EFFECTS OF TEACHERS' QUALIFICATION AND COMPETENCY ON PERFORMANCE IN FURTHER MATHEMATICS AMONG SENIOR SECONDARY SCHOOL STUDENTS IN KADUNA STATE, NIGERIA.

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A THESIS SUBMITTED TO SCHOOL OF POST GRADUATE STUDIES AHMADU BELLO UNIVERSITY, ZARIA IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER DEGREE IN MATHEMATICS EDUCATION

DEPARTMENT OF SCIENCE EDUCATION
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AUGUST, 2015

DECLARATION

I Olajumoke Olayemi OLALEYE (M.Ed/Educ/456/2011-2012) declare that this dissertation entitled "Effects of Teachers' Qualification and Competency on Performance in Further Mathematics among Senior Secondary School Students in Kaduna State" has been conducted by me in the Department of Science Education, Ahmadu Bello University Zaria under the supervision of Prof. Y.K. Kajuru and Dr. M.O Ibrahim. The information derived from the literature has been duly acknowledged in the text and a list of references provided. No part of the thesis was directly presented for another degree or diploma at any University.

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CERTIFICATION

This dissertation entitled "Effects of Teachers' Qualification and Competency on Performance in Further Mathematics Among Senior Secondary School Students in Zaria Metropolis Kaduna State" by Olajumoke Olayemi OLALEYE (M.Ed/Educ/456/2011-2012), met the regulations governing the award of Masters Degree in Mathematics Education of Ahmadu Bello University, Zaria, and is approved for its contribution to the knowledge and literary presentation.

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DEDICATION

This dissertation is dedicated to my husband Salami Peter Oluwatoyin Ganiyu and my children Eniola, Adewale and Adeleke.

ACKNOWLEDGEMENTS

I thank the Almighty God, the merciful God, who by His grace saw me through the completion of this study. My special thanks to my able and efficient supervisors Prof. Y.K Kajuru and Dr. M.O Ibrahim who contributed to the success of this project through their patience, guidance, remark, tolerance, co-operation, accommodation and their fatherly advice in going through the whole manuscript. I am also grateful to Dr. Mamman Musa, Head of Department Science Education, Dr. S.S Bichi, Prof. C. Bolaji, Mal. I.H Usman, Dr. (Mrs) S.B Olorokooba and other staff of the Department of Science Education who played vital role in the completion of this work. I appreciate the assistance given to me by staff of Mathematical Science Department and the Management of Educational Board Zaria. My deep appreciation goes to my dearly beloved husband, Dr. Peter Oluwatoyin Ganiyu Salami for his financial support, counsel and encouragement. I pray that God will grant him long life and prosperity. I appreciate the support given to me by my children Eniola Precious, Adewale Peter and Adeleke Paul may the Lord Almighty bless them all. I also thank my beloved parent Mr. & Mrs. Vincent Olaleye for their parental counsel and encouragement, I am greatly indebted to my brothers and sisters Mr. & Mrs. Adewumi, Abimbola, Oluwaseun & Joshua. Thanks a million. I also appreciate the support given to me by the staff and students of Government Secondary School (GSS) Chindit, Government Girls Secondary School (WTC) Zaria, Barewa College and Government Secondary School (GSS) Muchiya Zaria may the Lord Almighty bless them all. My sincere thanks to Mrs Nwanguma, Mr. Bulus, Mr. & Mrs. Ema, Mal. Aminu Musa and everyone who has in one way or the other contributed to the success of this project. May God see you through in your life time.

ABSTRACT

This study examined the Effect of Teachers' Qualification and Competency on Performance in Further Mathematics among Senior Secondary School Students in Zaria metropolis of Kaduna State, Nigeria. To achieve this therefore, this study adopted a survey research design employing pre-test and post-test separating the sample of the population into experimental and control groups for the purpose of analysis. Four (4) schools out of twenty-three (23) schools were randomly selected as the sample of the study with sample size of seventy-five (75) students using stratified sampling method. Three (3) Hypotheses were formulated and tested. Two instruments: Further Mathematics Achievement Test (FMAT) and Teacher Competency Test (TCT) were used in the study. Analysis of variance (ANOVA), Pearson Product Moment Correlation (PPMC) and Independent T-test were used to test the hypotheses. Analysis of variance (ANOVA) revealed that significant difference existed between students performance and teachers qualification, Pearson Product Moment Correlation statistics revealed that significant relationship existed between students performance and teachers competency and independent T-test revealed no significant difference between male and female students performance in Further Mathematics. Based on the findings of this study some recommendations were made and this included among others that teachers should encourage positive study habit among students which will consequently improve students achievement. Also all students especially science students should be encouraged to offer Further Mathematics as this will enhance their performance in general mathematics and other science subjects. Teachers of Further Mathematics should explore the right strategies to teach the subject.

ABBREVIATIONS

The major terms used in this research are explained below to avert any possible misinterpretations or misconceptions.

FM: Further Mathematics

WAEC: West African Examination Council

NECO: National Examination Council

MAN: Mathematics Association of Nigeria

NAE: Nigeria Academy of Education

NMC: National Mathematical Centre

SSS: Senior Secondary School

JAMB: Joint Admission and Matriculation Board

STAN: Science Teachers Association of Nigeria

FMAT: Further Mathematics Achievement Test

TCT: Teachers' Competency Test

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CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Education at secondary school level is supposed to be the bedrock and the foundation towards higher knowledge in tertiary institutions. It is an investment as well as an instrument that can be used to achieve a more rapid economic, social, political, technological, scientific and cultural development in the country. The National Policy on Education (2004) stipulated that secondary education is an instrument for national development that fosters the worth and development of the individual for further education and development, general development of the society and equality of educational opportunities to all Nigerian children, irrespective of any real or marginal disabilities.

Wikipedia (2010) describes Further Mathematics as the title given to a number of advanced secondary mathematics courses. Further Mathematics may also refers to any of several advanced mathematics courses at many institutions. In the United Kingdom Further Mathematics describes a course studied in addition to the standard mathematics A-Level courses, while in Victoria, Australia it describes a course delivered as part of the Victorian Certificate of Education (Akinsola, 2003). In Nigeria, Further Mathematics happens to be one of the subjects designed to be studied at Secondary School levels. As stated in the National Curriculum for secondary schools volume 5 of the Federal Ministry of Education, the aims and objective of Further Mathematics are to:

1. Help develop further conceptual and manipulative skills and its application.

2. Provide an additional intermediate course of study which bridges the gap between elementary mathematics and higher mathematics and

3. Meet the needs of potential mathematicians, Engineers, Scientists and other professionals, such as architects.

Further Mathematics affords Senior Secondary School students opportunity to be introduced to some topics in Advanced Level mathematics in order to prepare them to study mathematics or mathematics related courses in their next level of education. While all students offer mathematics, only few science students offer Further Mathematics. National Council for Curriculum Assessment (2005) noted that many students view mathematics as a difficult subject and perceive higher mathematics as an elite subject for only the best students. Akinsola & Ogunleye (2003) asserted that students could only find the study of mathematics more appealing when they perceive the subject matter as interesting, useful and relevant to their daily living. It is logical to think that students who offer Further Mathematics have opportunities to perform better especially in mathematics than their counterparts who do not offer it (Fajemidagba 2001). There is a term in education called 'opportunities to learn'. Ground &Cebulla (2000) defined opportunities to learn with regards to mathematics and science as the extent students have opportunity or chance to learn mathematic or any of the science subjects which bears directly on students' mathematics and science achievement. Brophy (2000) explained that in maximizing opportunity to learn, attention should not be given to wide coverage of the syllabi, but there should also be conscious efforts to teach content and skill involved deeply. It can then be inferred that students who offer Further Mathematics have better opportunity to learn more mathematical concepts than their counterparts that do not.

Many topics the science subjects however, cannot be understood without sound knowledge of mathematics. Setidisho (1996) asserted that mathematics is a fundamental science which is necessary for understanding most other fields. Probably, no subject forms such a binding force among various branches of science physical, biological and social as mathematics (Adetoye &Aiyedun, 2003). A student needs basic knowledge of mathematics like change of subject to understand density which appears under major topics like Ecology in Biology, diffusion in Chemistry and Floatation in Physics. Vector quantities which are not taught in Ordinary Level Mathematics Syllabus is taught in Further Mathematics and Physics. Science students offering Further Mathematics therefore have a double opportunity to be taught vector quantities both in physics and Further Mathematics.

Poor academic performance according to Aremu &Sokan (2003) is one that is adjudged by the examinee/testee and other significant as falling below an expected standard. Poor academic performance has been observed in school subjects especially mathematics among secondary school students (Adesemowo, 2005). Aremu (2000) stresses that academic failure is not only frustrating to students and parents, its effects are equally grave on the society in terms of dearth of manpower in all spheres of the economy and politics. In the analysis of Further Mathematics in NECO 2002 SSCE in four States of Northern Nigeria namely, Kano, Borno, Gombe and Yobe States confirmed that a total of 408 students registered but 104 were absent and 304 were present for the examination. For instance, A-level Further Mathematics has declined dramatically over the last forty years. Figures from the London Mathematical Society (1995) showed that the number of double mathematics entries in England and Wales

fell from 15,600 to 5,400 in 1994. This corresponded to an actual rise in single mathematic sentries from 43,200 to 56,900 (2011). There have been signs of improvement more recently (Howes, E.V.,2002). However, different people at different times have passed the blame of poor performance in secondary school to students because of their low retention, parental factors and association with wrong peers, lack of motivation and the likes (Aremu & Sokan, 2003).

In an era of standard-based reform in education, many believe the best way to raise student academic achievement is through improved teaching; (Porter & Caret, 2000). To that end, Porter &Brophy (2007) maintained that student learning can be improved only if teachers' practices are of high standard; however, they concluded many teachers are not prepared to implement practices that reflect high standards. Morakinyo (2003) believe that the falling level of academic achievement is attributable to teacher's non-use of verbal reinforcement strategy. Others found out that the attitude of some teachers to their job is reflected in their poor attendance to lessons, lateness to school, unsavory comments about student's performance that could damage the leaner's' ego, poor method of teaching and the likes affect students' academic performance.

The issue of poor achievement in mathematics has worried many individuals, the government, as well as organizations within Nigeria. Such concerned bodies include the Mathematical Association of Nigeria (MAN), the Science Teachers Association of Nigeria (STAN), the Nigerian Academy of Education (NAE) and the National Mathematical Centre (NMC) at Abuja to mention a few. For example, the theme of the 1986 annual conference of MAN held at Ahmadu Bello University Zaria was titled

"Mathematics in Nigeria, problems and prospects". The theme contained five sub-themes which focuses on Mathematics at primary, secondary, and tertiary levels, as well as mathematics for economic and mathematics for Industrial development.

Factors influencing students' performance have been of interest to education providers especially those keen to produce knowledgeable and skillful graduates that can contribute to the social and environmental landscape. Ascertaining the factors governing the academic performance of students is a challenging task as this is a product of psychological, socio-economic and environmental factors. Bakare (2004) pointed out that study habits of students cannot be divorced from their academic performance because success in academic endeavor depends largely on reading in the search for knowledge and facts. Also, Anameze (2006) noted that since education is regarded as an agent of national development; (factors that promote academic performance such as effective study habits should be encouraged among students. According to him the promotion of effective study habits among students should be of profound interest to all concerned with the business of education. Research findings suggest that many students in Nigerian secondary schools have defective study habits. For instance, Anameze (2006) carried out a research on study skills of secondary school students and found out that respondents possessed only about half of the amount of skills required for effective study habit. Effective study habits promote academic achievement. Medahunsi (2002) pointed out that good skills enable students to make rapid progress and learn as much as they can in all subjects. According to him good reading skills make students' day in school rich, productive and enjoyable.

Another view of mathematics education, which may be characterized as traditional holds that "students learn by absorbing clearly presented ideas and remembering them, and

that teachers offer careful explanations follows by organized opportunities for students to connect, rehearse, and review what they have learned" (Kilpatirk et al, 2001).

Determinants of students' performance have been the subject of ongoing debate among educators, academics, and policy makers. Many studies have examined this issue whose findings point to hard work and discipline, previous schooling, parents' education, family income and self motivation as factors that can explain differences in students' grades. Ale (2000) listed four major causes of poor achievement in mathematics in schools as teacher related factors, learners related factors, government factors and societal factors. These problems according to Ale formed a vicious circle. Ale added that the vicious circle could be broken with effective mathematics teaching, mathematics through acquisition of adequate problem solving techniques, introduction of appropriate mathematics curricula and their implementation, and societal administration for mathematics. The importance of Further Mathematics cannot be overemphasized, as seen from the foregone presentation; it holds an enviable position of serving as a fink between general mathematics and advance level mathematics studied at the universities. It was also highlighted that there is a low percentage of students that study and sat or pass the subject. This study attempted to bring to the fore the possible factors that are responsible for this observed low performance of students in Further Mathematics. This concord with a number of factors highlighted above; example, the role of a teacher in students' achievement. The study also addressed the effect of teacher qualification and knowledge unlike other studies in relation to students' performance in further mathematic.

According to Balogun (2007), students’ performances are affected by some factors of which teacher’s qualification is a major factor. He says that students who are noted as

dull students in school assessment would have improved so well if their teachers had the required teaching skills. The qualification of teachers in any school system cannot be ignored because it influences the performance of students in school/academic work. According to Abumere and Unuabona (2003), most students have dislike for Further Mathematics because of their teachers. This dislike could be attributed to either lack of teaching skills by the teacher or inability of the teachers to relate well with their students. The deplorable standard of Further Mathematics education at the secondary school level could be attributed to the fact that most Further Mathematics teachers prefer industrial, managerial and administrative works teaching. This statement points to the fact that Nigeria cannot develop modern technology and sustain it if she fails to pay more emphasis on improving the downward trend of performance in Further Mathematics at the secondary school level.

Teacher's qualification and competency is also very important and can be attributed to the fact that Nigerian cannot develop in modern technology especially the areas of mechanical industry since we are over-dependent on crude petroleum. The teacher is the principal source of information in teaching and learning. They are also considered as nation builders. For instance, a "quack" doctor is capable of ruining an individual at a time, so also a bad teacher can ruin both the individual and his nation for a long time. Parents and students who are ignorant ask why students should be made to suffer learning Further Mathematics or why Further Mathematics should remain compulsory in our secondary schools (Lassa 2004). Students now seem to say that Further Mathematics has no important role to play in their life and should be made compulsory to those who need it and those who are prepared to learn it as a result of the effects of teacher's qualification on

students' performance in their internal examination that fall below expectation (Adefarati, 2002).

In the same vein, "whether a school has a special method of teaching or not, long division is of no significance except to those who want to learn it. (Summer, 2008). Then why are students especially in secondary schools asked to learn Further Mathematics?

Today, in secondary schools, the mention of this very important subject which should have been students joy leave a majority of them in tears, let alone given them an assignment or test on the subject mathematics (Salami, 2007). Teachers can influence their students' academic performance in Further Mathematics by teaching them the subject with the use of instructional materials. To some students, other subjects can replace Further Mathematics in the school timetable while few students are not ready to face any challenge passed by Further Mathematics educations. Others are not ready due to the effect of teacher's qualification on their student's performance in Further Mathematics. The absence of the spirit of adventure is the order of the day in the present day secondary school. Many have the ability to develop very many things and many have not, he said, but due to their attitude and environmental condition these are and are not developed he concluded. According to (Baoku, 2004) "demand must depend on the supply" (pg 84) but looking at our educational situation today, there are very few qualified teachers teaching Further Mathematics compare to the number of students offering it in the secondary schools and this had a great influence on their academic performance in Further Mathematics . For Further Mathematics to be effectively taught, there should be a need for qualified or well trained teachers in the field.

1.2 Statement of the Problem

The main objective of mathematics education programmes of various institutions of learning in Nigeria is to make students understand mathematics and apply it to everyday activities. Unfortunately, some variables in the schools make it difficult for the main objective to be achieved.

Due to these variables students' understanding and performance in the subject is generally poor (Lassa, 2004). For instance, findings of researches conducted by Lassa (2004) and Ademulegun (2001) revealed that students generally perform poorly in Further Mathematics. This poor performance was further testified by Aremu (2003) and Oluwole (2000). Notably, among the variables for this poor performance as pointed out by Williams (2007), Aremu (2003) and Archer (2009) are teachers' qualifications and syllabus coverage. Most of the teachers are not qualified to teach and their attitude towards syllabus coverage is poor. This caused tremendous negative consequences on the students' understanding and performance. Thus, it has become necessary that research efforts be directed toward investigating the effects of teachers' qualifications and content knowledge on students' performance in Further Mathematics among Secondary School with a view of suggesting steps necessary to minimize the problem. Senior Secondary School level was selected so that the effects would be identified from the grassroots and because senior Secondary School level is a level at which solid or poor foundation is laid in Further Mathematics.

Teachers' qualification is a significant factor that affects students' performance in Further Mathematics. According to Atkinson (2005), Ale (2007) and Armentano (2003),

most of the Further Mathematics teachers at the government-owned Secondary Schools in Nigeria have poor qualifications and this has tremendous negative consequences on the students' performance. They revealed that averagely, 40% of teachers who teach Further Mathematics at the government-owned Secondary Schools in Nigeria are not qualified to teach at that level. They further attributed the students' poor performance to lack of qualified teachers and hence recommended that studies should be conduced to investigate the effect of lack of qualified teachers on students' performance. Another relevant variable that affects students' performance in Further Mathematics is syllabus coverage. For instance, Obioma (2006), Fabumi (2004) and Oluwole (2000) concluded that failure of mathematics teachers to cover the prescribed syllabus before the final examinations has a number of negative effects on students' performance. They stated that averagely 60% of teachers who teach Further Mathematics at the government-owned Secondary School in Nigeria fail to cover the prescribed syllabus before the final examinations. They attributed students' poor performance to teacher poor attitude towards syllabus coverage and hence recommended that further studies should be conducted to identify the effects of syllabus coverage on students' performance. The above evidences revealed that students' performance in Further Mathematics has been generally poor. The poor performance is connected to lack of qualified teachers and inadequate syllabus coverage. Hence the researcher hereby attempt to find out the effect of teachers' qualifications and competency on performance in Further Mathematics among senior secondary school students in Zaria metropolis of Kaduna State, Nigeria.

1.3 Objectives of the study

The objectives of the study were to:

1. Investigate effects of teachers qualification on students performance in Further Mathematics in Zaria metropolis, Kaduna State.
2. Investigate effects of teachers' competency on Senior Secondary School Students' academic performance in Further Mathematics in Zaria metropolis, Kaduna State.
3. Identify differences in performance of male and female Senior Secondary School students in Further Mathematics in Zaria metropolis, Kaduna State.

1.4 Research Questions

This study answered the following research questions.

1. What is the effect of Teachers' qualifications on students' academic performance in Further Mathematics?
2. What is the effect of Teachers' competency on Senior Secondary Students' academic performance in Further Mathematics?
3. Does gender affect Senior Secondary School students performance in Further Mathematics?

1.5 Research Hypotheses

On the basis of the research questions, the following null hypotheses were formulated and tested.

HO_1: There is no significant difference between teachers' qualification and students academic performance in Further Mathematics.

HO_2: There is no significant relationship between Teachers' competency and academic performance of Students in Further Mathematics.

HO_3: There is no significant difference between performance of male and female students in Further Mathematics.

1.6 Significance of the Study

The study provided an insight into the effect of teachers qualification and competency on performance in Further Mathematics among Senior Secondary School students in Zaria metropolis, Kaduna State. This would assist teachers, administrators, governments and councilors to appreciate the problem from the grassroots. The study is useful in bringing the teaching of Further Mathematics in line with modern technological devices and learning will take place effectively. The schools administrators would be awakened to their responsibilities of employing competent teachers and providing them conducive atmosphere to display their competency. Governments and Parents would see vividly the rationale to render more support to etcher training programmes financially, morally and otherwise. The study would enlighten teachers on the tremendous negative consequences of inadequate syllabus coverage on students' performance. This would enable them to change attitude and teach strictly according to the prescribed syllabus and cover it before the final examinations. The schools administrators would improve their methods of checking the syllabus covered by the teachers at the end of each term with a view of advising the victims for future improvement. The study would encourage the

parents to complement the teachers' effort of covering the syllabus by organizing extra lessons for their children at home or through informal coaching. This study will make students to be more interested in Further Mathematics and improved their performance. It would help students to develop positive attitude toward Further Mathematics. It would help the policy makers and curriculum developers to emphasize in the level of competency of senior secondary school Further Mathematics teachers based on their qualification. Mathematical Association of Nigeria (MAN) will benefit from the study.

The findings of this study would help senior secondary school students to remove some of the social apathy towards Further Mathematics and that their achievement depends on their own active participation not only on their teachers. Thus, the students would appreciate the need for their involvement in Further Mathematics activities in their classroom and help them to acquire both mathematical knowledge and skills which would enhance capacity building and sustainable development. In other words, the students would be enabled towards achievement of national goals for mathematics education. The society would benefit from the study because the study helps to improve students performance and positive attitude in Further Mathematics, then the subject and its allied courses (Engineering, Pharmacy, Industrial Physics e.t.c) would be studied by many students in institution of higher learning. If students study Further Mathematics and its allied courses our dream in the use of science and technology for capacity building and sustainable development will be fully realized. Finally, the study has paired way for further related studies.

1.7 Scope/Delimitation of the Study

In this study, the researcher examined the effects of teachers qualification and competency on performance in Further Mathematics among Senior Secondary School students in Zaria Metropolis, Kaduna State. Strictly, public senior secondary school two (SS II) students was considered in Zaria Metropolis, during the experiment, Polynomial, Differential equations, Matrices, content was precisely considered for of SS II only in Zaria metropolis of Kaduna State. Other divisions/towns in Kaduna state are excluded in this study. Two instruments: Further Mathematics Achievement Test (FMAT) and Teacher Competency Test (TCT) were used in the study.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Introduction

This chapter reviewed some research findings conducted in mathematics education relevant to the present study. The review was made on the effects of teachers qualification and competency on performance in Further Mathematics among Senior Secondary School students in Zaria metropolis, Kaduna State. Thus, the Chapter is organized according to the following subheadings:

2.2 Relevance of Motivational Theories to Further Mathematics Teaching and Learning.

2.3 Relevance of Further Mathematics to Senior Secondary School Curriculum in Nigeria.

2.4 Further Mathematics Teaching in Nigerian Secondary Schools

2.5 Teachers' Academic Qualifications on Senior Secondary Students' Performance in Further Mathematics.

2.6 Teachers' Competency on Performance of Secondary School Students in Further Mathematics.

2.7 Gender and Achievement in Further Mathematics.

2.8 Implications of Reviewed Literature.

2.2 Theoretical Framework

Theories that explain learning and the methods to achieve favorable outcomes are well documented in Education and Psychology literature. In this study some theories are reviewed with a view to selecting the ones that most appropriately explain the study.

2.2.1 Relevance of Motivational Theories to Further Mathematics Teaching and Learning.

In making instruction interesting in learning Further Mathematics, there is need to use methods/strategies and material/media which will make the learning of mathematics, active, investigative and adventurous as much as possible. Such methods also must be ones that take into account, learners' differences and attitudes towards mathematics as a subject. Examples could be the use of programmed learning texts, use of concrete materials and others instructional devices, which are manipulated. Also, mathematics exercises in form of various pencil and paper activities should also be used to enhance self-esteem of learners, which will in turn improve attitude of such students, it is recommended that varying activities (game activities), which have been designed to contain mathematics problems ranging from easy to very difficult, should be used.

At least each student no matter his ability level should be able to answer some questions correctly. This would go a long way to motivate such students towards further learning. When an activity is designed with its central feature being an admired situation, experience or individual, it would go a long way in motivating, pupils to learn mathematics. For example, in teaching addition at the primary school level, you could

centre learning activities on foods like snacks. It could as well be centered on a pleasurable experience and so on. All these suggestions would help to motivate learners towards learning. However, one strategy, which has been observed to bring about motivation to learners to learn mathematics, is the use of game based strategy (Aremu, 2008).

The target of the study is premised on student, teacher, and curriculum. Therefore theories that have to do with the characteristics of these entities as they affect learning would be applicable. Since the learning of any subject matter depends on the way it is presented to the learner by his or her teacher, the way the learner interacts with the learning experiences presented to him and the environment within which the learning takes place, it is therefore expected that these entities will be affected by variables that have to do with them; these include, school location attitudes, and background knowledge in mathematics that are considered in this study.

The theories of Maslow (2009) and Gagne (2005) have therefore provided theoretical basis for the study. Maslow's motivational theory expresses that there are two groups of needs; these are deficiency needs and growth needs. When the deficiency needs are met, learners are likely to function at the higher levels (that is growth needs level). This means that when the deficiency needs are met, self directed learning or desire to know and understand would be engaged in more easily. The implication of thesis that teachers should encourage students to meet their growth needs by enhancing the attractiveness of learning situation. In the light of these, when the environment where the student is learning (in this study, class, and location of school) is made attractive, effective learning is likely to take place. Gagne's theoretical formulations are attempts to identify aspects of learning and to match with the intellectual demands of the individual. While development is subordinated

to learning, Gagne's paradigm insists on identifying valid ordered sequences of instruction (pre-requisites) that can facilitate the learning of intellectual skills. Gagne's theory offers an opportunity for the Further Mathematics teacher to diagnose students' limitations and strengths more effectively, thus permitting more adequate individualization and personalization of instruction. Gagne's learning hierarchy also offers Further Mathematics teachers the opportunities of developing and conceptualizing agreed-upon Further Mathematics goals and objectives in reality oriented and learner - centre way. It is on this premise that Gagne anchors his belief that children learn an ordered additive capability. That is, the simpler and more specific capabilities is learned before the next more complex and general capability. Gagne therefore considered previous experience to have a major role in determining an individual's performance. It is within this framework that the present study looked into the student's background knowledge in Mathematics vis-a-vis their performance in Further Mathematics in the senior secondary school.

2.2.2 Relevance of Further Mathematics to Senior Secondary School Curriculum in Nigeria

Generally, mathematics has been identified as one of the basic perquisites for useful living in the society by the Nigeria national policy on education. The use of general mathematics has not been limited to academic environment but also been indispensible in all endeavours of human activity. This is evidenced in the application of basic mathematical concepts such as Addition and Subtraction in all business dealings.

The question that remains valid even to the educated mind is the needs for Further Mathematics when most students are yet to grasp the full extent of General mathematics in Nigeria Secondary schools.

In their review of Further Mathematics education, Charles and Lester (2011) states that:

1. The study of the subject should provide students with certain skills and process that prepare them to be productive member of the society.
2. The study of the subject should give students the necessary background and skills to enable them make career decisions consistent with their interest and ability.
3. The study of the subject should have potential for enriching the students' lives in some way.

The first point stress the importance of Further Mathematics in terms of life skills and the ability to function properly in the society, while the second emphasis the key role which Further Mathematics holds in relationship to many career choices. The third is less tangible and may be suggesting the methods of Further Mathematics having some value in terms of the way students think. Its worth of note that Further Mathematics as a subject is more popular among student in science departments of secondary schools in Nigeria. This is not unconnected with the probable career choice of students who are likely to be going w area of specialization such as engineering, pure and applied science and Statistics. Further Mathematics then serves as a bridging program to help students understand and get use to the rigor of scientific processes. Furthermore, further Mathematics helps students to grasp a remarkable understanding of their environment.

According to Tymocko, T. (2008) to introduce students to humanistic mathematics is to introduce them to a human adventure". Further Mathematics provides the platform and tools for students in Nigeria secondary schools to properly model their environment and be able to manipulate it to observe changes that might or have occurred in it.

Finally in order for Nigeria to remain relevant in the affairs of nations, there is the need to develop a new generation of students who are able to cope, understand and be part of the re-writing of world history through technological advancement. Its reasonable to state that general mathematics curriculum in Nigeria is inadequate for this crucial assignment thereby leaving Nigeria students with Further Mathematics as a viable alternative to achieve national objective of globalization.

2.2.3 Further Mathematics Teaching in Nigeria Secondary Schools

Mathematics in its entirety can be defined as a way of describing relationship numbers and other measurable quantities. (Encarta, 2009). The Encyclopedia Britannica (2009) defines mathematics as the science of structure, order and relation that evolved from elemental practice of counting, measuring and describing the shapes of objects. The Wikipedia online encyclopedia in quoting the Works of Steen (2000) and Devlin Keith, (2006) defines mathematics as the study of quantity, structure, space, and change. Jourdain (2003) is of the opinion that mathematicians seek out patterns, formulate new conjectures, and establish truth by rigorous deduction from appropriately chosen axioms and definitions. Scholars such as Steen (2000) defines mathematics as "an exploratory science that seeks to understand every kind of pattern - patterns that occur in nature, patterns that are invented by human mind ad even pattern that are created by other pattern". Thus for the

purpose of this study, mathematics is defined as a general way of thinking about the environment surrounding us, the relations between its elements and our interaction with it.

Booker (2005) stated that mathematics education is more than just a sum of appropriate learning of subject matter content and provision of suitable pedagogy teacher, but an understanding of the mathematical process or a coming to know what the doing of mathematics is all about. Accordingly, mathematics education (i.e. the teaching and learning of mathematics) can be defined as the study of practices and methods of teaching and learning mathematics, and the development of mathematics teaching tools that facilitates, exercise and practice with the definite goal of archiving satisfactory student performance. The concept of Further Mathematics education as applicable to the Nigerian secondary school education curriculum refers to the teaching of mathematical concepts that are considered to be theoretically advanced for teaching as part of the general mathematics curriculum. The main objective of its teaching is to prepare students in science oriented class for advance studies in science oriented programme in tertiary institution, mostly as a bridging ground for the understanding of basic scientific concepts. Menal (2008) considered mathematics as an essential foundation for many other subjects' areas as well as many occupations in life. Orton et al (2010) argued that "for many years mathematics have suffered from a belief that when it's not directly useful it has indirect utility in strengthening the power of reasoning or in inducing a general accuracy of mind". With the inherent logic in the process of mathematics, seems possible. It could simply be that those who possess good power of reasoning thrive in the world of mathematics rather than a study of mathematics and indeed further (advance) mathematics developing reasoning ability.

Many questions thus emerge: Why is Further Mathematics often seen as difficult and unpopular by many students? Why does large number of students fail Further Mathematics? Who and what is responsible for this high failure rate: is it due to inappropriate curriculum, inappropriate teaching methods or just lack of commitment from the learners. These issues are complicated and interrelated in most cases. Consequently, this study attempts to identify the various factors that are responsible or student's performance in Further Mathematics with specific emphasis on Kaduna State, Nigeria.

2.3 Review of Empirical Studies

Many studies on students performance have been carried out over the last few decades, more than ever before, as a result of declining level of performance in General Mathematics, Further Mathematics and other subjects alike, researches have been carried out on the possible reasons for this state of affairs. The following are some few that has relationship with the authors work.

2.3.1 Teachers' Academic Qualifications on Students' Performance in Further Mathematics

Over the past decades, educational planners, policy makers and administrators all over the world have become increasingly concerned about the quality of education provided by the school system. They have come to realize that many meaningful improvements in the quality of education that students receive are highly dependent on the quality of teachers (Anderson, 2009). This situation is especially true in the developing countries where teachers are usually the only adults who transact educational inputs to the students. In Schofield (2004), Shulman (2007) & Ball (2003) papers, they took subject-

matter knowledge as mathematics teacher's mathematics achievement. Thus, subject-matter knowledge is considered as a measurable performance indicator for assessing teachers' mathematics achievement. In the past decade, teacher's subject- knowledge was measured by the scores achieved on standardized tests, by number of academic modules, by number of courses taken in university (Ball, 2003; Shulman, 2007). In Nigeria, most educators have the same view on taking mathematics subject-matter knowledge as mathematics teacher's mathematics achievement. But these quantitative measures do not represent the teacher's entire knowledge of subject matter, especially in the teaching profession, since subject matter knowledge also includes pedagogical content knowledge.

In recent years, pedagogical content knowledge has been considered as another category of teacher's subject matter knowledge. Ball (2003) & Shulman (2007) feel that this kind of knowledge can be described as knowing the ways of representing and formulating the subject matter and making it comprehensible to students. As teachers' instructional devices influence the process of learning, it is therefore important to understand how teachers explain mathematics knowledge to students, what they emphasize and what they do not; and what methods they choose to help students understand.

In Nigeria as in many other developing countries, education has been usually considered to be the cornerstone and pillow of economic growth and developments. government believes that to survive in the competitive world economy, quality of education is the key variable. Grounded in this belief, educational reforms have taken places that are directed towards improving the quality of education. These reforms in

Nigeria are demanding greater performance and commitment from teachers, holding teachers for the performance of students in secondary schools.

Teachers are held responsible for the quality of students' work. The quality of the students' note-books and assignment shows the teacher's delivery quality and the students'' contribution assessment results shows whether there has been an improvement or not. Current models of supervision portray the teacher as participant rather than an observer in the learning process. The emphasis of these models is the importance of continuous improvement for both the teacher and student alike. Perennial poor mathematics (and Further Mathematics alike) performance in Nigerian secondary schools has generated an overwhelming need for a review of current teaching and learning strategies. The Mathematical Association of Nigeria (MAN) once declared a War Against Poor Achievement in Mathematics (WAPAM). Unfortunately, WAPAM achieved little in reversing the trend of poor mathematics achievement in Nigerian secondary schools.

The importance of teachers cannot be over stressed. This is because teachers play a number of roles. Specifically, teachers have been referred to by Oyedeji (2008) as an agent of innovation. For meaningful innovations, teachers' academic qualification is very important. This is because teacher education is a very complex enterprise. The complexity arises as a result of several factors which include determination of what effective teachers are, teachers are expected to fulfill a variety of roles, some common to all teachers, others uniquely related to certain kinds of environments of students or subject matter. Added to this, is the fact that teacher education involves the training of professionals who will educate students in future. Despite the complexity in the field of teacher education, one cannot over-emphasize the importance of academic training of teachers of all categories.

This is because the efficiency of any institution depends on the academic competence of the teaching staff since no educational system can rise above the quality of its teachers (FRN, 1991 p. 38).

A number of studies carried out had indicated the need for teachers' academic qualification in their various teaching subjects. Such studies include those of Swan & Jones (2001), Rubba (2001), Ivowi (2003,2004), Akinsola (2003), Setidisho (2006), Biggs (2006) & Osibodu (2001). Swan & Jones (2001) finding was that teachers should receive appropriate training in the subject matter area so that their classroom instruction could be above board. Rubba's (2001) study indicated that teachers have needs according to the science discipline taught. Ivowi, Akinsola, Setidisho, Biggs & Osibodu found out misconceptions in students which they traced to misconceptions held by their teachers. All the above studies prove that training of prospective teachers in the subject matter areas should not be taken lightly by science educators.

Ehrenberg & Brewer (2004) highlight seven important factors an effective school exhibit. These include: instructional leadership, clear and focused mission, safe and orderly environment climate of high expectation, frequent monitoring of student progress, positive home school relations and opportunity to learn and student time on-task. Policy makers in the education sector would do well if they realize that collaboration; teaming, peer view; coaching and monitoring are critical components professional development efforts. Schools that promote a culture of performance continuous assessment offer the capacity to enhance student achievement and the teacher's professional growth (Furtwengler, 2005). When teachers reflect on what and how students learn and use this knowledge to modify their instructions accordingly,

better teaching style and learning occur. The feedback from such reflective teaching can serve as an effective tool for teacher improvement, so it is not only the students that benefit, the teacher also gains.

The literature on teaching quality and qualification has typically been viewed as inconsistent and inconclusive of this perception has been fueled by a set of analyses conducted by Eric Hanusek and others over the past two decades. In his meta-analysis of studies examining the impact of several key educational resources on students' achievement, Hanushek (2008) concluded that there is no systematic relationship between educational inputs and students' performance. While impacts on student achievement is clearly the most important criteria for evaluating teacher quality (Monk, 2004), research has also identified a number of directly observable teacher characteristics that are linked to teacher quality and performance (Goldhaber& Brewer, 2002). Research also shows that teacher knowledge of specific subject matter, particularly at the secondary level is a good predictor of student achievement. Monk (2004) finds a strong correlation between teacher subject matter preparation in mathematics and student success for both low and high scoring students, while Goldhaber& Brewer (2002) note that students do better In mathematics if taught by a teacher with a bachelor's or master's degree in mathematics. The professional needs of a teacher vary in relation to the stage e is in the profession. The supports of an inexperienced teacher needs differ that of a teacher's assistant, or even a professional teacher. Supervision and coaching are critical elements of professional growth and development (Rockoff, 2004).

Furthermore, Fajemidagba (2006) identified four important variables in teacher education. The variables are teaching behaviour, subject matters, learning behaviour and

the setting. According to him, the subject matter constitutes pedagogical concepts, generalizations, prescriptions, theories from relevant field of psychology, philosophy and so on. This prompted Fajemidagba to study the need for the inclusion geometry in the education of mathematics teachers in Nigerian universities in His results revealed that the majority of secondary school Mathematics teachers had little exposure to geometry at the university level. Nearly all the study sample agreed that geometry should be included in the programmed for the pre-service Mathematics teachers. This further stress the need for such training for Further Mathematics teacher, as it was found out that some teachers of Further Mathematics deliberately skip certain topics in the syllabus hence losing confidence of their students due to their inability to deliver the "stuff" properly. As stated by Anyip, (2009), Jahun & Korau, (2005) confirmed the hypothesis that teachers perception of their competence to teach Further Mathematics differs significantly according to their qualifications.

Kinyomi (2006) from his study found out that study sample indicated that they improvement in the areas of English composition and Creative Writing to enable them functions better in their teaching. Participation in in-service training programmed can also improve teachers' classroom interaction pattern. This revelation was made by Igwebui (2005) when he determined the effectiveness of the Associate Certification in Education (ACE Sandwich) training programmers of the Institute of Education, University of Benin. Too little knowledge about subject matter can be a danger since the teacher may be propagating error. In addition, too much specialized theoretical knowledge could lead teachers to make course content unnecessarily theoretical and impractical. A major concern in teacher knowledge should therefore be directed to practical, everyday examples of

phenomena being taught as this is the objective of the 6-3-3-4 system of education in Nigeria.

These were the implications From Butzow & Qureshi's (2008) study "Science Teachers' Competences. A practical Approach" conducted on twenty-one science teachers selected by a fled random sampling technique. Their revelation was supported by the finding Odeyemi (2002) when he carried out a study titled "Science Educators' Perception of competences Necessary for Secondary Science Teaching". All the teachers in the sample rated professional role and development very high. One of the fundamental problems facing science teaching today is the question of how current are the professional teachers. The majority of teachers who have been employed in the past decades have been doing the same thing, the same way all along. They have no edge of the current ideas and innovations that have taken place in the educational field in the recent past. What account for this is that teachers have not given the opportunity for re-training (Ogunbiyi, 2004). He therefore recommended that teachers should be encouraged to go for workshop training in their areas of specialization. Okpala & Onocha (2005) concludes that academic qualification of teachers was paramount among the needs of teachers. It was to confirm the influence of teachers' academic qualifications on students' performances in Further Mathematics that this study was be carried out.

2.3.2 Teachers' Competency on Performance of Students in Further Mathematics

This study explored whether and how teacher's mathematical competency for teaching contributes to gain in mathematics knowledge is significantly related to student achievement or performance in Further Mathematics. The student mathematics

achievement can be attained by improving teachers' competency in Further Mathematics has attracted increasing attend from policy makers .To provide students with high qualified teachers, no child left behind requires teachers to demonstrate subject matter majors, certification, or other means. For example, teachers of Further Mathematics not only need to calculate correctly, but also know how to use pictures or diagrams to represent mathematics concept and procedures to students, provide students with explanations for common rules and mathematical procedures, and analyze student solution and explanations by inadequately measuring teachers' competency, existing educational product function research could be limited in the magnitude of effect that teachers' competency has on student learning ,but also about the kinds of teacher knowledge that matter most in producing students learning.

An important purpose of study is to demonstrate the independent effect of teachers mathematical competency for teaching to student performance net of other possible measures of teacher qualify such as teacher certification, educational course work and experience. By mathematical knowledge used to carry out the work of teaching mathematics. Example of this "work of teaching" include experience term and concept to student, interpreting students statement and solution using representation accurately in the classroom and providing students with examples of further mathematical concept or proof (Hill, Schilling, &Ball, 2004). Effectively in teaching results not simply in the knowledge, a teacher hold personally but how this knowledge is used in the classrooms. Teacher highly proficient in Further Mathematics will only help other learn Further Mathematics if they are able to used own knowledge to perform the texts they most enact as teachers for example, to hear students, to select and make good assignment and to manage disruption of

important ideas and useful work on skills. Harbison & Hanushek (2006).Shulman originally proposed 3 categories of teacher's subject matter competency. His first category. Is Content Knowledge, was indented to do note "the amount and organization of knowledge in the mind of teacher's contents knowledge, according to Shulman, included both facts and concept in a domain. The second category advanced by (Shulman, I.S. 2007) was Pedagogical Content Knowledge .The concept attracted the attention and interest of researchers and teachers educators. The component of pedagogical content knowledge according to Shulman (2007) are representation of specific content ideas ,as well as an understanding of what makes the learning of a specific topic difficult or easy for student.

Shulman third category, curriculum knowledge involves awareness of how topic are arranged both within a school year and over time and ways of using curriculum resources such as textbooks, to organize a program of study for student. Eggen and Kauchak(2010) highlighted hairy under which a study on three teachers knowledge of academic performance of student in Further Mathematics. These are namely: knowledge of content, pedagogical content knowledge and general pedagogical knowledge .It is a statement of fact that nobody can teach what he does not understand. It has been established that there is high correlation between what teachers know and what they teach (Wilson et al. 2009). Thus, the ability to teach Further Mathematics effectively depends on the teachers knowledge and knowledge occurs in a variety of forms. Teacher's effectiveness is impeded if the teacher is unfamiliar with the body of knowledge taught and that teachers, effectiveness is subject specific. The implication of this for teachers is that they most thoroughly understand the content of what. The mathematics teachers whose

understanding of topic is thorough use clearer language their discourse is more connected, and they provide better explanation than does whose background is weaker. the way the students perceive the teachers in terms of their (teachers) knowledge of content of subject matters may significantly affect the student academics performance in Further Mathematics pedagogical content knowledge depend on and understanding of a particular topic and how to explain it in a way that it will make sense to the students pedagogical content knowledge implies, an understanding of ways of representing the subject that it comprehensive to others and an understanding of what make the learning of a specific topic easy or difficult.

Eggen & Kauchak(2010) declared that where pedagogical knowledge is lacking teachers commonly paraphrase information in learners texts books or provide abstract explanation that are not meaningful to their student. From evidences available in literatures it is been established why teachers' competency in Further Mathematics is highly essential for effective teaching. Ehindero (2009) confirmed that a teachers teaching is influences by the level of his pedagogical knowledge, to promote orders and learning in the classroom, every teacher should possess essential teaching skills. Ehindero & Ajibade (2009) posit that teaching is a process of continuous personal development and professional self discovery alongside an emerging understanding of the teaching and learning process.

2.3.3 Gender and Achievement in Further Mathematics

In Nigeria, perhaps the whole of Africa, gender bias is still very prevalent. This is a view to which Onyeizugdo (2003,p.12) has also alluded in pointing out that "sex roles are sometime rigid in Africa, particularly in Nigeria… gender differences are emphasized." It is

commonplace to see gender stereotypes manifested in the day-to-day life of an average Nigeria. Certain vocation and professions have traditionally been regarded as men (medicine, engineering, architecture), and others as women's (nursing, catering, typing, arts). Typical parent call on boys to wash car, cut grass, fix bulb, or ladders to climb ladders to fix or to remove things. On the other hand, chores such as washing dishes, cooking, cleaning, and so on, are reserved for the girl. In a sense, what are regarded as complex and difficult tasks are allocated to boys, whereas girls are expected to handle the relatively easy and less demanding tasks as a result of this way of thinking, the large society has tended to see girls as the "weaker sex". Consequently, an average Nigeria child goes to school with these fixed stereotypes. These stereotypes persist because in term of assertiveness, for example, men in Nigeria were reported to be more assertive than women among teacher education, law, and pharmacy student (Adejumo, 2000).

Mathematics is a science subject and some gender-based science researchers have reported that what both the 'feminist empiricists' and the 'liberal feminist critics' seem to agree is that female in principle will produce exactly the same scientific knowledge as males provided that sufficient rigour is undertaking in scientific inquiry (Howes, 2002; Barton, 2008; Sinnes, 2006). They also believe that initiatives that build on the assumption that females and males are equal in their approach to science, and that inequality in science and science education is caused by political, educational and social factors external to science, would be expected to focus on removing these external obstacles. There is need therefore to give boys and girls exactly the same opportunities and challenges.

In Nigeria, gender-achievement studies include Abiam&Odok (2006) who found no sufficient relationship between gender and achievement in number and numeration,

algebraic processes and statistics. They however found the existence of a weak significant relationship in Geometry and Trigonometry. Though globally the issue of gender inequality in Science, Technology and Mathematics Education (STME) has produce inconclusive results, one meta analysis the period 1999 - 2002 on Mathematics and gender led to two conclusions: the average gender gap is very small (statistically insignificant), and the fact that the differences tend to decline with time(Friedman,2008).

Another meta-analysis of 100 studies in gender and mathematics performance corroboration the above finding (Fennema & Lamon, 2010). Some scholars the colonizers of Africa for applying direct transfer of Western Science curricula, examinations and teaching methods, which fail to address the continental challenges of Africa. Yoloye (2008) submitted that the result of this direct transfer of western curricula is a science and mathematics education in most African countries that is exemplified by decontextualized knowledge being transmitted by poorly trained teachers in under-resourced and sometimes overcrowded classrooms. As a consequence, the situation in Nigeria is that, academic performance in Mathematics education is still deplorably low, both in certificate and non certificate examinations. Many researchers identify inherent unfairness in school-based assessment (Grifith, Njabili, et al. 2005; Asim, 2007) which may result from teachers' incompetency in assessment (Asim, et al. 2007), as well as psycho-cultural factors among others as being responsible for this anomaly (Enukoha, 2005; Obodo, 2007; west African Examination Council, 2002). This poor Mathematics performance of students is further worsened by gender imbalance leading to the problem which now constitutes a major research focus across the globe (UNESCO, 2003).

In a study by Opolot-Okurut (2005) it was found that for all the attitudinal variables (anxiety, confidence and motivation), males had higher mean scores than females. that is, differences in student attitude toward mathematics based on gender were confirmed. Attitudes are known to have positive relationship with student achievement. This may be an indication that males perform better than females mathematically as a result of their higher attitude scores. It is believed that bridging gender gap is one major way of achieving egalitarianism and enhancing human a disparity has been reported in literatures in the achievement of males and females mathematics. Reasons were advanced for the difference in the performance of the Sexes in mathematics achievement. Aiken (2001), and Maccoby & Jackling (2004) reported that, lack of female role model is a factor in sex differences in mathematics education. Buamrind (2002) & Nash (2002) in Barbara & Barbara (2004) also reported that socialization of most women discouraged or suppressed their interest in mathematics. Wood (2006) also suggested that the discrepancy in higher level mathematics achievement between males and females may be a function of latter attainment of the formal operational stage by the females. Fox, Fennerna& Sherman (2007) however, suggested that the difference between males and females result because of career aspiration especially since the females would not be attracted much to engineering, physics and mathematics which they view as the domain of males. Fennema& Sherman (2007) also reported that both male and females viewed mathematics as a domain of the males.

The present study was interested in gender influence (especially on those female characteristics that predisposes them to taking mathematics and of course Further Mathematics related courses at tertiary levels) in Nigerian educational setting where

sciences and mathematics has masculine image and the traditional attitude of the society towards the education of students as to invest more on the education of boys and girls.

2.4 Implications of Reviewed Literature

In this chapter, a review of relevant literature to the study was presented. This included the theoretical framework and empirical studies relevant to present the theory of motivation as it relates learning generally and Further Mathematics in particular was reviewed. Empirically, the effects of teacher Qualification, and competency on performance of senior secondary school students were highlighted. An attempt has was made to tie each component of the literature review to the present study. None has attempted to investigate into the influence that teacher qualification might have on performance of student. More so, little or none of the literatures reviewed have highlighted the influence that teachers' competency might have on performance of students in Further Mathematics. This study examines the effect (if any) of Teacher qualifications, and competency on Performance of Further Mathematics students in Kaduna state with the view to relating each factor highlighted with academic performance.

Some of the literature reviewed in this study are those of (Ademulegun, 2005) who hold the belief that some of the teachers in secondary school qualifications were found not to be relevant to Further Mathematics teaching. Dalhatu, (2006) found out that some of Further Mathematics teacher were not properly qualified to teach the subject and these have gone a long way to affect the academic performance of students in Further Mathematics. More so, teachers' inabilities to tap on the reservoir of residual

knowledge emanating from past experience to impact on the understanding of students also hinder students' performances greatly. Closely related to this, is the teachers' inabilities to make effective use of teaching aids such as diagrams, illustrations and their likes. To buttress this, Hill, Schilling and Ball (2004) highlight the need for experience coupled with interpreting students statement and solution using representation accurately in the classroom and providing students' with simplified examples of Further Mathematics concepts to aid understanding of the subject mater. Schofield (2004), Schulman (2007) and Ball (2003) posited the subject matter and content development to be measured in line with pedagogical content knowledge use to bridge the gap between content delivery and student comprehension of the subject. To this end discovery of new methods and ways of representing and formulating the subject matter and making of comprehensive to students (Ball, 2003 and Schulman, 2007). The findings of this present study collaborates other findings in the literatures reviewed revealing negative effects on students performance in Further Mathematics. Based on the achievement tests conducted on teachers, this study found that teachers whose qualifications are B.Sc (Ed.) and B.Ed Mathematics had high performance while those with NCE qualifications had low performance. More so, students performance in the achievement tests were generally low which is a pointer to a hinge gap that exist between subject content delivery and students comprehension of the subject matter. To this effect, Swan (2005) posit that teachers should receive appropriate training in the subject matter area so that their classroom instruction could be above board. Ehrenberg and Brewer (2007) highlights important factors that an effective school can exhibit which include instructional leadership, clear and focused mission, frequent monitoring of student performance etc. In

the same vein, schools that promote a culture of performance continuous assessment offer the capacity to enhance student achievement and the teacher's professional growth (Furtwengler, 2005). Conversely, teachers have not reflected on what and how students learn and at the same time have not used this knowledge to modify their instructions accordingly in order to ensure better teaching style and learning.

Consequently, the implications of this study could be grievous simply because if attempt are not made to correct the imbalances that exist in the teachers qualifications and past experiences, and also the inabilities of teachers to use instructional materials effectively, the teaching of Further Mathematics would continue to be ambiguous and difficult to understand, therefore affecting students' performances greatly. The researcher agrees with all these findings and accepts that teacher's qualification has a greater effects on the performance of students in Further Mathematics secondary schools in Zaria Metropolis. The literature review so far have thrown great light on the research understanding on the effect of teachers qualifications and teachers' competency on students performance in Further Mathematics among secondary schools in Zaria Metropolis.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This study examined Effects of Teachers' Qualification and Competency on Performance in Further Mathematics Among Senior Secondary School Students in Zaria Metropolis, Kaduna State. The main objectives of this study was to assess effects of teachers' qualification on students' academic performance in Further Mathematics, assess effects of Teachers' competency on students academic performance in Further Mathematics and to identify differences in performance of male and female students in Further Mathematics. The focus of this chapter however, is to discuss the following sub-headings:

3.2 Research Design

3.3 Population of the Study

3.4 Sample and Sampling Techniques

3.5 Instrumentation

3.6 Validity and Reliability of the Instruments

3.7 Procedure for Data Collection

3.8 Procedure for Data Analysis

3.2 Research Design

The research design for this study was survey design adopting pre-test and post-test group. According to Tuckman (2008) survey design is partly but not fully true experimental design because it controls some but not all of the sources of internal validity.

Survey design involves selecting groups, upon which a variable tested without any random pre-selection process (Suttleworth, 2008). It is possible that school system may not accept new programs for testing on an experimental basis, may not allow intact classes to be disrupted or divided to provide for random or equivalent samples, may not allow for the treatment to be given to some and withheld from others. Pre-test and post test will be given to both experimental and control groups, only that it is the experimental group that will be exposed to teachers qualification and competency on students performance in Further Mathematics while control group will be exposed to lecture method. Students from the following four (4) schools such as Government Day Secondary School HayinDogo, Government Day Secondary School Basawa, Government Day Secondary School Bomo, Government Girls Secondary School Zaria from the 23 Secondary Schools in the study area were randomly selected using hat and draw technique. The diagrammatic presentation of this selection is indicated in Table 3.1. The four schools were divided into experimental and control groups. Both of them will be pre-test in order to ascertain their differences in academic performance. Treatment was administered to experimental group by exposing the teachers to students performance in Further Mathematics while the control group was taught using lecture method. At the end of the five weeks treatment period posttest was administered to both (experimental and control groups) using Further Mathematics Achievement Test (FMAT) and Teachers Competency Test (TCT). This is diagrammatically illustrated as follows:

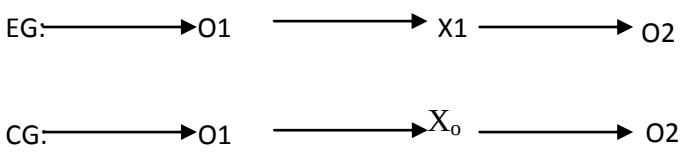


Figure: 3.1: Diagrammatic Illustration of the Research Design

Key:

EG = Experimental Groups

CG = Control Groups

O1 = pretest

O2 = posttest

Xo = No treatment

X_I = Treatment

3.3 Population of the Study

There are One hundred thousand nine hundred and seventy one (100,971) senior secondary school (SSI-SSIII) students in Kaduna State while one inspectorate division Zaria Metropolis have fifteen thousand two hundred and thirty four (15,234) senior secondary school (SSI-SSIII) students. The study area consists of 23 public senior secondary schools in Zaria Metropolis, Kaduna State. Which together sums up to a total of four thousand seven hundred and eighteen (4,718) students. Out of this total, 75 students were drawn, 4 teachers were sampled to measure their competency and qualification on students performance in Further Mathematics. The schools are made up of both single and mixed sexes. The average age of the population is 17years. Though it is expected that all the 4,718 students are offering general mathematics only a few numbers are offering Further Mathematics.

Table 3.1 Below gives the distribution of teachers, gender, classes and divisions in Kaduna State.

Table 3.1 Distribution of Senior Secondary Schools by Inspectorate Division, Classes, Sex and Teachers in Kaduna State.

S/N	Name of Division	SS 1		SS2		SS 3		Total		Teachers		Total
		M	F	M	F	M	F	M	F	M	F	
1	Anchau	2,446	796	2,112	746	1,962	648	6,520	2,190	412	27	439
2	B/Gwari	438	146	374	149	431	112	1,243	407	103	05	108
3	Giwa	1,287	659	1,270	664	1,091	611	3,648	1,934	314	133	447
4	Godogodo	1,577	974	1,544	985	1,837	957	4,958	2,916	355	52	407
5	Kachia	1,615	1,230	1,461	1,041	1,478	1,016	4,554	3,287	394	66	460
6	Kafanchan	1,996	1,428	1,935	1,434	1,689	1,305	5,620	4,167	623	310	933
7	Kaduna	1,921	2,325	1,668	2,440	2,049	2,017	5,638	6,782	586	699	1,285
8	Lere	1,892	696	1,890	683	1,564	544	5,346	1,923	316	54	370
9	R/Chikun	1,562	727	1,294	776	1,040	656	3,896	2,159	266	63	329
10	S/Tasha	1, 463	1,944	2,650	2,027	1,878	1,420	5,991	5,391	435	534	969
11	Zaria	3,698	1,757	3,033	1,685	3,144	1,463	10,328	4,905	733	489	1,222
12	Zonkowa	1,336	1,235	1,254	1,067	1,251	1,025	3,841	3,327	438	146	584
	Total	21,231	13,917	20,938	13,697	19,414	11,774	61,583	39,388	4,975	2,578	7,553

Source: Kaduna State Ministry of Education Headquarters, Kaduna (2015)

Table 3.2 below shows the details of population in their respective schools.

Table 3.2: Population of Public Senior Secondary Schools in Zaria Metropolis

School	Females	Males	Total
Barewa College Zaria	Nil	416	416
GSS Yakasai	5	45	50
GSS Tudun Shuai'bu (Snr.)	18	99	117
GSS Aminu Sabon Gari	51	241	292
GSS Dinya	2	43	45
GSS Dakace	37	66	103
GSS Tudun-Jukun	217	113	330
GGSS Pada	150	Nil	150
GGSS Dogon-Bauchi	500	Nil	500
SIASS Karau Karau	135	115	250
GGSS K/Gayan	240	Nil	240
GGSS (WTC) Zaria	278	Nil	278
GDSS Matari	40	90	130
GSS Kaura	120	153	273
GDSS Kofangiya	50	75	125
GSS K/Kuyuambana	92	220	312
Alhudahuda College	Nil	100	100
GSS Muchiya (Snr.)	50	75	125
GSS Zaria	Nil	75	75
GGSS Chindit (Snr.)	185	Nil	185
GSS Chindit (Snr.)	Nil	452	452
GSS Likoro	Nil	100	100
GSS Magajiya	29	41	70
TOTAL			**4718**

Source: Zaria Educational Zone (2015)

3.4 Sample and Sampling Techniques

Out of 23 schools in the population, 4 schools were randomly selected, stratified sampling was used based on the number of qualified teachers they had. A target population of 23 schools were imputed into the software to run a sample size of 4 schools which was calculated under the sampling error of 5%. Also using hat and draw technique to avoid vies, papers were cut into 23 pieces, in each paper, a school was written folded and put in a container, where a person was invited and selected 4 schools namely: Government Secondary School Chindit (Snr.) 20 students, Barewa College 10 students, Government Secondary School Muchiya 25 students and Government Girls Secondary School (WTC) Zaria 20 students. Two (2) schools were tagged experimentally which include GSS Chindit and Barewa College while other two control that include: GSS Muchiya and Government Girls Secondary School (WTC) Zaria. Proportionate sampling technique was used to draw 50% of each school, which all together sums up to 75 students.

Table 3.3: Sample of the Study

Groups	Name of Schools	Male	Female	Total
EXPERIMENT GROUP	GSS, Chindit	20	Nil	**20**
	Barewa College	Nil	10	**10**
CONTROL GROUP	GGSS (WTC)	20	Nil	**20**
	GSS Muchiya	15	10	**25**
	TOTAL	**55**	**20**	**75**

3.4.1 Treatment

Four teachers of Further Mathematics at government own secondary schools in Zaria Metropolis of Kaduna State were randomly selected for the study. The teachers were selected from the list of Further Mathematics teachers having equal qualification, equal teaching experience and considerably equal teaching potential in the metropolis. The selected teachers were grouped into the control (C) and experimental (E) groups. The control groups was exposed to the traditional lecture method while the experimental group was subjected to competency examination as well as training in lesson sharing and social skills (Iqbal, 2004).

3.5 Instrumentation

The research used two instruments to collect data for the study. These instruments are Further Mathematics Achievement Test (FMAT) and Teachers' Competency Test (TCT). Teachers' Competency Test (TCT) was developed by the researcher to elicit information on teachers as regard their academic qualifications, competency and techniques of teaching. This consisted of 55 items divided into two section. Section A consisted of five items of personal information, section B deals with teachers competency such as; methods of teaching, method of assessment and ways of improving the deficiency observed. Also the TCT is a test developed by the researchers in order to assess the level of acquisition of Further Mathematics concepts of the Teachers, TCT was 55 items objective test with 3 options (A,B, and C) as shown in Appendix B.

The Further Mathematics Achievement Test (FMAT) was a test developed by the researcher in order to assess the level of acquisition of Further Mathematics concepts of the

students. Further Mathematics Achievement Test (FMAT) was 30 items multiple choice objective tests with 5 options (A, B, C, D and E) as shown in (Appendix A). During the construction of the instrument for data collection, different SSII text books such as Further Mathematics Text Books, Science Teachers Association of Nigeria (STAN), New School Further Mathematics and so on where consulted, after the completion of each topics, questions were developed base on knowledge, comprehension and application as shown in Table 3.3. Table of specification for FMAT until the questions reach 30 items. The instruments (FMAT and TCT) was later taken to the experts in Science Education Department (unit of mathematics education) Faculty of Education, Ahmadu Bello University and validated both the content and face validity of the instrument.

FMAT was based on the senior secondary school SSII Further Mathematics curriculum content broken down into scheme as follows:

3.5.1 Content

- Polynomial
- Differential Equations
- Matrices

FMAT was structured according to low order questions based on knowledge and comprehension of the cognitive domain and the high order questions covering applications as shown below in table of specification for FMAT.

Table 3.4: Specification For Further Mathematics Achievement Test (FMAT)

S/No	Topic (Content)	Knowledge	Comprehension	Application	Total number of items
1.	Polynomial	4	2	5	11
2.	Differential equations	3	2	4	9
3.	Matrices	3	2	5	10
	Total	**10**	**6**	**14**	**30**

Source: Adapting S.S Obeka (2010)

3.6 Validity of Instrument

The FMAT item was subjected to face and content validation by three experts in mathematics education from Ahmad Bello University, Zaria. Letter of introduction was also given to the researcher by the Department of Science Education, titled "Students Field Research" to facilitate data collection from the various schools and organization.

The validators were requested to among other things:

- Check the suitability of the test.
- Check if the language used in constructing instruments is suitable for secondary students and teachers.
- Remove unnecessary or inappropriate item(s) and add any item(s) which are necessary, but had not been included.
- Check if the factors identified are actually being targeted at by each of the research instruments.

At the end of the validation, suggestions and comments were made used to develop the actual draft of the instruments. For instance, it was based on these suggestions the researcher use table of specification in constructing the Further Mathematics achievement test.

3.7 Reliability of the Instruments

The reliability coefficient of a test is the consistency to which the test repeatedly measures what it is intended to measure. Reliability of an instrument could be ascertained using different techniques such as Guttmen split - half, test-retest, parallel comparison and so on.

In this study therefore, Guttmen split–half technique was used. A pilot study was carried out in one secondary school within Zaria; this test the reliability coefficient of the instrument used in the study. The reliability of the FMAT and TCT was calculated to be 0.87 and 0.80 respectively. This indicated that the internal consistency of the instrument is within the acceptable level as opined by Ferguson, 2006

3.8 Procedure for Data Collection

The selected volunteering teachers for experimental group, having gone through the one week training about teachers qualification and competency on students performance in Further Mathematics were assigned to guide the selected students for a period of 5 weeks. The teachers in the control group were assigned to teach the students in the control group using the traditional lecture method while the teachers in the experimental group were assigned to guide the students in the experimental group. At the end of the 5 weeks exercise the data collection instrument Further Mathematics Achievement Test and Teachers Competency Test

was administered to both experimental and control groups to test the performance of the students and that of the teachers.

3.9 Procedure for Data Analysis

As mention earlier the purpose of this study was to examine the effect teacher's qualification and teachers' competency on student performance in Further Mathematics. Data were gathered through Further Mathematics Achievement Test and Teacher Competency Test. The two variables of teacher's qualifications and teachers' competency were analyzed, presented and discussed in relation to the students' achievement/performance. The two variables were treated as independent variable and scores of FMAT and TCT treated as a dependent variable. Each of the null hypotheses itemized in chapter one were analyzed using an appropriate statistical tool as shown below:

1. Null hypothesis one was tested using Analysis of Variance ANOVA Statistics. (that is B.Ed against the other qualifications, and so on).
2. Null hypothesis two was tested using independent Pearson Product Moment Correction (PPMC) statistics. This enable the researcher establish the difference between two variables.
3. Null hypothesis three was tested using Independent T-test statistics because the two population mean will be compared.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND DISCUSSIONS

4.1 Introduction

The aim of this study was to assess the effects of Teachers' Qualification and Competency on performance in Further Mathematics among senior secondary school students in Zaria metropolis, Kaduna State. The chapter contained data analysis, results and discussion of the main variables, as well as validation of the various working assumptions/hypothesis of this research which were obtained or emanating from the objectives of the study for inferential purposes. The data were also subjected to various hypothetical statistical tests and as such presented below.

4.2 Data Presentation

The results from tests of independent t-test, Pearson product moment correlation, and ANOVA tests were presented as follows:

4.2.1 Answer to Research Questions

Table 4.1 presented the data obtained with the view of providing answers to the research questions itemized in chapter one.

Research Question 1: Does teacher's qualification influence students' academic performance in Further Mathematics.

Table 4.1 shows teachers qualification and the frequency of Further Mathematics students taught.

Table 4.1: Influence of Teachers Qualification on Students Performance in Further Mathematics.

Teachers Qualification	Number of Students Taught (N)	Mean Performance of Students	Standard Derivation	Level of Influence
B.Sc.(Ed)	30	9.86	3.72	1st
B.Sc.	20	8.83	4.29	2nd
B.Ed.	25	8.15	3.16	3rd
TOTAL	75			

Source: Field Study, 2014

According to Table 4.1, each category of teachers qualification was taken and the number of students taught by B.Sc(Ed) from two schools were taken into consideration. The influence of academic qualification of teacher on students' performance when rated showed that B.Sc.(Ed.) teacher with students' mean score of 9.86 had the highest influence on students' performance. B.Sc. with students' mean score of 8.83 had the second highest influence on students' performance. B.Ed. teacher whose students' mean score was 8.15 had the third highest influence on students' academic performance.

Research Question 2: Does teachers' competency influence senior secondary school students performance in Further Mathematics?

Table 4.2 presents the responses of teachers on Further Mathematics teachers competency.

Table 4.2: Descriptive statistics showing Further Mathematics Teachers' Competency on Students' Performance

Variables	N	Mean	Standard Deviation
Students Performance	75	7.08	2.58
Teachers' competency	4	14.82	7.76

Table 4.2 above showed the mean and standard deviation of students performance and teachers competency. Clearly the mean of teachers responses on teachers competency was 14.82 with standard deviation of 7.76 and the mean of student performance in Further Mathematics was 7.08 with standard deviation of 2.58.

Research Question 3: Does gender affect students' performance in Further Mathematics

Table 4.3: Gender Performance of Students in Further Mathematics

Gender	N	Mean	Standard Deviation	Std. Error Mean
Male	55	24.16	9.22	.82
Female	20	24.42	8.59	1.57
Total	75			

The Table 4.3 above showed that there were 55 male and 20 female that participated in the study. The male has a mean score of 24.16 with standard deviation of 9.22 while female respondents had a mean score of 24.42 with standard deviation of 8.59

4.3 Hypotheses Testing

The following presentation analyses the data collated in order to address each of the null hypotheses as presented below.

4.3.1 Hypothesis 1:

There is no significant difference between teachers qualification and academic performance of students in Further Mathematics.

The Analysis of Variance (ANOVA) was used to verify whether there were differences in students' performance and teachers qualification as shown in Table 4.4 below.

Table 4.4a: Summary of Analysis of variance ANOVA on the difference in students Performance and Teachers qualification.

Variations	Sum of Squares	Df	Mean Square	F Ratio	F Critical	P Value
Between Groups	19.38	2	9.67	3.703	2.60	0.003
Within Groups	32.84	1	6.47			
Total	52.63	3				

From Table 4.4a There is a significant mean difference between teachers qualification and students performance in all the schools sampled. This is because the calculated F Ratio value of 3.703 is higher than F critical values of 2.60, while the calculated significance difference 0.003 is lower than 0.05 level of significant. Details of the Table 4.4(a) and 4.4(b) give us the confidence of reaching this decision that the result of the finding does not support the Null hypothesis, therefore null hypothesis is reject. Conversely, there is a

mean difference between teachers qualification and students' performance in all the schools sampled.

To further establish whether there are differences between groups of teachers qualification, a post hoc (LSD) test is performed as presented in Table 4.4(b) below.

Table 4.4(b) Post Hoc (LSD) Double Comparison Test on the Differences between Students Performance Based on Teachers Qualification.

Teachers Qualification(I)	**Teachers Qualification(J)**	**Mean Difference(I-J)**	**Standard Error**	**P Value**
B.Sc (Ed)	B.Ed	2.749*	.8578	.002
	B.Sc	1.162	1.041	.327
B.Sc	B.Sc (Ed)	1.028	1.045	.327
	B.Ed	3.777*	1.127	.001
B.Ed	B.Sc	-3.771*	1.127	.001
	B.Sc (Ed)	-2.749*	.857	.002

***The mean difference is significant at the 0.05 level.

The Post Hoc Double Comparison (LSD) Test in Table 4.4b further revealed where the significant difference exists and the level of difference. The Table revealed that significant difference exist between students taught by B.Ed teachers and those taught by either B.Sc or B.Sc(Ed) teachers. It showed that the students taught by B.Ed teachers had the least performance compared with students taught by B.Sc and B.Sc.(Ed) teachers. Therefore, the null hypothesis which states that there is no significant difference between students

performance and Further Mathematics teachers based on their qualification, is hereby rejected. Thus, accepting the assertion that there exists a significant difference between students performance and teachers based on their qualification.

4.3.2 Hypothesis 2:

There is no significant relationship between Teachers' competency and academic performance of students in Further Mathematics.

The mean scores and standard deviations of the student's performance in Further Mathematics and teachers competency in Further mathematics are calculated using PPMC as presented on Table 4.5 below.

Table 4.5: Summary of Pearson Product Moment Correlation (PPMC) on Teachers' Competency and Students Performance in Further Mathematics.

Variables	N	Mean	S.D	Corr. Index r	Critical r	Df	P value
Students performance	75	7.08	2.58				
				.76*	.19	77	.000
Teachers competency	4	14.82	7.76				

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

There is a statistically significant correlation between the teachers' competency and students' performance in all the schools sampled. The Table above shows the Pearson Correlation coefficient (0.76) and P value (0.19) gives us the confidence of reaching this decision that the result of the finding does not support the Null hypothesis, therefore

showing a statistically significant correlation between the teachers' competency and students' performance in all the schools sampled. And so, the null hypothesis was rejected.

4.3.3 Hypothesis 3

There is no significant difference between performance of male and female students in Further Mathematics.

Table 4.6 Independent t-test statistics between male and female students performance in Further Mathematics

Group Statistics

	Groups	N	Mean	SD	Std Error Mean	Df	t-cal	P value
Performance	Male	55	24.16	9.22	.82	73	15.72	0.000
	Female	20	32.42	13.59	1.57			

From Table 4.6, the performance of male and female students differs. This is because the p value of 0.00 is lower than the calculated t-value of 15.72. This reveals that there is no significant difference between male and female level of performance in further mathematics. And so the null hypothesis is rejected.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower	Upper
Performance	Equal variances assumed	17.72	.000	15.72	71	.000	38.64	1.61	41.42	35.45
	Equal variances not assumed			14.99	15.27	.000	38.64	1.77	42.07	35.12

There is a statistically significant mean difference between the male and female students' performance in the schools. The Table above shows the summary statistics as t = 15.72, P = 0.00 therefore showing a statistically significant mean difference between the male and female students' performance in the combined schools. And so, the null hypothesis is rejected.

4.4 Summary of Major Findings

Following the analyses of data collected and subsequent testing of the hypotheses formulated, the study reveals that:

1. There exists a significant relationship between teachers qualification and students' academic performance in Further Mathematics.

2. There are significant relationship between teachers' competency and students performance in Further Mathematics.

3. There is no significant difference between performance of male and female students in Further Mathematics.

4.5 Discussions

The study examined the effects of teachers qualification and competency on performance in Further Mathematics among Senior Secondary School Students in Zaria metropolis, Kaduna State. This research sets out research questions and hypotheses in order to establish possible relationships between the identified factors and students achievements.

Furthermore, the knowledge of the implications of students' personal factors in academic achievement, especially in Further Mathematics, may enhance positive self perception for the low achievers. Thus, a study of this nature may not just be a reflection of objective presentation of actual relationship between the independent and dependent variables, but that such findings may serve as mechanism compensating for the hidden feelings of students' relative academic competence. In an attempt to justify the claims made above, the researcher examined the relevance of the research finding. Abian and Odak (2006) as revealed in 2.3.3 who found no significant difference between gender and achievement in number and numeration, algebraic processes and statistics. Also Sinnes, (2006) reported that female's in principle will produce exactly the same scientific knowledge as male provided that sufficient rigour is undertaking in scientific inquiry. For example it is known that the examination assessing a student need for the post secondary mathematics remediation stressed algebraic problem solving, but the work keys test emphasized more

“applied mathematics” (i.e pre-algebraic computations and related problem solving). This concord with Stone III et al., (2005) findings which indicate that the potential competent teacher hold for significantly affecting a student mathematics performance is related to the kind or level of mathematics learning one is attempting to influence.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This study examined the effects of teachers' qualification and competency on performance in Further Mathematics among senior secondary school students in Zaria metropolis, Kaduna State. This chapter presents the conclusion, educational implications, limitations, recommendations and suggestions for further research. It also includes the summary of the entire work.

The enviable position which mathematics education system of most countries of the world, including Nigeria is perhaps justifiable. The reason is that mathematics education can exert a dominant, if not decisive influence on the life of individual as well as on the developmental effort of a nation Emovon, (2005). The universal recognition of the above submission is responsible for the prime position that has been accorded mathematics worldwide. Mathematics has been identified as a very important school subject and its importance in scientific and technological development of any nation has been widely reported. It was as a result of the recognition given to mathematics in the development of the individual and the nation that is made a core-subject among the natural sciences and other science-related courses in the Nigerian education system. Its inclusion as a core subject in the secondary school calls for the need to teach it effectively. This is because effective mathematics teaching can lead to the attainment of scientific and technological greatness. This made the government to make the Senior Secondary Mathematics a core

subject for all students at that school level in view of its services to other disciplines both at the secondary school and after-wards FRN, (2001).

Deficiency of Senior Secondary Mathematics which rendered it non-challenging enough for brighter students who will in future study engineering (and other sciences) brought about the Further Mathematics curriculum Nwosu, (2005). It is rather unfortunate therefore, that despite the importance role that Further Mathematics plays, it is not made a compulsory subject at the secondary school levels. Little wonder then that the subject is left for a limited few.

5.2 Summary

As mentioned earlier the main objective of this study was to determine empirically the Effects of Teachers' Qualification and Competency on Performance in Further Mathematics among Senior Secondary School Students in Zaria metropolis, Kaduna State. The concept of Further Mathematics as applicable to the Nigerian Secondary School Education curriculum refers to the teaching of mathematics concepts that are considered to be theoretically advanced for teaching as part of the general mathematics curriculum. The main objective of its teaching is to prepare students in science oriented class for advance studies in science oriented programme in tertiary institution, mostly as a bridging ground for the understanding of basic scientific concepts. Despite the important role of Further Mathematics, students' academic performance keeps declining by the day. An attempt was made by the researcher to consider three factors that may be responsible for this decline.

The study was designed to find out if teacher qualification and competency are factors of success in Further mathematics in Zaria metropolis Kaduna State.

The study was a descriptive design. It was carried out in four government Senior Secondary Schools. The four schools were randomly selected out of 23 schools in Zaria metropolis. Students from SSII were the subjects of the study from the four government owned schools in Zaria metropolis. The subjects comprise male and female students and were grouped based on the qualification of the teachers that teaches them. The size of the study was 75. As mentioned earlier, it comprise of 55 male and 20 female who offer Further Mathematics. Three research questions and three hypotheses guided the study. The independent variables used were teachers' qualification and competency and the dependent variable was students performance in Further Mathematics. To retrieve data from the subject, two instruments were utilized. It includes Teachers' Competency Test (TCT) and Further Mathematics Achievement Test (FMAT) was a 30 item questions constructed from past NECO and WAEC examination questions papers. The data collated from the investigation were subjected to analysis using several statistical tools which include mean, standard deviations, PPMC, t-test, and ANOVA suitable to answer the research questions and tested the hypotheses. The analysis of the data led to the following findings:

- That teachers educational qualification affects students performance in Further Mathematics.
- That teachers competency has influence on the performance of students in Further Mathematics
- That there was no significant difference between performance of male and female students in Further Mathematics.

5.7 Conclusion

The findings of this study in conjunction with a number of other studies in recent years revealed some noteworthy results. All the two independent, variables affecting the performance of students in Further Mathematics, the level of educational attainment of teachers' qualification and competency were positively related with students' outcome. The results of this study, suggest a number of implications f or policy intervention to improve the quality of teachers, encourage positive study habit among students which will consequently improve students achievement.

5.8 Recommendations

Based on the findings of this study, the researcher wishes to make the following recommendations.

1. The study calls for the need to improve teacher training programs and encourage teachers to further their qualifications, consequently teachers would become more competent in discharging their duties.
2. Teachers of Further Mathematics should explore the right strategies to teach the subject so that students will understand and apply the knowledge in other subjects and life generally.
3. A recommended number of years could be specified for teacher as mandatory to further their studies.
4. Every senior Secondary School students should endeavour to offer Further Mathematics in order to have enough prospective qualified science and engineering students in the institution of higher learning.

5. The National University Commission (NUC) should make a pass in Further Mathematics prerequisite for admission into some of the programmes as part of the uniform minimum standard expected of universities.
6. The Federal government should also classify Further Mathematics as a core subject for science, engineering and students of architecture.
7. School counselor should utilize guidance services and counseling techniques in promoting effective positive study habit.
8. The government (or curriculum planners) should harmonies the syllabus of general mathematics and further mathematics and take off some aspects like dynamic and so on to subjects like physics. This will allow the teaching Further Mathematics right from Junior Secondary Schools.

5.9 Limitations of the Study

The study has the following limitations:

1. The researcher proposed to collect data from 150 respondents, only 75 respondents (50%) were available for the investigation. This however, did not affect the generalization of the findings as 50 percent is appreciable for use in the study.
2. Some schools identified in this study have fewer students than what was intended for them by the researcher.

5.10 Suggestions for Further Study

This study is by no means conclusively on the issues raised, investigated and discussed, rather it has just set the ball rolling for others to re-investigate or better still focus on other aspects such as:

- Covering wider grounds to give it national outlook
- Other aspects on teacher factors could be exploited to access their impact on students' performance, for instance, teachers pedagogy, and methods of assessment.
- Other personality factors could also be investigated to have another dimension to students achievement, for example anxiety and perseverance

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APPENDIX A

FURTHER MATHEMATICS ACHIEVEMENT TEST (FMAT)

Instruction: Attempt all questions below, please choose by making a circle round your choice from the options A-E provided.

SEX: Male ( ) Female ( ) **Time allowed:** 1hr 15min.

1. Which of the area of the region bounded by the curve $y = 4 + 3x -$

X^2, the x axis and the ordinates x = -1 and 4?

A. $5\frac{1}{6}$ sq units B. $13\frac{1}{2}$ sq units C. $14\frac{1}{2}$ sq units D. $15\frac{1}{3}$ sq units E. $20\frac{5}{6}$ sq units

2. If $\begin{vmatrix} 12 & -1 & 5 \\ -4 & 11 & -7 \\ 5 & 8 & -10 \end{vmatrix}$ = 8, what is the value of x?

A. -9 B. -3 C. 0 D. 3 E. 9

3. The equation of a circle with centre (-7, 7) which passes through the point (0, 1) is

A. $x^2 + y^2 - 14x - 14y + 13 = 0$ B. $-x^2 + y^2 + 14x - 14y + 13 = 0$ C. $x^2 + y^2 + 14x - 14y + 13 = 0$ D. $x^2 + y^2 + 14x - 14y - 13 = 0$

4. The cumulative frequency function of the data below is giving by the equation y = cf (x). what is cf (5)?

Score (n)	3	4	5	6	8
Frequency (f)	30	32	30	35	20

A. 30 B. 35 C. 55 D. 62 E. 92

5. The modulus of the resultant of the velocities 8 ms $^{-1}$ and 8 ms $^{-1}$ inclined at an angle 60^0 is

A. 14.8 ms $^{-1}$ *B.* 1.48 ms $^{-1}$ C. 1.22 ms $^{-1}$ D. 12.2 ms $^{-1}$ E. 13.2ms $^{-1}$

6. If $\log_{\sqrt{8}} \frac{1}{32}$ = x, then x is

A. $-\frac{10}{3}$ B.$-\frac{5}{3}$ C. $\frac{5}{3}$ D.$\frac{10}{3}$

7. Then formula for the sum of n terms of a sequence is given by

$S_n = \frac{4n^2-2n}{n}$. The third term of the sequence is

A. 4 B. 6 C. 10 D. 18 E. 22

8. What is the standard deviation of the following set of scores to one decimal place

2.1, 2.6, 3.1, 3.6, and 4.1 ?

A. 2.6 B. 2.5 C. 0.7 D. 0.5 E. 0.3

9. What is the mean of the distribution below?

Score	0 – 9	10 – 19	20 – 29
Frequency	3	2	5

A. 4.35 B. 5 C. 14.5 D. 16.5 E. 55

10. A raindrop falls in still air at 3ms^{-1}. What is its velocity, if it falls through a current of air moving horizontal at a speed of 4ms^{-1}

A. 53.13° B. 51.33° C. 51.1° D. 52.3° E. 53.2°

11. Simplify $\frac{2p5 \; x \; 9r3}{12r7 \; x \; 3p2}$

A. $\frac{p2}{3r3}$ B. $\frac{2p2}{r4}$ C. $\frac{p3}{2r4}$ D. $\frac{2p2}{2r-4}$ E. $\frac{2p5}{r3}$

12. Evaluate $\int_3^5 2xdx$

A. -34 B. -16 C. -14 D. 16 E. 34

13. By how much is the mean of 30, 56, 31, 55, 43, and 44 less than the media?

A. 0.75B. 0.50C. 0.33D. 0.17E. 0.52

14. What is the range of values that satisfy the inequality $x^2 + 3x - 18 < 0$?

A. $-3 < x > 6$ B. $-3 > x < 6$ C. $-6 > x < 3$ D. $6 > x < 3$ E. $-6 < x < 3$

15. Solve the equation $\log_{10}(x-8)^2 = 2 - \log_{10}(x+1)^2$

A. x = -2 or -7 B. x = -2 or -9 C. x = -2 or 9 D. x = 1 or -18 E. x = 2 or 9

16. If $\sum Fd^2$ of 45 students in mathematics test is 2025, calculate the variance. A. 6.71 B. 13.42 C. 40.25 D. 45.00 E. 50.00

17. The 4^{th} 13^{th} terms of an A.P are 3 and 39 respectively, find the nth term of the progression.

A. 2n-4 B. 2n-l C. 4n - 13 D. 4n + 13 E. 4n + 17

18. The operation * is defined by $x * y = x + y^2$. Find 3*4

A. 7 B. 10 C. 12 D. 13 E. 19

19. If θ is acute and $\cos\theta = \frac{1}{2}$, find the value of $\cot^2\theta$

A. $\frac{1}{\sqrt{3}}$ B. $\frac{1}{3}$ C. $\frac{2}{\sqrt{3}}$ D. $\frac{1}{2}$ E. 3

20. How many committees are possible if a committee of 3 boys and 4girls is to be formed from 5boys and 6girls?

A. 12 B. 30 C. 100 D. 150 E. 200

21. If 24 students sit for an examination and 18 students are to be promoted to the next class/ which of the following should be made the least pass mark?

A. lower quartile mark B. median mark C. upper quartile mark

D. the 18^{th} percentile mark E. the 24^{th} percentile mark

22. The unit vector in the direction of (3i + 4j) is,

A. $\frac{1}{6}(3i + 4j)$ B. $\frac{1}{5}(3i + 4j)$ C. $\frac{1}{4}(3i + 4j)$ D. $\frac{1}{3}(3i + 4j)$ E. $\frac{1}{2}(3i + 4j)$

23. Which equation shows the general equation of circle?

A. $x^2 + y^2 = r^2$ B. $\frac{x^2}{a^2} + \frac{y^2}{b^2}$ C. $x^2 + y^2 + 2gx\ 2fy + c=0$ *D.*

24. The range of 4, 3, 11, 9, 6, 15, 19, 23, 27, 24, 21 and 16 is

A. 16 B. 21 C. 23 D. 24 E. 25

25. Evaluate the determinants of the matrix given as

$$\begin{matrix} 12 & -1 & 5 \\ -4 & 11 & -7 \\ 5 & 8 & -10 \end{matrix}$$

A. -1088 B. -1008 C. 1008 D. 1080 E. 1088

26. One bag contains 2 yellow and 3 red balls, another contains 3 yellow and 4 red balls. One ball is drawn from each bag. What is the probability that both balls are yellow?

A. $\frac{2}{35}$ B. $\frac{3}{35}$ C. $\frac{1}{7}$ D. $\frac{6}{35}$ E. $\frac{12}{35}$

27. What is the value of (6! - 4!)2?

A. 24 B. 48 C. 696 D. 720 E. 1392

28. A body is subjected to fall freely from the top of a building. What is the height of the building if it takes 5 seconds for the body to touch the ground from rest? (g = 10 m/s^2) A. 150m B. 135m C. 128m D. 125m E.75m

29. An operation ⊗ is defined on the set of real numbers by a ⊗ *b* = a + b + 1. If the identity element is -1, find the inverse of the element 2 under ⊗

A. -4 B. -2 C. 0 D. 4 E. 3

30. What is the equation of the circle with centre (-1, -1) and radius $\sqrt{2}$ units? A. $x^2 - y^2 - 2x - 2y = 0$ B. $x^2 + y^2 - 2x + 2y = 0$ C. $x^2 + y^2\ 2x + 2y = 4$ D. $x^2 + y^2 + 2x + 2y = 0$

APPENDIX B

TEACHER COMPETENCY TEST (TCT)

SECTION A

1 Name of School: ……..

2 School Ownership Type: Private [ ] Public [ ]

3 Sex : Male [ ] Female: [ ]

4 Qualification: B.Sc. [ ] B.Sc.(Ed.) [ ] B.Ed. [ ]

5 Years of Teaching Further Mathematics : Below 5 years [ ] Below 10 Years [ ] Above 10 Years [ ]

SECTION B

Instruction: Attempt all questions below, please choose by making a circle round your choice from the option A - C provided.

Time allowed: 2 hours

1). Express angle 45^0 in radians

(a) $\frac{\bar{x}}{4}$ rad (b) $\frac{\bar{x}}{8}$ rad (c) $\frac{\bar{x}}{10}$ rad

2) . On a circle of radius 12inches, find the length of the arc subtended by a central angle of $\frac{2}{3}$ rad.

(a) θ = 1 radian (b) θ = 0.8 rad (c) 0.1 rad

3). Express sin30 + sin20 as product

(a) 0.8419 (b) 0.04567 (c) 0.8143

4). Solve $\lim_{n\to\infty}\left(1+\frac{2}{n}\right)^{2n}$

(a) e^5 (b) e^4 (c) e^1

5). Find $\lim_{n\to\infty}\frac{a^x-b^x}{x}$

(a) $log_e(b/a)$ (b) $log_e(a/x)$ (c) $log_e\ (a/b)$

6). Solve $\lim_{n\to\infty} \frac{x^2}{x-1} - \frac{x^2}{x+1}$

(a) 1 (b) 2 (c) 4

7). $\lim_{n\to\infty} \frac{1-cos2x}{x^2}$

(a) -2 (b) 0 (4)

8) find the value of K so that f(x) will be continuous at x= 0

$$f(x) = \begin{cases} \frac{\sin 3x}{4x}, & x \neq 0 \\ k, & x = 0 \end{cases}$$

(a) ¼ (b) 2/4 (c) ¾

9). Which of the following is false about the function

$$f(x) = \begin{cases} 2x, & x \neq 1 \\ -1, & x = 1 \end{cases}$$

(a) f(1) = -1 (b) $\lim_{n\to 1} f(x) = -1$ (c) $\lim_{n\to 1} f(x) = 2$

10) If f(x) = log (cos 2x) find $\frac{d\ f(x)}{x}$

(a) $\frac{2(-\sin 2x)}{\cos 2x}$ (b) $\frac{2(\cos 2x)}{sin2x}$ (c) $\frac{(-sin2x)}{\cos 2x}$

11). Find $\frac{d^2}{dx^2}$ (x^2e^{-2})

(a) $(2-4x + x^2)e^{-2x}$

(b) $(2+4x - x^2) e^{-x}$

(c) $(2-4x + x^2) e^{-x}$

12). Find $\frac{dy}{dx}$ when $xy^2 + \cos 2y = 4$

(a) $\frac{y^2}{2(sin2y-xy}$ (b) $\frac{2(sin^2y-xy)}{y^2}$ (c) $\frac{siny-xy}{y}$

13). Find $\frac{dy}{dx}$ when $xy^2 + \cos 2y = 4$

(a) $\frac{y^2}{2(\sin\ 2y-xy)}$ (b) $\frac{2(sin2y-xy)}{y2}$ (c) 2sin(2y-xy)

14). Find $\frac{dy}{dx}(x^2e^{-x})$

(a) $(2-4x + x^2)e^{-2x}$ (b) $(2+4x - x^2)e^{-x}$ (c) $(2-4x + x^2)e^{-x}$

15). Solve $\int_{-1}^{\sqrt{3}} \frac{dx}{1+x^2}$

(a) $\frac{2\pi}{2}$ (b) $\frac{7\pi}{12}$ (c) $\frac{\pi}{2}$

16) Solve $\int \sin(2x + 3)\, dx$

(a) -2cos(2x+3) + c (b) -1/2 cos(2x +3) +c (c) 2cos(2x + 3) + c

17) Evaluate $\int \frac{sin^2x}{1+cosx}\ dx$

(a) x + cosx + c (b) x-cos + c (c) x – sinx + c

18). What is the domain of the function given by f(x) = $\frac{\sqrt{x^2-4}}{x-3}$ is

(a) { x: $x \neq 3$ }

(b) {x: $x \geq 2\ and\ x \neq 3$}

(c) { x: lxl $\geq 2\ and\ x \neq 3$}

19). Find the values of θ between 0^0 and 360^0 which satisfies

$6\sin^2\theta - 5\cos\theta - 2 = 0$

(a) $\theta = 30^0$ (b) $\theta = 60^0$ (c) $\theta = 40^0$

20). Solve the equation

$\tan(45^0 + x) + \cos(45^0 + x) = 4$ for which $o^0 \leq x \leq 360^0$

(a) $30^0, 150^0, 210^0, 330^0$

(b) $20^0, 130^0, 200^0, 300^0$

(c) $10^0, 120^0, 180^0, 280^0$

21). Find x if $\tan^{-1}2x + \tan^{-1}3x = \pi/4$

(a) x = 1/6 or x = -1 (b) x=1/5 or x=-2 (b) x=1/4 or x=-3

22). If A and B \re acute angles such that sin A =1/5, tanB = 1/3, find the value of A+B

(a) $\frac{\sqrt{24}}{5}$ (b) $\frac{\sqrt{23}}{4}$ (c) $\frac{\sqrt{22}}{3}$

23). If θ is an angle in the fourth quadrat satisfying the equation $\cot^2\theta$ =4, find $1/\sqrt{5}$($\sec\theta$ - $\operatorname{cosec}\theta$)

(a) 4/2 (b) 3/2 (c) 4/5

24). Compute the values of $\cos\frac{2\pi}{3}$ and $\sin\frac{2\pi}{3}$ using double angle identities

(a) $\frac{\sqrt{3}}{2}$ (b) $\frac{\sqrt{5}}{2}$ (c) $\frac{\sqrt{4}}{2}$

25). If $\cos\alpha = \frac{4}{5}$ and α lies in the first quadrant, find the value of $\tan 2\alpha$

(a) 24/7 (b) 25/7 (c) 26/7

26). Express 3 cos$\theta + 4\sin\theta$ *in term of* $Rsin(\theta + \alpha)$ and solve the equation

3cos $\theta + 45sin\theta = 2.5$ *of* $0^0 \leq \theta \leq 360^0$

(a) $\theta = 113^0, 353^0$ (b) $\theta = 110^0, 350^0$ (C) $\theta = 100^0, 340^0$

27). Given that $\frac{a \tan 75}{1-\tan 75^2} = \frac{1}{\cos 15}$

Find the value of tan 75^0 in surd form

(b) $\frac{2}{\sqrt{3}}$ (b) $\frac{-1}{\sqrt{2}}$ (c) $\frac{-3}{\sqrt{4}}$

28) convert the polar equation r = $\frac{5}{1+cos\theta}$ into rectangular Cartesian form

(a) r = $\frac{5}{1+cos\theta}$ (b) r = $\frac{3}{1+sin\theta}$ (c) $\frac{4}{1+sin\theta\ cos\theta}$

29). A surveyor is walking directly toward a tower, he first observed the tower at an angle of elevation of 10^0 after walking a distance of 50meters straight towards the tower, he observes the tower again at an elevation of 15^0. find the height of elevation of the tower

(a) 24.7m (b) 25.8m (c) 27.1m

30). A wire 121 inches long is bent 50 as to lie along the arc of a circle of 180 inches radius. Find in degrees the angle subtended by the arc at the center of the circle. θ = (a) 40^0 (b) 30^0 (c) 39^0

31). The area if a triangle is $336m^2$, the sum of the three sides is 84m. if one side is 28m, calculate the length of the two other sides.

(a) b = 20m c = 10m (b) b = 26m, c = 30m, (c) b = 10m, c = 5m.

32) a ship P is 15.7Km from a harbor H on a bearing of 48^0 ($N48^0E$) and another ship is Q is 24.3k from H on a bearing of P from Q. P=?

(a) 331^0 (b) 300^0 (c) 332^0

33) From two successive position on a straight road 1000m apart, a man observes that the angle of elevation of the top of a tower directly ahead of him are 12.17^0 and 42.58^0 how high is the tower.

(a) 400m (b) 417m (c) 412m

34). The perimeter of a sector OPQ of a circle center O, is 15cm. if the radius of the circle is 5cm cal. Calculate the area of the sector.

(a) 17.2cm^2 (b) 15.1 cm^2 (C) 14.0 cm^2

35). The minute hand of a clock is 5cm long, how far does the tip of the hand move during 10min?

(a) 5.24cm (b) 2.24cm (c) 3.24cm

36) the line joining the points (4,0) and (3,2) meet the axis OY at the point (0,b) find b.

(a) 7 (b) 6 (c) 8

37). Find the area enclosed by a triangle whose sides are represented by the equations

6x-y = 27, 2x -3y + 15 = 0 and 2x+y =5

(a) 31.9 sq unit (b) 32.8 sq. unit (c) 30.8 sq unit

38). Find the radius and center of the circle $2x^2 + 2y^2 – 8x + 5y + 10 = 0$

(a) ¾ (b) 2/3 (c) ½

39). Determine the equation of the circle passing through the points

(0,1), (-2,1) (-4, -1)

(a) $x^2 + y^2 + 2gx + 2fy + c = 0$
(b) $x^3 + y^3 + 3gx + 4fy + c = 0$
(c) $x^3 + y^2 + 4gx + 5fy + c = 0$

40). If the length of the tangent form the pont (3,2) to the circle $X^2 + Y^2 - 2X - 3Y + K = 0$ is 9 units find the value of K

(a) 50 (b) 80 (c) 40

41). Evaluate $\frac{7-i4}{4+i3}$

(a) 0.64 – i1.48 (b) 0.10 – i1.48 (c) 0.40 – i1.50

42). Evaluate $\frac{3+i2}{1-i3}$

(a) – 0.3 + i1.0 (b) -0.3 + i1.1 (c) -0.3 + i1.2

43). Evaluate $\frac{3+i5}{5-i3}$

(a) i (b) 0 (c) i2

44). Solve $e^{1-\frac{i\pi}{4}}$

(a) $\frac{e}{\sqrt{2}}(1-i)$ $(b)\frac{e}{\sqrt{3}}(2-i)$ $(c)\frac{e}{\sqrt{5}}(3-i$

45). Solve $\lim_{n\to\infty}\left(1+\frac{2}{n}\right)^{2n}$

(a) e^3 (b) e^5 (c) e^4

46). Solve $\lim_{x\to\infty}\frac{\ln x}{\sqrt{x}}$ *Hint: lnx =log$_e$x*

(a) 2/3 (b) 1/3 (c) 1

47) Solve $\lim_{x\to 2}\frac{x^2-4}{x-2}$

(a) 2 (b) 6 (c) 4

48) solve $\lim_{x\to 0}\frac{2\,sin2x}{sin4x}$

(a) ½ (b) 4/3 (c) 1

49). $b^2 = 4ac$ the graph is?

(a) Hyperbola (b) parabola (c) Circle

50). If $b^2 > 4ac$ the graph of is

(a) parabola (b) Ellipse (c) hyperbola

Marking Scheme

1. A	2.A	3. A	4.B	5. C
6. B	7. A	8.C	9. B	10. A
11. A	12. A	13. C	14. C	15. B
16. B	17. C	18. B	19. B	20. A
21. A	22. A	23. B	24.A	25. A
26. A	27. A	28. A	29. A	30. C
31. B	32. A	33. B	34.A	35. A
36. C	37. A	38. A	39. A	40. B
41. A	42. A	43. A	44. A	45. C
46. A	47. C	48. C	49. B	50. C