

# THE EFFECTS OF TEACHERS' ACADEMIC QUALIFICATION AND EXPERIENCE ON STUDENTS' ACHIEVEMENT AND INTEREST IN MATHEMATICS IN KEBBI STATE

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## ABSTRACT

*This study examines the effects of teachers' academic qualification and experience on students' achievement and interest in mathematics. The sample was made up of two hundred and twenty (220) senior secondary two students and fifty (10) mathematics teachers from two (2) secondary schools in Jega education zone of Kebbi State. One hundred and ten (110) students and five (5) mathematics teachers were selected from each school, using random sampling technique. The schools are Government Day Secondary School, Jega and Government Science College, Aliero. Two research hypotheses guided this study, the research hypotheses were tested using regression analysis and ANOVA. The findings from the study revealed that all teachers' academic qualification and experience when taken together made significant effects on students' achievement in mathematics. Based on the findings of this study, the recommendations are also given by the researchers.*

**Keywords:** Teachers' academic qualification, achievement, interest, Mathematics

## 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 mathematics to 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, molding, 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 labeling 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 principal initiator of learning. Therefore, this study is designed to survey the effect of teachers' academic qualification on students' achievement in mathematics.

### **Significance of the Study**

The study examines teachers' academic qualification and experience on students' achievement 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; subject matter knowledge, teachers' experience, teachers' academic qualification, and 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 knowledge of subject matter, teacher-student's relationship, teachers' qualification and teachers' experience and students' interest in mathematics.

### **Literature Review**

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 have it that quality indicators like teachers' 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'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 Ornstein 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 eight 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 take difference; its impact depends on the context of the classes taught.

### **Methods**

#### **Research Design:**

This is a survey research design which determines the effects of two variables (teachers’ academic qualification and experience). It is 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’ academic qualification

Teachers’ experience

##### **Dependent variables**

Students’ achievement in mathematics

Students’ 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 two hundred and twenty (220) senior secondary two students and fifty (10) mathematics teachers from two (2) secondary schools in Jega education zone of Kebbi state. One hundred and ten (110) students and five (5) mathematics teachers were selected from each school, using random sampling technique. The schools are Government Day Secondary School, Jega and Government Science College, Aliero.

### **Instruments for Data collection**

Mathematics Achievement Test (MAT) for students' achievement in mathematics.  
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. The 25 items comprises topics such as indices, logarithms, quadratic and simultaneous equations, probability and statistics.

### **Validity and Reliability**

The copies of Mathematics Achievement Test, Students Questionnaire and Teachers classroom observation form was given to expert in test and measurement, he recommended that all the instruments are valid for this study. 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 0.87 was obtained. This means the instruments are also reliable for this study.

### 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	40
B. Sc(Ed)	2	20
B. Ed	0	0
B.Sc	3	30
HND	1	10
PGDE/M.Ed/MSc.	0	0.0
Total		100

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, its inference could be made that 8% of the respondents are NCE holders, 70% are degree holders while 16% have undergone postgraduate education.



**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 students’ achievement.

**Research Hypothesis 2**

There is no relationship between the joint contribution of 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 students’ interest in mathematics. This implies that, the five factors have positive multiple relationships with students’ 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 students’ interest in mathematics.

## Conclusion

This study examines the effects of teachers’ academic qualification and experience on students’ interest and achievement in mathematics in Jega education zone of Kebbi state. The findings of the study revealed that all independent variables (teacher-student relationship, teachers’ academic qualification and experience) when taken together made significant contribution to students’ interest and achievement in mathematics. In the same vein, all the teacher variables relatively made significant contribution to students’ interest in mathematics.

## Suggestions for further study

There are many teachers’ characteristics such as age, gender, remuneration, academic qualification, professional qualification, experience, relation with students and so on. But this study considered only three (3) of these characteristics (i.e teachers’ academic qualification, experience and relation with students). Therefore, the researchers suggest that similar study can be carried out to consider the other teachers’ characteristics that are not included in this study.

## **Recommendations**

Based on the findings of this study, the following were given by the researchers:

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 ongoing training aimed at professional growth and better student outcomes.
6. Government should ensure that teachers with at least BSc.Ed in mathematics are recruited to teach mathematics at senior secondary school classes.

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