievement of students in mathematics is strongly dependent on the human dimensions of teaching. While curriculum content, teaching materials, and school infrastructure are undeniably important, they cannot alone produce meaningful learning outcomes without motivated, experienced, and committed teachers who are able to engage their students effectively. The teacher remains the

single most influential factor in determining how students perceive, experience, and succeed in mathematics.

1. Teacher Motivation and Student Achievement

The findings clearly indicate that teacher motivation significantly enhances students' mathematics performance. Teachers who are enthusiastic about their work tend to go beyond the basic instructional requirements by creating engaging lessons, offering extra assistance, and maintaining a positive attitude toward student progress. Motivation drives teachers to invest more time and effort in lesson preparation, assessment, and student mentoring.

When teachers feel valued, supported, and recognized for their efforts, their performance improves, and this directly translates into better learning outcomes. Conversely, when teachers face low pay, limited promotion opportunities, and poor working conditions, their morale and productivity decline. The study therefore concludes that teacher motivation is not just a personal matter but a critical institutional factor that directly influences the quality of mathematics teaching and learning.

2. Teacher Experience and Instructional Effectiveness

Teacher experience was found to be another crucial factor affecting students' mathematics achievement. Experienced teachers bring years of accumulated knowledge about student behavior, curriculum demands, and effective teaching strategies. They are often able to anticipate common learning difficulties, adjust their methods accordingly, and provide relevant examples that make abstract mathematical concepts easier to grasp.

The study concludes that the depth of a teacher's experience significantly enhances classroom effectiveness. However, experience alone is not sufficient unless it is complemented by ongoing professional development. Teachers need regular opportunities to upgrade their skills and adapt to evolving pedagogical practices. This combination of experience and continuous learning forms the foundation for sustained instructional excellence and improved student performance.

3. Teacher–Student Interaction and Learning Outcomes

The study also concludes that the quality of interaction between teachers and students is one of the strongest predictors of mathematics achievement. A classroom where students feel respected, encouraged, and supported becomes a space where learning can flourish. Positive teacher–student relationships build trust, reduce anxiety, and promote active participation.

In contrast, classrooms characterized by hostility, intimidation, or neglect hinder students' willingness to engage. When teachers are approachable, empathetic, and willing to provide assistance, students are more likely to develop confidence in their ability to understand mathematical concepts. Thus, the study concludes that effective teacher–student interaction is a cornerstone of successful mathematics education because it integrates cognitive instruction with emotional and social support.

4. Teacher Attitude and Classroom Climate

Although the statistical analysis showed that teacher attitude had an insignificant direct effect on students' performance, the qualitative findings revealed its indirect but powerful influence on classroom atmosphere and student motivation. The study concludes that teacher attitude is a hidden yet vital component of the learning process.

Teachers who exhibit patience, fairness, and respect create a positive classroom climate where students feel comfortable asking questions and expressing ideas.

A teacher's negative attitude, on the other hand, can discourage students and foster fear or disinterest toward mathematics. Therefore, attitude functions as a psychological bridge between teaching effectiveness and student engagement. The study underscores that improving teachers' attitudes requires both personal reflection and institutional support, including mentoring, recognition, and emotional well-being initiatives.

5. The Combined Impact of Teacher-Related Factors

Finally, the study concludes that the four teacher-related variables—motivation, experience, attitude, and teacher–student interaction—are interdependent. When these factors work together, they create an environment conducive to effective teaching and meaningful learning. A motivated teacher with strong interpersonal skills and years of experience can inspire students to view mathematics not as a difficult subject but as a manageable and rewarding one.

The study therefore affirms that enhancing mathematics achievement requires a holistic approach that addresses the professional, psychological, and relational dimensions of teaching. Efforts to improve student outcomes must focus not only on curriculum reforms and assessment strategies but also on strengthening teacher morale, competence, and engagement.

In summary, the study concludes that teachers play an irreplaceable role in shaping students' mathematical understanding and performance. Improving teacher motivation, supporting professional development, encouraging positive interactions, and fostering constructive attitudes are key to raising the standard of mathematics education in

Ghana's senior high schools. The next section translates these conclusions into specific recommendations for policy and practice.

5.4 Recommendations

The findings and conclusions of this study highlight that improving students' achievement in mathematics requires deliberate and sustained efforts from multiple stakeholders. Teachers, school administrators, educational policymakers, parents, and students all play interconnected roles in shaping the quality of mathematics education. Based on the results, the following recommendations are made to guide practice, policy formulation, and further professional development within the educational system.

1. Recommendations for the Ministry of Education and the Ghana Education Service (GES)

The Ministry of Education and the Ghana Education Service should play a leading role in developing and implementing policies that enhance teacher motivation, professional development, and classroom effectiveness.

a. Develop structured teacher motivation programs.: There is a need for nationwide motivation and recognition schemes that reward teachers who demonstrate excellence and dedication. Motivation should not be limited to financial incentives but should include non-monetary rewards such as professional awards, opportunities for further study, public recognition, and promotion based on performance. These measures will enhance morale and encourage teachers to remain committed to their work.

b. Strengthen professional development and continuous learning: Regular in-service training and workshops should be organized to help mathematics teachers acquire new pedagogical strategies, assessment techniques, and classroom management skills. The GES should collaborate with universities, teacher training colleges, and

educational NGOs to deliver ongoing capacity-building programs that expose teachers to innovative approaches, including the use of technology and learner-centered instruction.

c. Establish a National Mathematics Development and Research Centre: Such a center would serve as a hub for research, curriculum development, and teacher support. It should focus on designing strategies to improve mathematics teaching and learning outcomes in both urban and rural schools. The center could also promote collaboration among mathematics educators, curriculum experts, and policymakers.

d. Improve working conditions for teachers. The Ministry should address challenges related to teacher workload, classroom infrastructure, and resource availability. Ensuring that teachers have adequate materials, smaller class sizes, and supportive supervision will enhance teaching effectiveness and ultimately improve student achievement.

2. Recommendations for School Administrators

School heads and administrators are directly responsible for creating a conducive environment for effective teaching and learning. They should adopt management practices that promote teacher motivation, collaboration, and accountability.

a. Foster a positive school culture: Administrators should cultivate a culture of mutual respect and collaboration among teachers, students, and management. This can be achieved through regular staff meetings, open communication channels, and participatory decision-making processes that allow teachers to contribute ideas on improving mathematics instruction.

b. Provide academic and emotional support for teachers: School leadership should pay attention to teachers' professional and emotional well-being. Providing counselling

services, peer mentoring programs, and team-building activities can help reduce burnout and strengthen teacher commitment.

c. Encourage classroom innovation and supervision: Heads of departments should carry out regular classroom observations followed by constructive feedback sessions. Teachers should be encouraged to experiment with different instructional methods, use teaching aids, and integrate practical problem-solving activities that connect mathematics to real-life applications.

d. Strengthen collaboration between teachers and parents: Administrators should facilitate strong communication between schools and parents through meetings, workshops, and report feedback systems. When parents and teachers work together, students receive consistent support at home and in school, which enhances academic performance.

3. Recommendations for Mathematics Teachers

Mathematics teachers are at the centre of students' academic development. They must continuously seek to improve their knowledge, teaching methods, and relationships with students.

a. Maintain a positive and professional attitude: Teachers should approach their work with patience, empathy, and enthusiasm. A positive attitude encourages students to develop confidence and curiosity about mathematics. Teachers should also be conscious of their language and tone in the classroom, ensuring that their feedback builds students' confidence rather than diminishes it.

b. Adopt learner-centered teaching approaches: Teachers should shift from traditional teacher-dominated methods to participatory and interactive learning strategies. Techniques such as group discussions, cooperative learning, project-based

assignments, and real-world problem-solving can make mathematics more engaging and relatable.

c. Promote continuous self-development: Teachers should take advantage of professional training opportunities, research new teaching methods, and collaborate with colleagues to share ideas. Reading educational journals, attending seminars, and using online learning platforms can help them stay updated with global best practices in mathematics education.

d. Build strong teacher–student relationships: Teachers should establish an atmosphere of trust and respect in their classrooms. They should encourage open communication, listen to students' concerns, and offer additional support to those struggling. A teacher who shows genuine interest in students' progress often motivates them to put in more effort.

4. Recommendations for Parents and Guardians

Parents play a vital role in shaping students' attitudes toward learning. Their involvement can either reinforce or undermine the efforts of teachers.

a. Show consistent interest in academic progress: Parents should actively monitor their children's academic performance, attend school meetings, and communicate with teachers about their children's strengths and weaknesses in mathematics.

b. Create a supportive home environment: Providing a quiet study space, access to textbooks or online resources, and regular encouragement can help students develop better study habits. Parents should avoid criticizing poor performance harshly and instead help students view challenges as opportunities to improve.

c. Reinforce positive attitudes toward mathematics: Parents should avoid transmitting negative beliefs about mathematics being too difficult or irrelevant.

Instead, they should emphasize its usefulness and encourage persistence, discipline, and curiosity in their children.

5. Recommendations for Students

Students themselves have a responsibility to take ownership of their learning. Their motivation, attitude, and effort are central to academic success.

a. Develop a positive mindset toward mathematics: Students should view mathematics as a skill that can be mastered with practice rather than as a subject reserved for a few gifted individuals. Cultivating a positive attitude and consistent study habits can help overcome fear and anxiety.

b. Seek help when needed: Students should not hesitate to ask questions during lessons or seek clarification from teachers and peers. Joining mathematics clubs or study groups can provide extra support and encouragement.

c. Practice regularly and apply concepts: Consistent practice improves retention and problem-solving ability. Students should also relate mathematical principles to real-life contexts such as budgeting, measurements, or data interpretation, which deepens understanding.

6. General Recommendation for Policy Implementation

Finally, a collaborative framework among stakeholders should be developed to ensure that the recommendations made in this study are implemented effectively. The Ghana Education Service, school heads, and teacher associations should work together to monitor progress, evaluate the impact of implemented policies, and continuously refine strategies to enhance mathematics education.

The implementation of these recommendations will contribute to a more motivated, skilled, and student-centered teaching force. In turn, this will create a positive and

productive learning environment that encourages excellence in mathematics and improves students' overall academic performance.

5.5 Suggestions for Further Research

Although this study has contributed valuable insights into how teacher-related factors influence students' achievement in mathematics, it also opens the door for further scholarly exploration. Every research has its boundaries, and recognizing these boundaries helps future researchers to build on what has been achieved and to address questions that were beyond the scope of the present investigation. The following suggestions are therefore proposed for future research in related areas.

1. Broaden the Geographical Scope of the Study

This study was limited to selected senior high schools within the Atwima-Kwanwoma District of the Ashanti Region. While the findings provide useful insights into the local context, they may not fully represent the situation in other districts or regions across Ghana. Future researchers should consider conducting similar studies across multiple districts or regions to allow for broader generalizations. A nationwide comparative study could also help identify regional variations in teacher motivation, classroom practices, and student performance.

2. Include Teachers' Perspectives in Future Investigations

The present study focused primarily on students' perceptions of teacher-related factors. While this provided valuable data, it did not capture the teachers' own experiences, challenges, and attitudes toward teaching mathematics. Future studies should therefore include both teachers and students as participants to obtain a more balanced and comprehensive understanding. A dual-perspective approach would make it possible to compare how teachers perceive their motivation and performance with how students experience it in the classroom.

3. Examine Additional Variables Influencing Mathematics Achievement

Although this study concentrated on teacher motivation, experience, attitude, and teacher–student interaction, other important variables such as school leadership, availability of teaching resources, parental involvement, and student self-efficacy may also play a significant role. Future research could explore how these additional factors interact with teacher-related variables to influence learning outcomes. A more holistic model incorporating both school-level and home-level influences would provide deeper insights into the complex web of factors affecting mathematics achievement.

4. Conduct Longitudinal Studies on Teacher Influence

This research used a cross-sectional design that captured data at a single point in time. However, students' academic progress and teacher effectiveness often evolve over extended periods. A longitudinal study that tracks students' performance over several academic years would be valuable in understanding the long-term effects of teacher motivation, experience, and attitude on mathematics achievement. Such research could also reveal how teacher-related factors change as educational policies, classroom practices, and teacher development programs evolve.

5. Explore Intervention-Based or Experimental Research

While this study identified correlations and relationships between teacher-related factors and student achievement, it did not test the effectiveness of specific interventions. Future research could adopt an experimental or quasi-experimental design to evaluate the impact of targeted teacher motivation programs, professional development workshops, or mentoring systems on student performance. This type of study would provide empirical evidence on what strategies work best in improving both teacher productivity and student achievement.

6. Investigate the Role of Technology and Digital Pedagogy

With the increasing integration of technology in education, future studies could focus on how digital tools, online learning resources, and interactive platforms influence teacher–student interaction and engagement in mathematics. Research could explore how teachers' technological competence interacts with motivation and experience to affect teaching effectiveness in modern classrooms.

7. Examine Gender and Socio-Cultural Dimensions

Another important area for future investigation is the influence of gender and socio-cultural factors on mathematics teaching and learning. It would be useful to explore whether teacher-related factors affect male and female students differently and how cultural attitudes toward mathematics shape student performance. Understanding these dynamics would help tailor interventions that promote gender equity and inclusiveness in mathematics education.

In summary, while the present study has made a meaningful contribution to the understanding of teacher-related factors affecting mathematics achievement, there remains much to explore. Future research should build upon these findings by adopting broader samples, integrating diverse perspectives, and experimenting with new methodologies. Through continued inquiry, education stakeholders can gain deeper insights into the complex dynamics of teaching and learning, ultimately paving the way for more effective policies and classroom practices that enhance students' success in mathematics.

5.6 Final Reflection

The findings of this study reaffirm the vital role teachers play in shaping the academic lives of students. Mathematics, often regarded as one of the most challenging subjects

in the school curriculum, requires more than knowledge transmission; it demands emotional connection, patience, and inspiration from the teacher. This study has shown that effective teaching goes beyond classroom instruction and includes the teacher's attitude, motivation, experience, and relationship with students.

From the onset, the study was guided by the understanding that mathematics achievement is not solely determined by students' intellectual ability but by the environment in which learning takes place. The Reinforcement Theory, which formed the theoretical basis for this research, emphasizes that positive reinforcement—through encouragement, recognition, and supportive feedback—can transform students' behavior and enhance learning outcomes. The results of this study strongly validate this principle. Teachers who exhibit enthusiasm, empathy, and commitment foster a classroom climate that nurtures students' curiosity, confidence, and persistence in learning mathematics.

Equally, the study brings attention to the fact that teachers themselves need reinforcement. When teachers are motivated, adequately resourced, and recognized for their effort, they are more likely to transfer that motivation to their students. On the contrary, when teachers operate in conditions of neglect or low morale, the classroom energy declines, and students' learning suffers as a result. Therefore, investing in teachers' well-being and professional growth should be viewed not merely as administrative responsibility but as a national educational priority.

Another key reflection arising from the study is that mathematics instruction must be human-centered. The interactions between teachers and students are not just formal exchanges of knowledge but dynamic relationships that influence how students think, feel, and act toward learning. A teacher's ability to build trust, show respect, and

communicate effectively can transform students' fear of mathematics into interest and achievement. In this sense, the teacher becomes not only an instructor but also a mentor, motivator, and role model.

The study also underscores that no single factor can independently determine success in mathematics. Rather, it is the interplay between several teacher-related variables—motivation, experience, attitude, and teacher–student interaction—that creates the conditions for meaningful learning. When these elements are aligned within a supportive school environment, the result is a generation of students who are not only competent in mathematics but also confident in their ability to apply it in solving real-world problems.

Finally, the reflection on this research emphasizes that improving mathematics education in Ghana requires a collective commitment. The Ministry of Education, the Ghana Education Service, teacher training institutions, school administrators, parents, and students must work together to create a culture that values teachers and supports continuous improvement. Policymakers should focus on developing systems that recognize excellence in teaching, while schools should create structures that encourage collaboration, mentorship, and professional dialogue among teachers.

In conclusion, this study has demonstrated that teachers are at the heart of educational transformation. Their motivation, experience, and interaction with students form the foundation upon which academic success in mathematics is built. If teachers are supported, respected, and empowered, the ripple effect will be seen in improved student outcomes, stronger schools, and ultimately, a more skilled and progressive nation.

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APPENDICES

APPENDIX A

QUESTIONNAIRE

This questionnaire is designed for the purpose of collecting data on the "Influence of teacher related factors on student's Mathematics achievement": information in the questionnaire will be used for academic purpose only. Please do not write your name. I sincerely thank you for dedicating your valuable time to responding to the questions in this survey. Please rest assured that all the information you provided will be handled with the utmost confidentiality and used exclusively for academic purposes.

PART I: PARTICIPANT INFORMATION

Please tick (√) or fill `the appropriate option

1. Gender ☐ Male ☐ Female
2. Course of study ☐ General Art ☐ General Science ☐ Home Economics

   ☐ Visual Arts ☐ Business ☐ Technical
3. What is your age……

PART II: TEACHER-RELATED FACTORS

Please tick **(√)** the appropriate option that correspond with your answer. Rate the scale:

1	2	3	4	5
Strongly disagree	Disagree	Neutral	Agree	Strongly agree

SECTION A: To what extent does the influence of teacher motivation on students' mathematics achievement? (Tick only one answer in the table)

NO:		1	2	3	4	5
1	Studying mathematics will enable you to prepare for future career.					
2	Studying math will be useful for the course of your choice at the university					
3	Studying mathematics at a higher level will enable you to obtain a more prestigious job later in life					
4	Studying mathematics will improve your work competence in the future					
5	Studying mathematics will broaden your knowledge					
6	Studying mathematics will improve your work competence in the future					
7	Studying mathematics enables you to analyze a problem, and select suitable strategies for solving					
8	Studying mathematics encourage you to work co-operatively with others.					

SECTION B: TEACHER-STUDENT INTERACTION

To what degree does the interaction between teachers and students impact the academic performance of students in mathematics? (Tick only one answer in the table)

S/N		1	2	3	4	5
9	Students and teachers treat each other with respect					
10	Most teachers are enthusiastic about teaching and communicating with students.					
11	He has high expectations for all students					
12	They think about students as individuals and believe all students can learn					
13	Teaching individual students according to their different needs and abilities					

SECTION C: TEACHER'S EXPERIENCE

In what ways does the experience of teachers contribute to the academic success of students in mathematics? (Tick only one answer in the table)

SN		1	2	3	4	5
14	The teacher explains the objectives of the lesson clearly at the start of each period					
15	The teacher is updated with current trends, relevant to the subject matter					
16	The teacher uses various strategies, teaching materials,					

	and techniques in presenting lessons					
17	The teacher encourages student's participation in discussions					
18	Group students based on abilities across classroom work					
19	The teacher demonstrates the correct way to solve math problems					
20	He creates extra time for remedial teaching					
21	New teachers teach better than old teachers					

SECTION D: TEACHERS' ATTITUDE

To what degree do teachers' attitudes impact the academic performance of students in mathematics? (Tick only one answer in the table)

S/N		1	2	3	4	5
22	My teacher promptly answers student's questions in class					
23	My teacher does not bother whether or not students' complete assignment					
24	My teacher scores students' work promptly with comments for future improvement					
25	My teacher does not give assignment and test promptly except end of semester exam					
26	My teacher keeps on insulting me when I fail to provide correct answers					

27	My teacher is not regular and punctual to class					
28	He is open to suggestions, and opinions of students and is worthy of praise					
29	I feel free to ask any questions to my teachers.					
30	He is very committed to his work					

(Tick only one answer in the table)

S/N	Items on mathematics achievement	1	2	3	4	5
1	Learning mathematics enhances my professional knowledge and skills					
2	Learning mathematics enhances my decision-making ability					
3	Learning mathematics enhances my thinking ability					
4	Learning mathematics enhances my analytical ability					
5	Mathematics makes me think fast					
6	Mathematics is more enthusiastically for me than a significant number of my school mates					
7	My present knowledge in mathematics is high					
8	I feel happy when answering mathematics.					
9	I get good results in mathematics					
10	I usually do well in mathematics					

APPENDIX B

STUDENTS' FOCUS GROUP DISCUSSION SCHEDULED

- What are teachers' attitudes to you when you face problem in mathematics?
- How helpful to you have been teacher' report form comments like very poor can affect you?
- Does the displaying of students' poor work in class affect students' academic performance?
- What do you consider to be significant teacher attitudes that have helped you to improve on your academic performance?
- How teachers reacted to you when you failed to perform according to his expectation?