

## **The Relationship between Teachers' Variables and Students' Achievement and Interest in Mathematics in Kebbi State**

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### **Abstract**

*This study examines the relationship between teachers' variables and students' interest and achievement in Mathematics. One research question and two (2) research hypotheses guided this study, the research question were answered using percentage, mean and standard deviation while the research hypotheses were tested using multiple regression and ANOVA. The findings from the study revealed that all teachers' variables (pedagogical knowledge, subject matter knowledge, teacher-student relationship, teachers' qualification and experience) when taken together made significant contribution to students' interest and achievement in Mathematics. However, all the teacher variables (independent variables) relatively (alone) made no significant contribution to students' achievement in Mathematics except subject matter knowledge, which was found significant. In the same vein, all the teacher variables relatively made significant contribution to students' interest in Mathematics. There is also an indication that sampled Mathematics teachers in Jega Educational zone of Kebbi State are good in the area of pedagogical and subject matter knowledge but poor in their relationship with their students. Base on the findings of this study, the recommendations are also given by the researchers.*

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**Key Words:** *Teachers' variables, achievement, interest, Mathematics*

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### **Introduction**

Increasingly, nations need a skilled, knowledgeable workforce and a citizenry equipped to function in a complex world. This can only be achieved through a sound understanding of science and technology. Science is a major tool for change in the modern world. Science is most often referred to as a way of pursuing knowledge. It is associated with scientific method itself, as a disciplined way to study natural world. Science is the bedrock of all technological advancement (Onifade, 2001), the scientific feat has turned the world into a global village and turned those who are not technologically advanced to mere pawns in the game of survival. There is an increasing demand for professional practicing scientists everywhere. There is rapid increase in scientific knowledge, which has resulted in a mass of new materials being incorporated into the school syllabus. Science is a systematic enterprise that builds and organizes knowledge in form of testable explanations and predictions about the universe. Mathematics is bedrock of science and technology, without mathematics there is no real development in science and technology (Ezielo, 1975). Mathematics has all through the years been an important subject both in the role it plays in everyday activities and in its usefulness

to other sciences. Mathematics is a body of knowledge centered on concepts such as quantity, structure, space, change and also the academic discipline that studies them (Pierce, 2007). Mathematics is further defined by Pierce as the science that draws necessary conclusions. Other practitioners of mathematics such as Sowmya (2005), maintains that Mathematics is a science of pattern and highly needed in everyday life. According to Agwagah (2008), Mathematics is the study of numbers, shapes, quantity, structure, and change or describe things (Macmillan Dictionary, 2007). Carl Friedrich Gauss (1777-1855) known as the “Prince of Mathematicians” also refers to Mathematics as “the Queen of the Sciences” and the bedrock of other sciences. These definitions emphasize the importance of Mathematics.

Mathematics is widely used throughout the world, in human life and many fields including social sciences, Natural Sciences, Engineering, Medicine and Education. It is a vital tool in science, commerce and technology. According to Iji (2007), Mathematics provides an important key to understanding of the world. In the areas of buying and selling, communication, timing, measurement, moulding, recording among others, the importance is highly acknowledged. Mathematics is one of the core subjects in both junior and senior secondary school curricula in Nigeria, which justifies its recognition as being essential in the development of technological advancement in Nigeria. The Federal Government of Nigeria made Mathematics compulsory and one of the core subjects in both primary and secondary schools because of its usefulness (FGN, 2004). Some of the roles of Mathematics according to Nurudeen (2007), includes: its ability to enhance the thinking capabilities of individuals by making them to be more creative, reasonable, rational as well as imaginative. There is no school curriculum or a national development planning which does not take cognizance of the usefulness and development in school mathematics.

Despite the importance of Mathematics, there are a number of observable problems associated with its teaching and learning, especially at the secondary school level. These problems include poor method of instruction (Kalijah, 2002). This is supported by the assertion of Agommuoh and Nzewi (2003) that attributed the deterioration in students’ achievement in mathematics to ineffective method of teaching. It requires the ability to use algebra and geometry; this makes the learning of mathematics particularly difficult for many students (Redish, 1994). Ogunleye (2001) prioritizes the lack of adequate qualified and experienced mathematics teachers and of laboratory equipment as two major recurring problems of teaching mathematics in secondary schools. Angell (2004) pointed out that students find mathematics difficult because they have to contend with different representations such as formulas and calculations, graphs and conceptual explanations at the same time. In developed countries, it has been observed that students’ success in mathematics is lower than chemistry and biology, that students do not like science lectures and that most have no preference for science, particularly physics (Mattern and Schau 2002, Rward and Straw 2000).

It is claimed that academic success or failure is related to many factors. In general, various studies that attempt to explain academic success or failure do so by beginning with three elements that intervene in education; parents (family causal factor), students (personal causal factor) and teachers (academic causal factors) (Diaz 2003). However, students’ dwindling performance in Physics in public examinations is so worrisome and this has led many researchers into investigating the factors that could be responsible for this. Among the variables identified are: Students’ poor study habit, low self-esteem, teacher factors (teacher quality), shortage of qualified teachers, inadequate teaching facilities in Schools, home and school environmental factors, and so on (Oludipe, 2002, Aluko, 2010, Ifesanwo, 2012,

Lawal, 2012, and Omotayo, 2012). Adodo (2007) argued that one key overriding factor for the success of students' academic achievement is the teacher. Orleans (2007) asserts that the key factor in what comes out at the end of schooling is what goes on in the classroom. Mills (as cited in Wambugu and Changeiywo, 2008), states that teaching methods are crucial factors that affect the academic achievement of students, and no matter how well-developed and comprehensive a curriculum is, its success is dependent on the quality of the teachers implementing it (Ajaja, 2009; Ughamadu, 2005). Usman, (2003) argued that shortage of qualified teachers is responsible for the poor academic achievement observable among the students. The West African Examination Council (2009) report stated that "poor knowledge of subject matter, inadequate preparation and poor labelling of diagrams were some of the weaknesses that adversely affected candidates' performance.

### **Statement of Problem**

Over the years, students' achievement in mathematics has prompted educational researchers to continuously make relentless efforts at identifying mitigating factors that might account for the observed poor performance. Some research studies suggest that factors inside and outside the classroom affect students' achievement and interest. Among other variables identified are: Students' poor study habit, low self-esteem, teacher factors (teacher quality), shortage of qualified teachers, inadequate teaching facilities in Schools, home factor, school environmental factors and many others. Despite their efforts, students continue to exhibit poor performance in the subject.

In this vein, teacher factor has been linked to be one of the causes of students' poor performance, in this sense there is need to look into the quality of teachers in our secondary schools because effective teaching elicit effective learning. Teacher is the principle initiator of learning. Therefore, this study is designed to survey the teacher quality indicators as correlate of students' interest and achievement in mathematics.

### **Research Question**

What is the level of teachers' qualities with respect to (a) Qualification (b) Teaching experience (c) pedagogical knowledge (d) subject matter knowledge (e) Teacher-Student relationship?

### **Research Hypotheses**

**HO<sub>1</sub>:** There is no relationship between the joint contribution of pedagogical knowledge, knowledge of subject matter, teacher-student's relationship, teachers' qualification and teachers' experience and students' Achievement in mathematics.

**HO<sub>2</sub>:** There is no relationship between the joint contribution of pedagogical knowledge, knowledge of subject matter, teacher-student's relationship, teachers' qualification and teachers' experience and students' interest in mathematics.

### **Significance of the Study**

The study examines teacher quality indicators as correlate of students' achievement and interest in mathematics. Findings from this study would be very useful to the teachers and other stake holders in Education sector on which of the quality indicators that contribute positively to students' achievement and interest in mathematics, thereby charging them to work towards developing and applying it in classroom practices. The findings from the study will also bring to an end the long search by educational researchers, a remedy to the problem of students' poor performance in Mathematics. It will also be significant to the Education agencies to always monitor the quality of teachers they post to schools.

### **Scope of the Study**

This study was carried out on senior secondary two (SS2) Mathematics students and their teachers in some selected Government owned secondary schools in Jega educational zone of Kebbi state, Nigeria. The study covers the following teacher quality indicators; pedagogical knowledge, subject matter knowledge, teachers' experience, teachers' qualification, and teacher-student relationship.

### **Literature Review**

The study investigates teacher quality indicators as correlate of students' interest and achievement in mathematics. A quality teacher is one who has a positive effect on student learning and development through a combination of content mastery, command of a broad set of pedagogic skills, and communications/interpersonal skills. Quality teachers are life-long learners in their subject areas, teach with commitment, and are reflective upon their teaching practice. They transfer knowledge of their subject matter and the learning process through good communication, diagnostic skills, understanding of different learning styles and cultural influences, knowledge about child development, and the ability to marshal a broad array of techniques to meet student needs. They set high expectations and support students in achieving them. They establish an environment conducive to learning, and leverage available resources outside as well as inside the classroom. This study was guided by Education Production Function theory (EPF) which connects teacher characteristics to students' achievement. This theory is also called input-output theory. Teachers have been recognized as indispensable factor and the most important element in the cause of transmission of knowledge and academic success. Concepts and attributes used to indicate teacher quality are complex and lack consensus definition. Some literature has teacher quality indicators as not only knowledge and skills, but also personal qualities like attitudes, organizational skills, teaching skills, guiding and supporting, communication skills, and so on.

Several studies has it that quality indicators like teacher's subject matter knowledge, pedagogical knowledge, teachers' qualification have strong positive effect on achievement while others observed contrary to that. Some researchers claimed that teachers' knowledge of her students has the highest correlation to their achievement, while others maintained that teachers' teaching experience has the highest correlate. Generally, effective classroom management was observed to have strong positive correlate to students' interest as well as their achievement.

### **Teacher Quality Indicators**

Berliner (2005) describes quality teacher as one who shows evidence of certain qualities of teaching in the lives of students. These qualities include more than assessing knowledge on a certification test. Teacher qualities must include the logical acts of teaching (defining, demonstrating, modelling, explaining and so on), psychological acts of teaching (caring, motivating, encouraging, rewarding, punishment, planning, evaluating and so on), and the moral acts of teaching (showing honesty, courage, tolerance, respectful, fairness and so on) (Berliner 2005). A good teacher can help close the achievement gap that results from other factors such as socio-economic status. According to Harris and Sass (2011), it is accepted in general that promoting teacher quality is a key element in the improving primary and secondary education in United States. The literature on teacher quality and qualifications has typically been viewed as inconsistent, and inconclusive. Discussions of teaching and teaching quality during the early-childhood years tend to focus more heavily on knowledge of child development. Specifically, the early-childhood literature emphasizes: the importance of knowing how to best promote children's social and emotional needs, organize the learning

environment for young children, help children make connections, and encourage language skills and higher order thinking (Pianta and Hadden, 2008; Sadowski, 2006). The assumption is that quality early-childhood teachers possess these abilities, which will translate into academic and developmental success in future schooling and life.

Changes in society are leading to new expectations about the role of education, which in turn is leading to new demands of teacher's quality. It is universally accepted that education should enrich an individual's knowledge and develop his potentials. Education is largely of functional value in the society. Thus, there is an increased need to be more explicit in describing teacher quality. In the debate about innovative powers of Europe and knowledge economy, discussion on teacher quality tends to focus on knowledge and skills. Quality indicators used to monitor teacher quality are predominantly quantitative, leading to a very limited and one-sided perspective on the quality of teachers and teacher education (Association for teacher education in Europe, 2006). Besides, concepts used to define teacher quality are complex and lack clear definitions. This might lead to negative emotions concerning a reduction in professional autonomy of teachers and teacher education institutes and might stimulates the belief that teacher's professional development is complete once met merely quantitative standards.

Since education is a dynamic and the most important instrument of change, the quality of instruction at all levels should be updated. In international discussions about teacher's quality, the use of terms like "competence" and "standard" assumes different meanings in different countries leading to different definition of quality. Teacher's quality should be an overall concept that comprises not only knowledge and skills but also personal qualities such as respect, care, courage, empathy and personal values, attitudes, identify belief etc. The way in which these characteristics are implicitly and explicitly included in indicators of quality reflect dominant social, cultural, economic and educational views and concerns about teacher's quality.

Several studies focus on teacher's quality, using categorization of teacher characteristics. Categorizes and indicators can be seen from the perspective of adult teachers, administrators, teacher educators, educational, researchers and students. These studies provide descriptive lists attempting to identify the key elements of teacher quality (Myers and Myers, 1995, Wong and Wong, 1998). There are lists of teacher's competencies such as knowledge, skills, dispositions, lists of knowledge and skills on effective researchers (Isumi and Even, 2002, Rice, 2003). Other skills frequently identified in research are management and organizational skills, interpersonal skills such as communication, skills to work collaboratively, to guide and support learners, teaching skills in using stated objectives of learning, using instructional methods that foster critical thinking, involving students actively in learning, using innovative teaching methods etc. Besides these studies, individualized personal attitudes, values and ethical behavior of quality teaching such as being respectful, democratic, fair caring, understanding, approachable, open-minded, having a sense of humor, autonomy etc. (Evans,2002, Rogers and Renard, 1999).

European member states official documents on teachers' qualification establish two main categories of standards. The first category includes requirements for qualification of teachers with respect to academic profile, individualizing measurable and policy relevant indicators such as teacher preparation programs and degrees, teachers' coursework, teacher's experience, teacher's self-reflection and self-evaluation. The second category includes many personal characteristics important for good teachers, which are not always measurable

(international council on Education for Teaching, 2008). In this sense, quality is a complex multifaceted personal construct, reflecting the views on learning used by teacher and other state holders that depends on the specific local context of teacher. From teacher's perspective, this can be characterized by the sentence "you teach by who you are" (ICET, 2008).

### **Teacher's subject matter knowledge and achievement**

Ferguson (1998) and Hanushek, Kain and Rivkin (1999) reported that teacher quality is the most important educational factor producing students' achievement. The recent research shows that the teachers with little subject matter knowledge fail in teaching and made no contributions to their students' achievement (Yaman and Soran, 2000; Buyukkaragoz, 1995; Kiliç, 1997; Kahyaoglu and Yavuzer, 2004; Kuçuk, 2005; Usak, 2005; Ozdemir, 2006; Canbazoglu, 2008). Research has it that attitudes towards science change with exposure to science, but that the direction of change may be related to the quality of that exposure, the learning environment and teaching method (Newble 1998, Cracker, 2006). The National council of teachers of mathematics (2000) observed that teachers who have strong subject matter knowledge give details in their lesson, link the topic to other topics, throw questions to students, stray from the textbooks and promotes students' learning outcome. Subject matter knowledge has been of interest to educators, but more recently, there has been a shift to pedagogical knowledge (Johnson, and Ahtle 2006). Majority of the classroom teachers lack substantial subject matter knowledge, the knowledge of what to teach and how to teach the subject matter effectively (Chonjo, Osaki, Possi, Mrutu 1996, Mushashu 1997, Sichizya, 1997). Sanchet and Linares (2003) attempted to identify the influence teacher candidate subject matter knowledge for teaching on the process of pedagogical reasoning. Their findings show that four teacher candidates in the study differed in their subject matter knowledge for teaching both in the different aspects of concepts they emphasized and in the use of a representation repertoire to structure learning activities. Teachers' subject matter knowledge is of great importance for academic achievement because one can't give what he or she doesn't have.

### **Teacher's pedagogical knowledge and achievement**

Research on learning to teach shows that teachers' existing knowledge and beliefs are critical in shaping what and how they learn from teacher education experiences (Borko and Putnam 1996). Several literatures have revealed that pedagogical knowledge is an essential and critical element in determining teachers' success in teaching and learning processes in the classroom (Ball and Bass 2000, Hill et al 2004). According to contemporary theory, learning is situated in a particular context and it an active constructive process that is heavily influences by individuals' existing knowledge and beliefs (Borko and Patnam 1996). A study of Okoye, Momoh, Aigbomian and Okecha (2008) shows that combined variables of teacher quality and instructional strategies are correlated with achievements. Torff (2005) purports that lack of pedagogical skills and knowledge is a bigger threat to teacher quality than certification issues. Although, studies have produced contradictory findings about which attributes of teachers are more likely to translate into effective classroom performance, some information on how specific teachers' attributes correlate with students' achievement is available. Additional teacher education has a positive correlation with student achievement in some cases. Other studies found that it negatively affects achievement (Greenwald, Hedges and Laine 1996, Hanushek, 1999). Okoye et al (2008) conducted a study which examined the correlates between two independent variables of teacher quality and instructional strategy on students' performance in secondary school science in Ethiopia East and Ekwuani Local Government Area of Delta State. The result showed that the teacher quality and instructional strategy had positive significant relationship with achievement in science

### **Teacher-Student relationship and achievement**

Several literatures reveal that strong relationship exists between the instructor's involvement and students' achievement. Studies of (Miller 2001, Katz and Dance 1999) show that students shape their own educational expectations from their perceptions of their teachers' expectations. Fans and Williams (2010) and Wentzel (2003) observed that motivation may play key role in the relationship between teacher-student relationship and academic achievement. Motivation theorists suggest that students' perception of their relationship with their teacher is essential in motivating students to perform well (Bandura 1997, Fan and Williams 2010). Students who perceived their relationship with their teacher as positive, warm and close are motivated to be more engaged in school and to improve their academic achievement (Hughes, Caval and Jackson 1999). Wentzel (1998) maintained that students' motivation to learn is impacted positively by having a caring and supportive relationship with the teacher. Morse and Morse (1995) found that students with positive attitudes towards science had positive attitudes towards their science teachers. Combining a degree of entertainment with other aspect of quality teaching is likely to promote students involvement and consequently students' learning (Marks 2000). A possible reason for association between academic improvement and positive teacher-student relationship is students' motivation and desire to learn (Wentzel 1998). Motivation is closely linked to students' perceptions of teachers' expectation.

### **Teacher's experience and achievement**

Scholars including Darling-Hammond (1999), and Obanya (2003) asserted that the quality of an educational system depends on the quality of the teachers. Ferguson (1992) and Wenglinsky (1992) in different studies found that the single factor affecting academic growth of students is differences in effectiveness of individual classroom teachers. Certain studies on performance suggest that three consecutive years of quality teachers can help overcome the average achievement gap between children from low income and children from higher income families (Hanushek, 2005, Boyd 2008). Clearly, the context of teaching is important and may affect the impact of teacher attributes. It is argued that prospective and experienced teachers' knowledge and beliefs serve as a filter through which their teaching takes place (Borko and Putnam 1996).

However, a study conducted by Martins, Mullis, Gregory, Hoyle and Shen (2000) showed that in a situation where experienced teachers are not promoted out of the classroom into management positions, level of experience has a significant influence on teaching effectiveness of the teachers and their students' achievement. Aiken (1991) in his study found that teaching experience of teachers is significantly related to their teaching effectiveness and their students' achievement. The findings of Martins et al (2000) showed a strong positive relationship between teacher experience and students' outcomes. Murname (1996) opined that the typical teaching- learning curve peaks in a teacher's first few years. Other studies have shown that new teachers have incomplete or superficial pedagogical content knowledge (Ornstein et al 2000, Feiman-Nemser and Parker 1990). A novice teacher tends to rely on unmodified subject matter knowledge, most often directly extracted from the curriculum and may not have a coherent framework or perspective from which to present the information. Novice also tends to make broad-pedagogical decisions without accessing students' prior knowledge ability levels or learning strategies. If beginning teachers are to be successful, they must wrestle simultaneously with issues of pedagogical content knowledge as well as general pedagogy or generic teaching principles (Grossman 1990 as cited in Ornsten et al 2000). Similarly, pre-service teachers have shown to find it difficult to articulate the relationship between pedagogical ideas and subject matter concepts (Gess-Newsome and

Lederman 1993). Wilson (1992) documents that more experienced teachers have a better “overarching” view of the content field and on which to base teaching decisions.

### **Teacher’s qualification and achievement**

A number of researches have argued that teacher quality is a powerful predictor of students’ performance. The research carried out by Rivkins, Hanushek and Kain (1998) identifies teacher quality as the most important school-related factor influencing student achievement. Darling-Hammond (2002) opined that measures of teacher preparation and qualification are by far the strongest correlates of student achievement in reading and mathematics. Rockoff (2003) found a strong and statistically significant difference between teachers’ qualification and achievement. Studies show little impact of emergency or alternative- route certification on students’ performance in either mathematics or science as compared to teachers who acquire standard certification (Goldhaber and Brewer (1997) found that a teachers’ advanced degree is not generally associated with increased students learning from eighth to tenth grade, but having an advanced degree in mathematics and science for mathematics and science teachers appears to influence students’ achievement. The same were not found to be true for English and history teachers. Monk and King (1994) found that even in subjects where subject-specific training may make a difference; its impact depends on the context of the classes taught.

### **Teacher qualities and students’ interest in Mathematics**

Studies have shown that self-efficacy is the main predictor of students’ academic achievement, interest in the selection and career (Zeldin and Pajares 2000). The choice of mathematics as a major field of study or taking more advanced mathematics courses is determined by students’ interest, motivation and above all achievement (Hoffmann 2002). A study by Buabeng and Ntow (2010) revealed a wide range of reasons which accounted for students’ negative response to mathematics in Ghana. Prominent among these factors were teacher factor, poor performance, perceived difficulty nature of mathematics and unknown career opportunities in the subject. Most of the students reported that there is a reduced interest in the subject at the Senior High School level because the subject was poorly presented to them. Interestingly, mathematics teachers who participated in the study admitted that poor tuition is one of the many reasons accounting for the low interest level among students (Buabeng and Ntow, 2010). Studies, such as that of Blaring (1988) revealed that students with educational interest have grade point averages in specific related courses than with low interest scores. This is similar to that of Lavin (1965) that there is a reciprocal relationship between interests and learning achievements as each reinforces the other. This shows that interest can serve as a motivating factor of attention and thus enhancing good memory to the learners. Aremi (1998) observed that when pupils express lack of interest in the subject, it affects the way they react or listen to the teacher. Hall (1989) pointed out there is a need to motivate pupils so as to arouse and sustain their interest in learning mathematics.

### **Methods**

#### **Research Design:**

This is a survey (correlation) design which determines the relationship of two variables. It is a research design which has the goal of identifying predictive relationships among occurring variables. This study surveys the teacher quality indicators as a correlate to students’ interest and achievement in mathematics.



## **Variables in the study**

### **Independent variables**

Teachers' subject matter knowledge  
Teachers' pedagogical knowledge  
Teacher-student relationship  
Teachers' qualification  
Teachers' experience

### **Dependent variables**

Achievement in Mathematics  
Interest in Mathematics

### **Population of the study:**

The population for the study was made up of all the senior secondary two (SS2) Mathematics students and teachers in Jega Educational Zone of Kebbi State.

### **Sample and Sampling Technique**

The sample was made up of five hundred (500) senior secondary two students and fifty (50) Mathematics teachers. Ten (10) Mathematics students and one (1) Mathematics teacher were selected from each of the fifty (50) schools, using stratified random sampling technique.

### **Instruments for Data collection**

Mathematics Achievement Test (MAT)  
Students Interest in Mathematics Questionnaire (SIMQ)  
Students' Questionnaire on Teacher-Student Relationship (SQTSR)  
Teacher's Classroom Observation Form (TCOF)  
Teachers' Demographic Characteristics Form (TDCF)

### **Students' Interest in Mathematics Questionnaire (SIMQ)**

This instrument was structured by the researcher, it was meant to measure the interest of students in mathematics. It consists of two sections; section A, which contains demographic variables of the respondents. Section B consists of 20 items which reflect students' interest and what they feel about mathematics. The items were rated on the 4 likert-scales, starting from Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD).

### **Students' Questionnaire on Teacher-Student Relationship (SQTSR)**

This was structured by the researcher based on research questions. It also has two sections A and B. A contain demographic variables of the respondents, B contains certain aspects of teacher- student relationship. This instrument was administered to the students because the researcher thinks they are the in the better position to say much about their relationship with their teacher.

### **Teachers Classroom Observation Form (TCOF)**

This instrument was adapted by the researcher from Rhoads, Scott and Spinna (2011). It was used to observe teachers' subject matter knowledge and pedagogical knowledge in the classroom.

### **Mathematics Achievement Test (MAT)**

This instrument contains two sections A and B, A contains demographic variables of the respondent such as name of school and class, B contains Mathematics questions made up of

twenty five (25) items.

### Validity and Reliability

The initial copy was subjected for face and content validity by giving them to the supervisor of the project, another expert from the department teacher Education (science unit), another expert from the department of Education foundation. Based on their corrections and criticisms, final copy was produced. To test for reliability, the initial copies were given to twenty (20) students not participating in the study but similar in characteristics. Data collected was calculated using Pearson product moment correlation coefficient ( $r$ ) and the reliability of 0.77 was obtained.

### Method of Data Analysis

Data collected were analyzed using descriptive statistics of frequency count, mean, standard deviation and percentage. In addition, inferential statistics of multiple regressions were used.

### Results

**Research Question 1** What is the level of teachers' qualities with respect to (a) Qualification (b) Teaching experience (c) pedagogical knowledge (d) subject matter knowledge (e) Teacher-Student relationship?

#### Demographic Distribution of the Respondents;

**Table 1: Distribution of teachers' Educational Qualification:**

Qualification	Frequency	Percent
NCE	4	8.0
B. Sc(Ed)	21	42.0
B. Ed	10	20.0
B.Sc	4	8.0
HND	2	4.0
PGDE/M.Ed/MSc.	8	16.0

The table above present distribution of teachers' educational qualification, the result shows that majority of the respondents are degree holders in science education 42%, while 20% of the respondents are degree holders in education but not in science education. From the result again, it inference could be made that 8% of the respondents are NCE holders, 70% are degree holders while 16% have undergone postgraduate education.

**Table 2: Distribution of teachers' experience**

Year of Experience	Frequency	Percentage (%)
1-5 years	1	2.0
6-10 years	7	14.0
11-15 years	4	8.0
16-20 years	13	26.0
21-25 years	5	10.0
26-30 years	12	24.0
31 and above	8	16.0

The result in the Table 2 above shows the distribution of teachers' experience, the result revealed that 16% of the respondents have spent years ranging from 1-10 years while 32% have spent years ranging from 11-20 years, in the same vein, half (50%) of the respondents

sampled have spent more than 20 years in the service.

**Table 3: The level of Teacher quality with respect to subject matter knowledge**

Item	Very Good	Good	Fair	Fairly week	Poor	Mean	Std
SUBJECT MATTER CONTENT (Shows good command and knowledge of subject matter, demonstrates breadth depth of mastery)	39 39%	21 21%	23 23%	14 14%	3 3%	3.79	1.192
ASSISTANCE TO STUDENTS (Assist students with academic problems and misconceptions)	33 33%	17 17%	22 22%	16 16%	12 12%	3.43	1.402
Weighted Mean = 3.61							

Table 3 above represents level of teachers' quality with respect to subject matter knowledge, it could be observed from the table that teachers in the sample respondents are good at the area of subject matter (mean, std=3.79, std. =1.192) except for the aspect of assistance to the students, as the general mean responses ranges from 3.5-4.0. Also, the mean response of teacher assistance to students is (mean= 3.43, std = 1.402) which implies that the teachers perform fairly in the area of rendering assistance to students.

**Table 4: The level of teacher quality with respect to teacher-student relationship**

S/N	ITEMS	Mean Response	Std. Dev.	Remark
1	I entertain fear when my mathematics teacher enters class.	3.37	.867	Average
2	Am always scared to ask my mathematics teacher questions based on the topics taught.	3.10	.976	Average
3	Students break some rules in mathematics class.	2.46	1.052	Poor
4	My mathematics teacher is aware of the topics that are very difficult to us.	1.81	.896	Poor
5	My mathematics teacher adapts to variations in our abilities and backgrounds.	1.87	.775	Poor
6	My mathematics teacher gives every member of the class chance to express his /her own opinion.	1.51	.734	Poor
7	My mathematics teacher uses praises and rewards to encourage us.	1.86	.788	Poor
8	I feel safe and secured in mathematics class.	1.73	.747	Poor

9	My mathematics teacher supports me both academically and otherwise.	1.84	.779	Poor
10	I have confidence in myself that I will do very well in mathematics.	1.38	.654	Very poor
11	My mathematics teacher really wants me to learn.	1.34	.521	Very poor
12	I like my Mathematics teacher so much.	1.54	.757	Poor
Weighted Mean = 1.85				

**Key:** Mean response 0.0-1.49 = very poor, 1.5-2.49 = poor, 2.5-3.49 = average, 3.5-4.49 = good while 4.5-5.0 = very good.

Table 4 shows the level of teacher quality with respect to Teacher-Student Relationship. From the table, it could be observed that average number of students entertain fear when their mathematics teacher enters class. Similarly, average number also is scared to ask their mathematics teacher questions based on the topic taught. The general indication here is that teachers' quality with respect to teacher-students relationship is generally poor.

### Research Hypothesis 1

There is no relationship between the joint contribution of pedagogical knowledge, knowledge of subject matter, teacher-student's relationship, teachers' qualification and teachers' experience and students' Achievement in mathematics.

**Table 5: Joint Contribution of Independent Variables on Student' Achievement in Mathematics**

Model		Sum of squares	DF	Mean Square	F	Sig.
1	Regression	45.767	4	9.153	5.417	.000 <sup>b</sup>
	Residual	831.382	493	1.690		
	Total	877.149	497			
<b>Model Summary</b>						
Model		1				
R		.228 <sup>a</sup>				
R Square		.052				
Adjusted R Square		.043				
Std. Error of the Estimate		1.29992				

Table 5 shows that the five variables namely: pedagogical knowledge, knowledge of subject matter, teacher-student's relationship, teacher qualification and teacher's experience taken together jointly correlate positively ( $R = .228$ ) with student's achievement in mathematics. This implies that, the five factors have positive multiple relationships with student's achievement in mathematics. Hence they have the potential of explaining student's achievement in mathematics to a certain extent. Also the five variables could explain 5.0% of total variance in students' achievement ( $R^2 = 0.52$ ). This leaves the remaining 94.8% to other factors that were not considered in the study and the error (chance). The level of significance of the joint contribution of all independent variable was presented in the ANOVA Table, the table shows that R value of .228 was significant ( $F = 5.417, P < 0.05$ ). This implies the five variables made a significant composite contribution to student's achievement.

### Research Hypothesis 2

There is no relationship between the joint contribution of pedagogical knowledge, knowledge of subject matter, teacher-student's relationship, teachers' qualification and teachers' experience and students' interest in mathematics.

**Table 6: Joint Contribution of Independent Variables on Student' Interest in mathematics**

Model		Sum of squares	Df	Mean Square	F	Sig.
1	Regression	7208.524	5	1441.705	529.085	.000 <sup>b</sup>
	Residual	1337.927	491	2.725		
	Total	8546.451	496			
<b>Model Summary</b>						
Model		1				
R		.918 <sup>a</sup>				
R Square		.843				
Adjusted R Square		.842				
Std. Error of the Estimate		1.65073				

Table 6 shows that the five variables namely: pedagogical knowledge, knowledge of Subject matter, teacher-student's relationship, teacher qualification and teacher's experience taken together jointly correlate positively ( $R = .918$ ) with student's interest in mathematics. This implies that, the five factors have positive multiple relationships with student's interest in mathematics. Hence they have the potential of explaining student's interest in mathematics to a certain extent. Also the five variables could explain 84.3% of total variance in students' interest in mathematics ( $R^2 = 0.843$ ). This leaves the remaining 15.7% to other factors that were not considered in the study and the error (chance). The level of significance of the joint contribution of all independent variable was presented in the ANOVA Table, the table shows that R value of .918 was significant ( $F (4,492) = P < 0.05$ ). This implies the five variables made a significant composite contribution to student's interest in mathematics.

### Conclusion

This study examines teacher quality indicators as correlate of students' interest and achievement in mathematics. Findings from the study revealed that all teacher variables (pedagogical knowledge, subject matter knowledge, teacher-student relationship, teachers' qualification and experience) when taken together made significant contribution to students' interest and achievement in mathematics. However, all the teacher variables (independent variables) relatively (alone) made no significant contribution to students' achievement in

mathematics except subject matter knowledge, which was found significant. In the same vein, all the teacher variables relatively made significant contribution to students' interest in mathematics.

### Recommendations

1. Teachers should be exposed to seminars and workshop to upgrade and enhance their knowledge of mathematics.
2. Teachers should be regularly supervised and monitored on the general aspect of teaching and learning.
3. Teachers should be able to establish good relationship with their students; this will enhance their interest in learning mathematics.
4. Teacher education program should be given much attention especially in the area of course content, quality of students being admitted and quality teachers being produced.
5. Regular and continuous professional development is paramount to developing and maintaining high quality science and mathematics teachers. The Ministry of Education should ensure that all teachers have the chance to improve their classroom instruction by receiving on-going training aimed at professional growth and better student outcomes.

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